

The Influence of Carbon Emission Disclosure and Green Innovation on Firm Value with Profitability as a Moderating Variable

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ARTICLE HISTORY

Received: August 11, 2025
Revised: September 17, 2025
Accepted: September 25, 2025

DOI

<https://doi.org/10.52970/grar.v6i1.1662>

ABSTRACT

This study aims to analyze the effects of Carbon Emission Disclosure and Green Innovation on firm value, with Profitability as a moderating variable. Firm value in this study is measured using the Tobin Q ratio. The data were obtained from Annual Reports and Sustainability Reports through purposive sampling, resulting in a sample of 19 companies with a total of 76 observations. Data analysis was conducted using Moderated Regression Analysis (MRA) in SPSS Software version 26 to examine the effect of independent variables and the role of the moderating variable. The hypothesis testing results indicate that Carbon Emission Disclosure and Green Innovation have a significant effect on firm value, whereas Profitability does not moderate the effect of Carbon Emission Disclosure and Green Innovation on firm value. These findings suggest that when companies transparently disclose their carbon emission data and undertake environmentally supportive innovations, it enhances the firm's value. Meanwhile, the level of profitability does not alter or influence the relationship between carbon emission disclosure and green innovation with firm value.

Keywords: Carbon Emission Disclosure, Green Innovation, Firm Value, Profitability.

JEL Code: E44, F31, F37, G15

I. Introduction

Every firm that is established must have good goals in the short and long term. The main goal is to make a profit. But not only getting profits, the firm also has a long-term goal of maximizing the firm's value so that every stakeholder benefits from the firm. The purpose of maximizing the firm's value is to attract investors to invest in the firm. A good firm performance will drive up the stock price, increase the firm's value, and provide benefits to investors. According to Indrastuti (2021), the firm's measurable financial performance is in the form of financial statements. The struggle to produce financial statements with integrity and gain public trust depends on many factors, including pressure from management, regulators, investors, and the public interest. Now, attention to the environment is one of the important factors that affect this value. Companies that care and are active in protecting the environment, for example, by reducing pollution, using environmentally friendly energy, or managing waste well, will usually be viewed more favorably by the public and investors. If companies pay attention to environmental issues, they tend to gain more trust from customers and investors. This trust can make the stock price rise, attract more investment, and ultimately

increase the value of the firm itself. In addition, environmentally friendly companies can also avoid fines or sanctions for violating environmental regulations, so that their finances are more stable. Conversely, if companies ignore environmental issues, they could lose public trust, be sanctioned, or even boycotted by consumers. This can certainly make the firm's value decrease. Therefore, protecting the environment is not only a matter of social responsibility, but also an important strategy so that the firm's value remains high and the business can survive in the long term.

The relationship between firm values and environmental issues in the transportation and logistics sectors is very real and increasingly crucial today. According to a report from the Institute for Essential Service Reform (IESR), 2023, the transportation sector accounts for around 23% of total greenhouse gas (GHG) emissions in Indonesia, with land transportation being a major contributor, accounting for 90% of transportation sector emissions. In addition, private vehicles such as cars and motorcycles account for 55% of the total emissions of the transportation sector, while freight transportation accounts for about 28.1%. High carbon emissions resulting from their operational activities. These emissions not only negatively impact the environment but can also affect a firm's image in the eyes of the public and investors. The transportation and logistics sector was chosen as the object of research because this sector makes a significant contribution to carbon emissions and environmental impacts in Indonesia. Its operational activities, such as the use of fossil fuels for vehicles and logistics, generate significant amounts of greenhouse gas emissions. Therefore, the issue of carbon emission disclosure is very crucial for this sector as a form of responsibility for the environmental impact produced. Companies in this sector are required to follow regulations related to sustainability reporting and carbon emission disclosure, such as OJK Regulation Number 51 of 2017 and Presidential Regulation No. 98 of 2021 concerning the control of greenhouse gas emissions. Disclosure of carbon emissions is one of the indicators of the firm's compliance with regulations and efforts to gain legitimacy from the public and the government, which increasingly demands transparency and climate change mitigation.

