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# The Effect of Carbon Performance on Firm Value and Moderating Role of Ownership Concentration and Public Visibility

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**ABSTRACT**
With the increasing awareness of stakeholders and climate change issues, companies increasingly tries to manage their emissions. This study aims to examine how carbon emissions performance effects firm value and to examine the moderating role of ownership concentration and public visibility. This study uses a data set of 52 companies with 206 observations in non-financial companies listed on the Indonesia Stock Exchange during 2016-2023. The results show that carbon emission performance has a positive effect on firm value and ownership concentration cannot moderate the relationship, but public visibility can weaken the relationship between carbon emission performance and firm value. This research implies the importance of companies managing carbon emissions as a business sustainability strategy that can attract investors and maintain public visibility to avoid environmental controversy.

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## INTRODUCTION

Indonesia is one of the countries that signed the Paris Agreement in 2016. This signifies Indonesia's commitment to addressing environmental issues, particularly those related to global warming and climate change, as the Paris Agreement represents a global pact to reduce carbon emissions and other greenhouse gases in an effort to limit global warming. However, there is a phenomenon cited by CNBC Research Indonesia, which reports that, according to data from Climate Watch in 2020, Indonesia was responsible for emitting one point forty-eight billion tons of carbon, accounting for three point one percent of global emissions. Although this percentage may seem small, Indonesia ranks as the sixth-largest emitter of greenhouse gases in the world (Putri, 2023).

Climate issues and global warming have become important considerations in investment decision-making in the capital market. All related stakeholders are increasingly focusing on environmental aspects, particularly regarding carbon emissions. It is also supported by stakeholder theory which outlines the relationship between a company and its stakeholders, who are affected by or influence the company's activities, objectives, and related decisions (Monica et al., 2021). From this perspective, a company must operate not solely for its own benefit, but also with consideration for its stakeholders. Therefore, companies must be able to utilize their resources effectively and incorporate climate change risks into their corporate policies in order to maintain sustainability and meet market value expectations.

Research suggests a relationship between carbon emissions and firm value. Investors tend to favor companies with robust carbon performance or lower emissions, as these factors can positively influence a firm's market value (Benkraiem et al., 2022). Conversely, high levels of carbon emissions reflect environmentally unfriendly investments, which ultimately lead to a decrease in both revenue and firm value (Sun et al., 2022). This decline in value can also be viewed as a penalty for the emissions produced by the company.

Firm value represents how the market perceives the company as a whole (Silaban et al., 2024). In publicly listed companies, the company's stock price reflects the market valuation. The valuation of a firm extends beyond its profitability, encompassing economic performance, dedication to social equity, and a commitment to sustainable practices. Investors are increasingly considering sustainability issues such as global warming and the growing environmental concerns of today (Sun et al., 2022). Companies that prioritize environmental preservation are receiving greater attention from investors, due to the increasing awareness of pro-ecology movements and sustainability (Monica et al., 2021).

Ownership concentration and public visibility may play a substantial role in persuading management behavior in tackling the challenges of climate change in attempt to enhance firm value. The decision to engage in specific corporate activities or initiatives may be driven by the role of ownership concentration. Ownership concentration is a key corporate governance characteristic, signifying to the ratio of shares held by the largest shareholders (Truong, 2024).

Given the increasingly urgent issue of climate change, companies must strive to achieve performance that is not only economically favorable but also takes into account the environmental impact of their operational activities. Large ownership by shareholders can create pressure that influences a company's sustainability decisions, including those related to carbon emissions management (Bedi & Singh, 2024). According to stakeholder theory, pressure from the largest shareholders will drive the company to meet their expectations by considering broader social and environmental impacts. Furthermore, large shareholders in a company also seek to build positive relationships with stakeholders, ultimately enhancing the company's sustainability performance and strengthening the positive relationship with firm value (Albitar et al., 2020; Alessa et al., 2024). Therefore, investors may favor companies that have good carbon emissions performance with higher ownership concentration, thus strengthening the positive relationship between carbon emissions performance and firm value.

Furthermore, the activities undertaken by a company are also influenced by public visibility. According to reputation theory, a company faces a reputational process that may arise from its past actions. An improved corporate reputation in terms of environmental responsibility will bring economic

benefits from a broader range of stakeholders. Thus, companies are aware that their activities can be monitored by both the public and stakeholders, and therefore choose to engage in positive actions to maintain their reputation.