Carbon Emission Disclosure is one of the important indicators in assessing the extent to which companies are responsible for environmental issues. Investors tend to give a higher rating to companies that actively and transparently disclose information related to carbon emissions, as this is considered a form of the firm's commitment to sustainability and good governance. However, the relationship between Carbon Emission Disclosure and firm value is not always consistent. The results of the study (Sari & Budiasih, 2022) show that carbon emission disclosure can provide positive signals to investors, thereby increasing the value of companies, especially in the manufacturing sector and companies that have taken sustainability practices seriously. On the other hand, research (Apriliani et al., 2024) shows a negative correlation, especially in the energy sector, where carbon emission disclosure is actually associated with high environmental risks and potential additional costs, so it can reduce the value of the firm. Green Innovation is a firm's effort to develop environmentally friendly products, processes, or technologies to reduce negative impacts on the environment. Green Innovation plays an important role in building a socially and environmentally responsible corporate image, which ultimately has an impact on increasing investor trust and customer loyalty. Based on research (Tonay & Murwaningsari, 2022), which states that the implementation of Green Innovation has been proven to have a positive influence on firm value, because companies that carry out green innovations are considered superior in facing competition, increasing efficiency, and attracting investors who care about sustainability. However, the influence of Green Innovation on firm value can also be influenced by other factors such as firm size and industrial sector, so the results can vary between companies.

This study also uses profitability as a moderation variable. Companies with high levels of profitability demonstrate their ability to effectively manage resources to generate large profits. In the transportation and logistics sector, the use of profitability as a moderation variable is very relevant. High profitability indicates the firm's ability to efficiently manage resources to generate profits, which is especially important in this sector given the characteristics of large and fluctuating operating costs. If transportation and logistics companies are able to manage operational costs efficiently, for example, by paying attention to environmental aspects such as fuel efficiency, optimal fleet management, and waste reduction, then the use of resources becomes more effective and can avoid potential cost increases in the future. Based on the background and findings of

previous researchers, this study aims to test the effect of carbon emission disclosure and green innovation on firm value with profitability as a moderating variable in transportation and logistics sector companies listed on the Indonesia Stock Exchange during the period 2021-2024.

II. Literature Review and Hypothesis Development

2.1. Signaling Theory

According to (Ross, 1977) States that strong financial statements indicate healthy firm operations. This theory supports the firm's voluntary disclosure, as found in annual reports and sustainability reports. This disclosure acts as a signal, conveying information about the firm's actions to align with the objectives of the interested parties. This signal can be in the form of carbon information disclosure. The disclosure is a positive signal that the firm gives to the principal, as well as providing information that the firm cares about the environment. This is done to lure investors to invest, increase a positive reputation, and at the same time increase the value of the firm.

2.2. Stakeholder Theory

According to (Freeman & McVea, 1983) Stakeholder theory is an important concept in understanding the relationship between companies and various parties that are influenced by or can affect the firm (stakeholders). This theory explains that the firm is not only responsible to shareholders, but also to other stakeholders. (Freeman & McVea, 1983) explains that there are two models in the theory, namely, (1) policy models and business plans; and (2) the corporate social responsibility model of stakeholder management. Both help in understanding and managing the agent-principal relationship effectively. By understanding the needs and expectations of stakeholders, companies can make decisions that are more aligned with the interests of all parties, and ultimately improve the firm's long-term success.