With the advancement of the current information technology era, the internet media plays a crucial role in disseminating information. Google Search Volume (GSV) can reflect varying patterns of attention and interest toward a particular object (Salsabila & Adhariani, 2023), with the volume reported by Google likely representing the exploration behavior through internet of the general population. The bigger the GSV, the more obvious or popular the reputation of the company, which in turn encourages the company to maintain its reputation and improve its performance (Chen et al., 2021; Li et al., 2017). Therefore, the increased attention from the public is considered to drive sustainability performance, and such performance creates a positive reputation, which is believed to strengthen the positive correlation between carbon emissions performance and its firm value.

In the context of this study, existing literature has examined ownership concentration as a moderating factor between ESG and firm value (Albitar et al., 2020; Rastogi et al., 2024), as well as the relationship between ownership concentration and firm value (Kong et al., 2020; Novita & Sahrul, 2020). Furthermore, public visibility has been used as a moderating variable between gender diversity and water disclosure (Salsabila & Adhariani, 2023), as a subsample analysis in the relationship between ESG and firm value (Aouadi & Marsat, 2018), and prior studies have also investigated the relationship between firm visibility, as measured by media coverage, and firm value (Dang et al., 2021; Li et al., 2017). Therefore, this study seeks to extend the existing body of literature by incorporating ownership concentration and public visibility into the relationship between carbon emission performance and firm value.

Indonesia is one of the signatories of the Paris Agreement and ranks as the sixth-largest carbon emitter globally, the third-largest in Asia, and the largest in Southeast Asia (Kurnia et al., 2021; Wuri, 2024,). This makes Indonesia an attractive context for researchers to select as the sample for this study. The research covers the period from 2016, when Indonesia signed the Paris Agreement, to the most recent period, 2023. The data used in this study are quantitative in nature and derived from secondary sources.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### Stakeholder Theory

The primary objective of this theory is to help managers in enhancing the value of a company's operations while minimizing the potential losses that stakeholders may experience. The core emphasis of this theory lies in explaining the connection between a company and its stakeholders, who either influence or are influenced by the firm's operations, objectives, and strategic decisions (Monica et al., 2021). A company's attention to environmental concerns is one form of corporate responsibility toward stakeholders, making sustainability a crucial factor in influencing investor perceptions and decisions. Increasing ownership concentration can also create pressure for company managers to meet the expectations of these stakeholders. These expectations may manifest in business decisions that prioritize sustainability issues alongside the company's profitability goals. Thus, in accordance with this theory, companies must strive to satisfy the interests of their largest shareholders.

### Reputation Theory

Reputation is the perception that stakeholders may form based on a company's past actions and future prospects. An entity with a poor reputation may take actions to improve it, while an entity with a good reputation may engage in activities aimed at maintaining or enhancing that reputation. Reputation theory posits that a social entity (such as an individual or organization) is involved in processes related to reputation, whereby the entity actively monitors activities that are linked to its reputation. Awareness of the importance of reputation, driven by public attention toward a company, helps the company to shape a positive image or reputation, which in turn exerts a significant positive influence on its performance and financial support (Chen et al., 2021; Li et al., 2017). Therefore, companies must strive to achieve strong performance and engage in positive activities in order to earn a good reputation in the eyes of the public.

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**Carbon Performance and Firm Value**

As climate change continues to grow as a critical global concern requiring attention, investors will consider the possibility of providing financial support to Firms that exhibit robust environmental practices (Silaban et al., 2024). To maintain a competitive edge and uphold firm value, businesses must integrate environmental risk considerations into their strategic planning. One approach that companies can adopt is to improve their environmental performance by minimizing emissions and reducing environmental cost burdens.

From the perspective of stakeholder theory, companies must operate not only for their own benefit but also with consideration for their stakeholders. Benkraiem et al. (2022) state that companies with high carbon emissions will face greater pressure from stakeholders in response to stricter climate regulations. This pressure will compel companies to pay closer attention to the amount of emissions they produce.

In line with stakeholder theory, investors can demand that companies meet their expectations. These expectations may include the management of emissions and strong environmental performance by the company. Benkraiem et al. (2022) note that investors prefer to invest in companies with strong carbon performance. Regulations tied to carbon emissions may raise compliance expenses and trigger additional indirect costs linked to carbon output, such as measurement, monitoring, and emission reduction costs (Shrestha et al., 2022). In this regard, Sun et al. (2022) supports the view that environmentally unfriendly investments with high carbon emissions will increase costs for the companies or entities involved. As a result, poor carbon emissions performance leads to reduced revenues and a decline in firm value. This decline in value indirectly demonstrates that investors penalize companies for carbon emissions that do not align with their expectations.