2.3. Firm Value

Firm value represents the condition of a firm, meaning that the quality of the firm's value also reflects the overall condition of the firm itself. The firm value is the realized value of assets when the firm is sold, or the value of the firm's share price. If the stock price is higher, the firm value will be better, and the prosperity of shareholders will increase. (Pande et al., 2024). Here is the formula used to measure the value of a firm:

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

2.4. Carbon Emission Disclosure

Carbon Emission Disclosure is a firm's activity in recording, acknowledging, disclosing, and measuring the extent of carbon emissions produced by the firm. (Yuliandhari et al., 2023). Carbon Emission Disclosure is done by scoring each disclosure item using a dichotomous scale, where each disclosed item is given a value of 1 and the undisclosed item is given a value of 0. The total score that a firm can obtain ranges from 0, as the lowest score, to 18, as the highest score, depending on the number of items disclosed in the firm's report. In the five categories, 18 items were identified. Here is a checklist for carbon emission disclosure:

Table 1. Carbon Emission Disclosure Checklist

Category	Item	Information
Climate Change: risks and opportunities	CC1	Assessment/description of the risks (regulatory, physical, or general) relating to climate change and actions taken or to be taken to manage the risks
	CC2	Assessment/description of current (and future) financial implications, business implications, and opportunities of climate change
GHG Emission	GHG 1	Description of the methodology used to calculate GHG emissions (e.g., GHG protocol or ISO)
	GHG 2	Existence external verification of the quantity of GHG emission- if so, by whom and on what basis
	GHG 3	Total GHG Emissions – metric tons CO ₂ -e emitted
	GHG 4	Disclosure of scopes 1 and 2, or the direct GHG emissions
	GHG 5	Disclosure of GHG emissions by sources (e.g., coal, electricity, etc.)
	GHG 6	Disclosure of GHG emissions at the facility or segment level
	GHG 7	Comparison of GHG emissions with previous years
Energy Consumption	EC 1	Total energy consumed (e.g., tera-joules or peta-joules)
	EC 2	Quantification of energy used from renewable sources
	EC 3	Disclosure by type, facility, or segment
GHG Reduction and Cost	RC 1	Details of plans or strategies to reduce GHG emissions
	RC 2	Specification of the GHG emissions reduction target level and target year
	RC 3	Emissions reductions and associated costs or savings
	RC 4	Cost of future emissions factored into capital expenditure planning.
Carbon Emission Accountability	AEC 1	Indication of which board committee (or other executive body) has overall responsibility for actions related to climate change
	AEC 2	Description of the mechanism by which the board (or other executive body) reviews the firm's progress regarding climate change

Source: Choi et al (2013)

2.5. Green Innovation

Green Innovation emerged as a firm's response to the environmental and social issues that are developing today. Green Innovation can be understood as innovations related to environmentally friendly processes or products that can improve the firm's environmental and economic performance. (Rahelliamelinda & Handoko, 2024). Quoted from the journal, (Agustia et al., 2019) Uses four indicators to assess green innovation: (1) the use of cutting-edge technology in the production process to minimize energy, water, and waste consumption; (2) incorporation of environmentally friendly materials in the product; (3) adoption of environmentally friendly packaging materials; and (4) recycling of materials and components. Here is the formula:

$$Green\ Innovation = \frac{Number\ of\ items\ disclosed}{Total\ Disclosure\ Items}$$

2.6. Profitability

Profitability is the ability of a firm to consistently generate profits from the use of the resources it has over a period of time. According to (Hardiyansah et al., 2021), a high firm value is considered a high firm profitability value because profitability reflects a return on investment where the firm's profits have been an important part in deciding dividend distribution. Therefore, it can be concluded that the value of a firm is

influenced by the level of profitability of the firm. Profitability in this study is proxied by return on assets. According to (Kieso et al., 2020), Return on Assets can be formulated as follows:

$$\text{Return on Asset} = \frac{\text{Net Income}}{\text{Average Total Assets}}$$

2.7. Hypothesis

Carbon Emission Disclosure is a firm's process of disclosing information related to the amount of carbon emissions produced and its management and reduction efforts. This disclosure is usually done through annual reports, sustainability reports, or environmentally specific reports. The main objective of this disclosure is to increase the transparency and accountability of companies regarding their environmental impact, as well as to encourage more environmentally friendly business practices. Research (Hardianti & Mulyani, 2023) Found that Carbon Emission Disclosure has a positive effect on firm value. This means that the higher the disclosure of carbon emissions, the higher the value of the firm. Meanwhile, internal research (Rachmawati, 2021) Shows that Carbon Emission Disclosure does not have a significant effect on the firm value. The study concludes that even if companies disclose carbon emissions, they do not necessarily affect investor perceptions or the value of companies in the capital markets.

Green Innovation is a firm's effort to develop products, processes, or business strategies that are oriented towards environmental conservation. The influence of Green Innovation on firm value has been extensively researched, and the results are mixed. According to the results of the study (Lutfian & Isfianadewi, 2023) Show that Green Innovation has a positive and significant effect on firm value. This innovation is able to increase competitiveness, improve the firm's image, and provide a sustainable competitive advantage. According to the results of the study (Lutfian & Isfianadewi, 2023) Show that Green Innovation has a positive and significant effect on firm value. This innovation is able to increase competitiveness, improve the firm's image, and provide a sustainable competitive advantage.

Profitability acts as a moderating variable that strengthens the influence of carbon emission disclosure on firm value. This means that the higher the firm's profitability, the more significant the impact of carbon emission disclosure on increasing firm value. Companies with high profitability generally have greater financial resources to support transparent and comprehensive carbon disclosure activities. With adequate financial capabilities, companies can manage their operational activities more efficiently and environmentally friendly, so that carbon emissions disclosure is not only a reporting obligation, but also a positive signal to investors and stakeholders regarding the firm's commitment to sustainability. Based on research (Lestari, 2023) States that profitability is able to moderate the relationship between Carbon Emission Disclosure and Firm value. Meanwhile, research conducted by (Hariadi & Nurwanda, 2024) and (Herawaty & Marini, 2024) Shows that profitability does not affect profitability.

Profitability moderates the influence of green innovation on firm value, so that the positive influence of green innovation on firm value becomes stronger in companies with a high level of profitability. This means that companies that implement green innovation will increase the firm's value more significantly if the firm also has high profitability. Good profitability shows the firm's ability to manage resources efficiently, so that green innovations carried out can have a more optimal impact on increasing firm value. Based on research (Rahelliamelinda & Handoko, 2024) States that profitability is able to moderate the relationship between Green Innovation and Firm value.

Based on the theoretical review previously described, the hypothesis and theoretical framework model of this study can be conveyed in the figure below:

H1: Carbon Emission Disclosure has a positive effect on Firm value

H2: Green Innovation has a positive effect on Firm value

H3: Profitability can moderate the relationship between Carbon Emission Disclosure and the value of the firm.

H4: Profitability can moderate the relationship between Green Innovation and the firm value