Based on the above discussion, the researcher argues that investors tend to prefer companies with strong carbon performance or those that produce lower carbon emissions, as this has the potential to increase firm value, and vice versa. Thus, the first hypothesis in this study is:

**$H_1$: There is a positive relationship between carbon emissions performance and firm value.**

**Ownership Concentration as Moderation Variable**

One of the efforts a company can make in addressing climate change is by planning sustainability-related performance strategies, such as carbon performance, which is expected to optimize firm value. However, decisions regarding company strategy may also depend on the largest shareholder groups. The presence of several large shareholders in a company leads to greater ownership concentration. In other words, the higher the share of ownership held by the largest shareholders, the more concentrated the ownership becomes.

From the perspective of stakeholder theory, the largest shareholders in a company have expectations and preferences to be more involved in sustainability activities, not only for their own benefit but also to maintain good relationships with other stakeholders (Albitar et al., 2020). The preferences of large shareholders regarding sustainability initiatives create pressure on the company to increasingly consider broader social and environmental impacts, thereby fostering better sustainability performance (Alessa et al., 2024). A company's strong sustainability performance, along with a positive perception from investors regarding ownership concentration can drive investment choices that further strengthen the favorable relationship between carbon performance and firm value.

Several studies support the idea that higher ownership concentration aligns with the interests of owners and managers who are motivated to improve sustainability performance, which ultimately strengthens the positive relationship between that performance and market valuation. Albitar et al. (2020) reveal that concentrated ownership can lead to higher ESG disclosures as an effort by majority owners, thereby strengthening the positive relationship between ESG and market performance. According to Rastogi et al. (2024) higher ownership concentration enhances the positive impact of ESG performance on company value. Furthermore, Dan & Shen (2022) find that ownership concentration plays a role in promoting voluntary carbon emissions disclosure.

Drawing from the previous points, stakeholder theory indicates that businesses should align with the expectations of their stakeholders, including

shareholders. The researcher argues that the largest shareholders seek to maintain good relationships with other stakeholders and encourage the company to be more mindful of the operational impacts it generates. Therefore, investors may prefer companies with better carbon emission performance and higher ownership concentration. Based on this, the second hypothesis proposed in this research is:

**$H_2$: Ownership concentration strengthens the positive relationship between carbon emissions performance and firm value.**

### Public Visibility as Moderation Variable

In the current era of information technology, the visibility of a company can be observed through online media, which plays a crucial role in facilitating the communication of information to the public. The increasing public awareness and concern regarding environmental issues have prompted companies to pay attention to environmental performance, including carbon emissions, as a strategy to maintain their market value. Public visibility is considered as the oversight conducted by the public, and stricter oversight provides company managers with strong incentives to act in the best interests of shareholders and engage in activities that maximize firm value (Aouadi & Marsat, 2018; Dang et al., 2021).

According to reputation theory, companies must be cautious in taking actions that will shape their reputation. Silaban et al. (2024) argue that a company's actions can impact its reputation and fundamental principles, as public scrutiny can influence investor perceptions of their business. Investors tend to assess information through media as an indicator of a company's strengths or weaknesses, helping them form more realistic expectations about the company.

In this study, public attention or visibility is proxied through Google Search Volume (GSV), which reflects patterns of attention and interest that vary over time toward a particular subject (Salsabila & Adhariani, 2023). Consistent with reputation theory, the higher the GSV, the more visible or popular the company's reputation becomes, which encourages the company to improve its performance and maintain its reputation (Chen et al., 2021; Li et al., 2017). Aouadi & Marsat (2018) found that visibility, as reflected through GSV, enhances the relationship between ESG performance and a company's market value. The better a company is perceived, the more likely it is to be valued by investors, consumers, and employees.

Based on the explanation above, the researcher argues that good carbon emission performance, combined with high public visibility of a company, can enhance investor confidence to invest, as the company is perceived to be more committed to maintaining its reputation and performance. This, in turn, can strengthen the positive relationship between carbon emission performance and firm value. Hence, the third hypothesis proposed in this research is:

**$H_3$: Public visibility strengthens the positive relationship between carbon emissions and firm value.**

## RESEARCH METHODS

This study includes 52 non-financial companies listed on the Indonesia Stock Exchange (IDX) from 2016 to 2023, with a total of 206 observations. The study uses a quantitative data collection technique with secondary sources from the Refinitiv Eikon Database and Google Trends. Data analysis is conducted using regression analysis with Stata. Two models are employed in this study. The first model is used to test Hypothesis 1, while the second model is used to test Hypotheses 2 and 3. Both models are expressed in the following equations:

Model 1:

$$FV_{it} = \beta_0 + \beta_1 CP_{it} + \beta_2 OCt_{it} + \beta_3 PV_{it} + \beta_4 Size_{it} + \beta_5 Lev + \beta_6 Growth_{it} + \beta_7 Capex_{it} + \varepsilon_{it} \quad (1)$$

Model 2:

$$FV_{it} = \beta_0 + \beta_1 CP_{it} + \beta_2 OCt_{it} + \beta_3 PV_{it} + \beta_4 CP^{*}OC_{it} + \beta_5 CP^{*}PV_{it} + \beta_6 Size_{it} + \beta_7 Lev + \beta_8 Growth_{it} + \beta_9 Capex_{it} + \varepsilon_{it} \quad (2)$$

This study consists of the dependent variable, which is firm value; the independent variable, which is carbon emission performance; and the moderating variables, which are ownership concentration and public visibility. To control for factors that are likely related to firm value, the researcher includes control variables. Investors consider firm size as one of the key factors before deciding to invest. Larger firms tend to have higher value, as with increased firm size come larger

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assets, market share, and resources, which in turn contribute to higher firm value (Hapsoro & Falih, 2020). Furthermore, higher leverage provides a greater tax shield due to tax deductions from interest expenses, which can enhance profitability, attract investors, and ultimately increase firm value (Samuel et al., 2023). Next, firm growth can be observed through the growth of the company's assets. Companies that demonstrate high asset growth are typically seen as having positive profit projections for the future. In this case, investors are more likely to view such profit projections as an opportunity for investment in the company (Melinda & Wardhani, 2020). Finally, a high capital expenditure ratio is considered to foster long-term growth and investments that are potentially beneficial to shareholders' wealth, thereby increasing investor confidence and, ultimately, firm value (Satt et al., 2022).

**Table 1. Research Variables**

| Name of Variable | Variable Measurement | Source |
|---|---|---|
| Firm value | Tobin's Q = (market capitalization + total liabilities) / total assets | Thomson Reuters Refinitiv Eikon |
| Carbon emission performance | Natural logarithm of total Scope 1 and 2 emissions divided by total revenue, multiplied by (-1) | Thomson Reuters Refinitiv Eikon |
| Ownership concentration | The proportion of ownership of the three largest shareholders in the company | Thomson Reuters Refinitiv Eikon |
| Public Visibility | Natural logarithm of the average GSV of the company name | Google Trends |
| Size | Natural logarithm of total assets | Thomson Reuters Refinitiv Eikon |
| Leverage | Total liabilities divided by total assets | Thomson Reuters Refinitiv Eikon |
| Growth | The difference between the total assets of the current period (t) and the previous period (t-1) divided by the total assets of the previous period (t-1) | Thomson Reuters Refinitiv Eikon |
| Capital expenditure | Total capital expenditure divided by total assets | Thomson Reuters Refinitiv Eikon |

Source: Data Processed (2025).

## RESULTS AND DISCUSSION

### Descriptive Statistics

Descriptive statistics are useful as an overview of the information regarding the research variables. However, since outliers were detected in all variables using the box-plot method in the Stata application, winsorization treatment was applied to address the variables with extreme values (outliers). Winsorization was performed to clean the data before estimating the parameters in the research model. The results of the descriptive statistics analysis are presented in the Table 2 and Table 3.

**Table 2. Descriptive Statistics Before Winsorization**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| FV | 206 | 1.9827 | 2.1784 | .6380 | 16.2633 |
| CP | 206 | 8.6917 | 2.4839 | 2.1165 | 15.6511 |
| OC | 206 | .6267 | .1423 | .2181 | .9283 |
| PV | 206 | 3.2811 | .8169 | -.2567 | 4.4039 |
| Size | 206 | 21.7744 | .9495 | 18.7254 | 24.0888 |
| Lev | 206 | .4609 | .1950 | .1028 | .9948 |
| Growth | 206 | .0637 | .2183 | -.6071 | 2.0320 |
| Capex | 206 | .0473 | .0426 | .0003 | .2081 |

Source: Data Processed (2025).