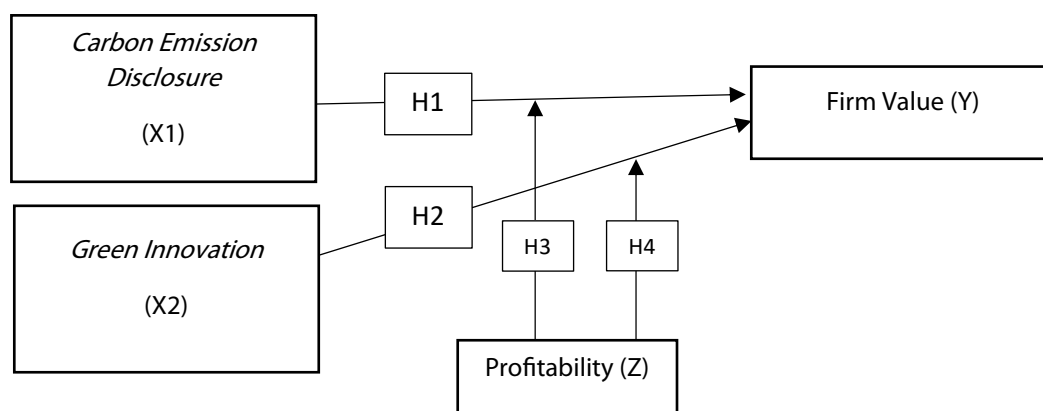


Figure 1. Conceptual Framework

III. Research Method

3.1. Research Methodology

This research was conducted in Indonesia using secondary data obtained from annual reports and sustainability reports published by companies on the Indonesia Stock Exchange (IDX). The approach used is hypothesis testing to evaluate the relationship between two or more variables through empirically testable statements. This study examines the influence of various independent variables, namely carbon emission disclosure and green innovation, on dependent variables, namely firm value, with profitability as a moderating variable. The research objects used in this study are companies listed in the transportation and logistics sectors on the Indonesia Stock Exchange (IDX) during the 2021-2024 period.

3.2. Population and Sample

This research focuses on companies in the transportation and logistics sectors listed on the Indonesia Stock Exchange (IDX) during the 2021-2024 period as a population. The sampling method used is purposive sampling, which is a sample selection based on certain criteria.

Table 2. Sampling Criteria

Criteria	Total
Transportation and logistics sector companies listed on the Indonesia Stock Exchange for the period 2021 – 2024	37
Companies in the transportation and logistics sector that do not publish and present complete annual reports according to the data required in the study during the period of 2021 - 2024.	(16)
Transportation and logistics companies that do not present financial statements in rupiah.	(2)
Total Sample Companies	19
Research Period (Years)	4
Total Research Samples	76

Based on the table above, a sample of 19 companies was selected that published Annual Reports and Sustainability Reports, which presented financial statements in rupiah and were published in a period of 4 years, making a total sample of 76.

Table 3. List of Sample Transportation and Logistics Sector

No.	Code	Firm Name
1	ASSA	Adi Sarana Armada Tbk.
2	BIRD	Blue Bird Tbk.
3	CMPP	AirAsia Indonesia Tbk.
4	IMJS	Indomobil Multi Jasa Tbk.
5	MIRA	Mitra International Resources
6	MITI	Mitra Investindo Tbk.
7	SAFE	Steady Safe Tbk
8	SDMU	Sidomulyo Selaras Tbk.
9	TAXI	Express Transindo Utama Tbk.
10	TMAS	Temas Tbk.
11	HELI	Jaya Trishindo Tbk.
12	TRUK	Guna Timur Raya Tbk.
13	TNCA	Trimuda Nuansa Citra Tbk.
14	BPTR	Batavia Prosperindo Trans Tbk.
15	SAPX	Satria Antarana Prima Tbk.
16	PURA	Putra Rajawali Kencana Tbk.
17	PPGL	Prima Globalindo Logistik Tbk.
18	TRJA	Transkon Jaya Tbk.
19	HAIS	Hasnur Internasional Shipping

3.3. Data Source

The type of data used in this study is secondary data. The secondary data in question is annual reports and sustainability reports from transportation and logistics sector companies listed on the Indonesia Stock Exchange (IDX) for the 2021-2024 period. The data used was taken from the official website www.idx.co.id, the official website of each firm, as well as information based on literature and other information related to this research.

3.4. Data Analysis Techniques

According to Sugiyono (2017), data analysis is the process of searching for and organizing data obtained from interviews, observations, and documentation in a systematic manner. The data analysis technique used in this study is quantitative analysis, which is processed using the SPSS (Statistical Package for the Social Sciences) 26 software. The collected data are analyzed using the following techniques.

3.5. Descriptive Statistical Test

In this study, statistical testing was conducted by examining the minimum, maximum, mean, and standard deviation. The mean was used to determine the average value of the variables during the observation period, while the standard deviation was utilized to characterize the data with the highest risk.