**Table 3**. Descriptive Statistics After **Winsorization**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| FV | 206 | 1.6676 | .9417 | .7911 | 3.7762 |
| CP | 206 | 8.5996 | 1.8832 | 5.6628 | 11.4780 |
| OC | 206 | .6324 | .1091 | .4519 | .8083 |
| PV | 206 | 3.3427 | .6179 | 2.1602 | 4.0788 |
| Size | 206 | 21.7780 | .7732 | 20.3829 | 22.9312 |
| Lev | 206 | .4575 | .1722 | .1888 | .7452 |
| Growth | 206 | .0392 | .0883 | -.0887 | .1974 |
| Capex | 206 | .0443 | .0327 | .0103 | .1144 |

Source: Data Processed (2025).

## Estimation Model and Classical Assumption Test

To select the best regression model among the Common Effect Model (CEM), Random Effect Model (REM), and Fixed Effect Model (FEM), a series of tests were conducted, including the Chow test, Lagrange Multiplier test, and Hausman test. Based on the results of the model tests, Fixed Effect Model (FEM) is the most appropriate model for testing both models in this study.

The researcher conducted tests for classical assumptions, which included assessments of multicollinearity, heteroscedasticity, and autocorrelation. Multicollinearity was assessed by evaluating the Variance Inflation Factor (VIF) values for each variable, with centering treatment applied to mitigate multicollinearity concerns. The findings from the multicollinearity test confirmed that the data is free from multicollinearity problems. Heteroscedasticity was tested using the Modified Wald test, and autocorrelation was tested using the Wooldridge test. The p-values of these tests are smaller than 0.05, prompting the researcher to apply clustering treatment during the regression analysis to address heteroscedasticity and autocorrelation issues, ensuring that the model is free from classical assumption problems.

## Regression Test Result

Regression analysis was conducted on Model 1 to test the first hypothesis, and on Model 2 to test the second and third hypotheses.

**Table 4**. Regression Test Result

| Variables | Expected Sign | (Model 1) FV | (Model 2) FV |
|---|---|---|---|
| CP | + | 0.157** | 0.158** |
| | | (0.086) | (0.080) |
| OC | + | -0.631 | -0.822 |
| | | (1.057) | (1.298) |
| PV | + | -0.038 | -0.056 |
| | | (0.075) | (0.065) |
| CP_OC | + | | -0.347 |
| | | | (0.452) |
| CP_PV | + | | -0.080** |
| | | | (0.041) |
| Size | + | -1.154*** | -1.233*** |
| | | (0.217) | (0.218) |
| Lev | + | 0.252 | 0.465 |
| | | (0.877) | (0.853) |
| Growth | + | 0.842** | 0.803** |
| | | (0.432) | (0.437) |
| Capex | + | -1.873 | -1.541 |
| | | (2.136) | (2.009) |
| Constant | | 1.602*** | 1.697*** |
| | | (0.418) | (0.085) |
| Observations | | 206 | 206 |
| Number of id | | 52 | 52 |
| R-squared | | 0.251 | 0.277 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

Source: Data Processed (2025).

Based on the test of Hypothesis 1 presented in Table 4, a significant positive relationship was found between carbon emissions performance (CP) and firm value (FV) at the 5% and 10% significance levels. This indicates that Hypothesis H1 is supported.

Based on the test of Hypothesis 2 shown in Table 4, a significant positive relationship was found between carbon emissions performance (CP) and firm value (FV) at the 5% and 10% significance

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levels. However, no significant relationship was observed between the interaction variable CP_OC and firm value. This indicates that Hypothesis H2 is not supported.

Based on the test of Hypothesis 3 shown in Table 4, a significant positive relationship was found between carbon emissions performance (CP) and firm value (FV) at the 5% and 10% significance levels. Additionally, a significant negative relationship was found between the interaction variable CP_PV and firm value at the 5% and 10% significance levels. This indicates that Hypothesis H3 is not supported.

## DISCUSSION

### Carbon Emission and Firm Value

The results of the study indicate that good carbon emission performance will increase firm value, and conversely, the opposite holds true. Referring to stakeholder theory, a company's attention to environmental aspects is a form of corporate responsibility aimed at minimizing the negative impacts of its operations and fostering mutually beneficial relationships with stakeholders. Modern stakeholders, particularly shareholders, expect firms to prioritize not just financial success but also sustainable practices. One area of concern is the carbon emissions produced by companies. Based on the findings of this study, companies with better carbon emission performance are more likely to meet stakeholder expectations and receive greater support from stakeholders.

Stakeholders, including shareholders, are increasingly prioritizing companies that have a positive environmental impact. Actions taken by companies to manage and take responsibility for carbon emissions in the context of current climate issues are seen as capable of addressing environmental challenges and preparing for future challenges, particularly those related to carbon emissions. As such, companies with good carbon emission performance can provide satisfaction to stakeholders and gain trust, which can enhance their competitiveness and market value.

This finding is consistent with the research by Benkraiem et al. (2022), who found that good carbon emission performance fosters a positive market reaction and increases firm value. Companies that successfully demonstrate environmental commitment and generate lower carbon emissions tend to be viewed as more attractive investment options and are considered environmentally friendly investments. Furthermore, Sun et al. (2022) argue that companies with high carbon emissions will incur additional costs, which could lower revenue and decrease market value. Poor carbon emission performance is likely to face higher environmental liability and compliance costs and could damage the company's reputation, thus reducing its attractiveness to investors. Therefore, by implementing good carbon emission performance, companies can sustain and enhance their competitive advantage in the market, leading to an increase in firm value.

### Ownership Concentration as Moderation Variable

According to the study's results, concentrated ownership does not amplify the positive correlation between carbon emissions performance and firm valuation. These results do not support the stakeholder theory, which posits that the largest shareholders in a company should be able to drive sustainability initiatives, including carbon emission performance. According to this theory, larger or more concentrated shareholders are typically more focused on long-term decision-making that encompasses environmental sustainability. This concern is expected to provide a positive image that can attract investor attention, thereby enhancing carbon emission performance and firm value. However, the findings of this study show that high ownership concentration does not have a significant impact on strengthening carbon emission performance and firm value.

This finding is consistent with the research conducted by Choi et al. (2024), which indicates that although stakeholder theory suggests that the largest shareholders tend to build good relationships with stakeholders, this does not directly enhance investors' positive perceptions of companies with high ownership concentration. One reason is that investors may recognize the potential for conflicts between shareholders and the company's board, where the board may steer the company according to their own interests rather than aligning with shareholders' opinions, thereby reducing the effectiveness of the company's performance.

Furthermore, this finding is also supported by Wu et al. (2022), who state that although

there are changes in the environment in which companies operate, such as increased attention to environmental issues, companies with high ownership concentration may still not demonstrate a corresponding increase in firm value. In other words, the firm's value does not experience significant changes because shareholders remain focused on short-term financial results. This suggests that while good carbon emission performance reflects a company's responsibility toward the environment, high ownership concentration is not enough to influence investors' decisions regarding the company. As a result, ownership concentration fails to strengthen the positive relationship between carbon emission performance and firm value. Based on this finding, companies need to emphasize clear communication regarding the long-term benefits and provide convincing evidence to shareholders that investments in sustainability will have a positive long-term impact, not just on short-term financial performance.

**Public Visibility as Moderation Variable**

The results of this study indicate that public visibility weakens the positive relationship between carbon emission performance and firm value. This finding does not fully support reputation theory. In the context of this theory, companies under public scrutiny tend to engage in various activities to maintain their reputation and project a positive image. Good carbon performance, combined with the positive image gained from public attention, should theoretically strengthen the relationship between carbon performance and firm value. However, the findings of this study reveal that even though a company's carbon performance is commendable, high public attention, particularly through information circulating on the internet, may lead investors to discount or reduce the positive relationship between carbon performance and firm value.

This is similar to the findings of Chai et al. (2023), who revealed that in the digital age, the public has increasingly easy access to a wide range of information. However, this ease of access often makes it difficult for the public to discern the accuracy of the information, leading to a general mistrust of media reports. On one hand, the internet plays a role in disseminating positive information about a company's performance, including sustainability initiatives. On the other hand, the internet often highlights negative issues related to environmental practices or ESG matters. In this context, public visibility can pose risks in the form of controversy. Investors who prefer to avoid involvement in controversial issues may be more inclined to steer clear of companies under public scrutiny. Therefore, even though a company may demonstrate good carbon performance, investors might tend to avoid companies that are in the spotlight, as they do not want to be associated with controversies related to the company's environmental performance. As a result, the positive relationship between carbon performance and firm value weakens when the company is under high public visibility.

Based on these findings, companies need to be more cautious in managing their public visibility, particularly with regard to environmental issues such as carbon emission performance. While good carbon emission performance can enhance firm value, excessive public attention, especially in the current digital era, can invite controversy that negatively impacts investor perceptions. Therefore, it is important for companies to manage effective communication about their sustainability performance, ensuring that the information disseminated does not create negative perceptions that could influence investors' investment decisions.

**Control Variables**

Regarding the control variables, the findings reveal a significant negative relationship between firm size and firm value. This relationship may arise because larger companies incur higher operational costs, including labor, building maintenance, and equipment expenses, which can reduce profitability. Such a decline is typically less attractive to investors and may result in a decrease in firm value. Additionally, companies with larger assets tend to allocate higher retained earnings, thereby reducing the dividends paid to shareholders, which in turn leads to a decrease in firm value (Jannah et al., 2022). Furthermore, a significant positive relationship was found between asset growth and firm value. Companies with high asset growth tend to show positive future profit projections. As a result, investors perceive these projections as an opportunity to invest in the company, thereby increasing firm value (Melinda & Wardhani, 2020). However, no significant relationship was found

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between leverage and capital expenditure and firm value, indicating that debt levels and capital expenditures do not directly influence investors' perceptions when making investment decisions in the companies studied.

## SENSITIVITY ANALYSIS

Based on the results of the hypothesis 2 test, which were not significant, the researcher conducted a sensitivity analysis by measuring ownership concentration using the proportion of shares held by the largest shareholder in the company. The test results, presented in Table 5, indicate findings consistent with the previous results, namely that ownership concentration (CP_OC) does not moderate the relationship between carbon emission performance and firm value. Meanwhile, carbon emission performance (CP) is positively associated with firm value (FV), and public visibility (CP_PV) weakens the positive relationship between carbon emission performance and firm value. These results are consistent and further strengthen the previous findings.

**Table 5. Sensitivity Analysis Result**

| Variables | Expected Sign | (Model 1) FV | (Model 2) FV |
|---|---|---|---|
| CP | + | 0.156** | 0.160** |
| | | (0.086) | (0.084) |
| OC | + | -0.106 | -0.008 |
| | | (0.781) | (0.994) |
| PV | + | -0.034 | -0.048 |
| | | (0.077) | (0.069) |
| CP_OC | + | | -0.052 |
| | | | (0.302) |
| CP_PV | + | | -0.072** |
| | | | (0.042) |
| Size | + | -1.173*** | -1.246*** |
| | | (0.215) | (0.218) |
| Lev | + | 0.359 | 0.469 |
| | | (0.879) | (0.992) |
| Growth | + | 0.863** | 0.856** |
| | | (0.440) | (0.443) |
| Capex | + | -1.830 | -1.569 |
| | | (2.157) | (2.031) |
| Constant | | 1.551*** | 1.693*** |
| | | (0.420) | (2.031) |
| Observations | | 206 | 206 |

Source: Data Processed (2025).

**Table 5. (continued)**

| Variables | Expected Sign | (Model 1) FV | (Model 2) FV |
|---|---|---|---|
| Number of id | | 52 | 52 |
| R-squared | | 0.249 | 0.268 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

## ADDITIONAL ANALYSIS

To assess the consistency of the model and the research results, the researcher added a control variable for the period during the COVID-19 pandemic, considering the economic uncertainty during that time which could have impacted investment decisions as well as firm value. The COVID-19 pandemic period is measured using a dummy variable, where 1 is assigned to observations from the years 2019, 2020, and 2021, and 0 is assigned to observations from the years 2016, 2017, 2018, 2022, and 2023.

**Table 6. Additional Analysis Result**

| Variables | Expected Sign | (Model 1) FV | (Model 2) FV |
|---|---|---|---|
| CP | + | 0.233*** | 0.232*** |
| | | (0.085) | (0.081) |
| OC | + | 0.075 | -0.094 |
| | | (1.204) | (1.321) |
| PV | + | -0.048 | -0.063 |
| | | (0.069) | (0.058) |
| CP_OC | + | | -0.204 |
| | | | (0.443) |
| CP_PV | + | | -0.070** |
| | | | (0.038) |
| Size | + | -1.048*** | -1.122*** |
| | | (0.176) | (0.179) |
| Lev | + | -0.0002 | 0.144 |
| | | (0.725) | (0.734) |
| Growth | + | 0.640* | 0.622* |
| | | (0.402) | (0.401) |
| Capex | + | -0.842 | -0.614 |
| | | (1.753) | (1.648) |
| COVID | ? | 0.270*** | 0.260*** |
| | | (0.077) | (0.075) |
| Constant | | 1.576*** | 1.563*** |
| | | (0.362) | (0.077) |
| Observations | | 206 | 206 |

Table 6. (continued)

| Variables | Expected Sign | (Model 1) FV | (Model 2) FV |
|---|---|---|---|
| Number of id | | 52 | 52 |
| R-squared | | 0.337 | 0.355 |
| Standard errors in parentheses<br>*** p<0.01, ** p<0.05, *p<0.1 | | | |

Source: Data Processed (2025).

Based on Table 6, similar findings to the previous results are observed. In Model 1, a significant positive relationship is found between carbon emission performance (CP) and firm value (FV). In Model 2, it is concluded that ownership concentration (CP_OC) does not moderate the relationship between carbon emission performance and firm value. However, public visibility (CP_PV) weakens the positive relationship between carbon emission performance and firm value.

Furthermore, for the COVID variable in both models, a significant positive relationship with firm value was found, indicating that during the COVID pandemic, the firm value in this study increased. The main reason supporting this is that during this period, people tended to spend more time at home, leading them to think about ways to increase their wealth, one of which was through stock investments that could boost the market capitalization of companies. Additionally, Rohmah (2023) in her research suggests other reasons behind stock investment decisions during the pandemic, including the possibility of relatively lower stock prices during the pandemic, which attracted investors to purchase shares. Furthermore, during the pandemic, many companies began to transform digitally and innovate, creating opportunities for companies to grow more rapidly, thus fostering a positive outlook among investors. Therefore, investors' decisions to invest during the pandemic ultimately led to an increase in firm value. For the other control variables, similar results were found as in the previous tests.

## CONCLUSION

This study investigates the relationship between carbon performance and firm value, along with the moderating roles of ownership concentration and public visibility, focusing on non-financial firms listed on the Indonesia Stock Exchange between 2016 and 2023. The data used in this study consists of 206 observations sourced from the Refinitiv Eikon Database and Google Trends. The results indicate that carbon emission performance is positively and significantly related to firm value. Companies with good carbon performance are preferred by investors, which in turn increases firm value. Ownership concentration does not moderate the relationship between carbon performance and firm value, whereas public visibility weakens the positive relationship between carbon performance and firm value. Despite companies demonstrating good carbon performance, investors may show less interest in companies that are under public scrutiny, as they may not want to be involved in controversies related to the company's environmental performance.

Several implications of this study for companies include the need to focus more on managing and reducing carbon emissions as part of a business sustainability strategy that can attract investor attention. Demonstrating good carbon emission performance is expected to have a positive long-term impact. Additionally, companies should manage their public visibility to ensure that circulating information does not lead to controversies or negative perceptions from investors. For regulators, it is crucial to implement policies such as the carbon tax, which is still pending, by establishing clear emission calculation standards, a structured carbon tax payment mechanism, and a transparent and effective monitoring system to provide incentives for companies to reduce carbon emissions. Furthermore, regulators should encourage investments in environmentally friendly or low-carbon technologies to help companies transition to more sustainable business models.

This study utilizes Google Search Volume (GSV) obtained from Google Trends as a measure of public visibility. Although Google Trends can measure the level of public attention, the data generated cannot indicate whether the attention is derived from positive or negative information. Future researchers may consider incorporating the aspect of controversy, for instance, by combining GSV with ESG controversy scores to capture public attention toward sustainability issues, whether in a positive or negative context. This study focuses on Indonesia for the period 2016–2023, given the limitations of time and resources, meaning that the results can only be generalized within this context.

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Future research could expand by conducting cross-country studies or using a longer time frame, such as the past decade, to obtain a broader understanding. Additionally, future researchers could develop this study by exploring other independent, mediating, or moderating variables that may be related to carbon performance and firm value. For example, corporate governance variables such as institutional ownership or foreign ownership, which may exert pressure from global investors more concerned with environmental issues.

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