3.6. Classical Assumption Test

The classical assumption test is an essential procedure in regression analysis to confirm that the model adheres to key statistical criteria, ensuring the results are trustworthy and unbiased. This test typically covers four components: (1) a normality test to verify if the residuals or data distribution follow a normal pattern; (2) a multicollinearity test to detect correlations between independent variables that could skew estimates; (3) an autocorrelation test to identify any correlations among residuals over time, which might cause systematic errors; and (4) a heteroscedasticity test to check if residuals maintain constant variance across

different observations. When these assumptions hold, the regression model is deemed dependable and appropriate for making precise inferences.

3.7. Hypothesis Testing

Based on the analysis, this study aims to test four main hypotheses: first, the effect of carbon emission disclosure on firm value; second, the effect of green innovation on firm value; third, the moderating role of profitability on the effect of carbon emission disclosure on firm value; and fourth, the moderating role of profitability on the effect of green innovation on firm value. With this systematic research approach, the findings are expected to contribute to academics and practitioners in understanding the factors influencing firm value in transportation and logistics sector companies listed on the Indonesia Stock Exchange (IDX).

IV. Results and Discussion

4.1. Descriptive Statistical Test

Descriptive statistical testing provides information related to the data that is being considered, not to test hypotheses, but it is used to analyze and Present data and calculations to clarify the characteristics of the data that is being considered. Measurements that are used in this technique consist of the Total sample, the maximum value, the minimum value, the average, and the standard Deviation.

Table 4. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Carbon Emission Disclosure	76	0,26	197,93	6,0161	23,49530
Green Innovation	76	0,00	0,67	0,2872	0,16758
Firm Value	76	0,00	0,75	0,3833	0,14885
Profitability	76	-0,46	2,07	0,0350	0,26624

Based on Table 1, the mean for Carbon Emission Disclosure is 6.0161, the standard deviation is 23.49530, the highest score is 197.93, and the lowest score is 0.26. The next independent variable is that Green Innovation has a mean of 0.2872 with a standard deviation of 0.16758. The highest score is 0.67 and the lowest is 0.00. The dependent variable (firm value) has a mean of 0.3833, and 0.16758 is the standard deviation. Then, the highest score is 0.75 and the lowest score is 0.00. The moderation variable, namely Profitability, has a mean of 0.0350, and 0.26624 is the standard deviation. Then, the highest score is 2.07, and the lowest score is -0.46.

4.2. Classic Assumption Test

a. Normality Test

The normality test aims to determine whether the distribution of the data is normal, where in this study, it was carried out using a test statistic of the Kolmogorov-Smirnov Test. Residual. Here are the recruitment criteria. Results from this test:

- 1) The value of sig. < 0.05, which means that the data distribution is abnormal.
- 2) The value of sig. > 0.05 means that the data distribution.

Table 5. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		76
Normal Parameters ^{a,b}	Mean	0,0000000
	Std. Deviation	0,12422791
Most Extreme Differences	Absolute	0,062
	Positive	0,061
	Negative	-0,062
Test Statistic		0,062
Asymp. Sig. (2-tailed) ^c		.200 ^d

Table 2 is the result of the normality test conducted by the researcher, showing a value of 0.200, which is greater than >0.05 . It can be concluded that the regression model used is normally distributed, so that the research can be continued.

b. Multicollinearity Test

The multicollinearity test in this study aims to see whether or not there is a correlation between (independent) variables. The following are the decision-making criteria from the results of this test, with a tolerance value of >0.10 :

- 1) $VIF < 10$, meaning free from multicollinearity.
- 2) $VIF > 10$, meaning there is multicollinearity.

Table 6. Multicollinearity Test Results
Coefficients^a

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Carbon Emission Disclosure	0,742	1,348
	Green Innovation	0,879	1,138
	X1_Z	0,626	1,596
	X2_Z	0,742	1,349

The results of the multicollinearity test revealed that the tolerance and VIF values of each variable in the coefficients table were ≥ 0.10 and ≤ 10 . Therefore, the multiple linear regression model of this study is free from multicollinearity.

c. Autocorrelation Test

This test is carried out to evaluate whether there is a correlation between the residual in a given period and the error rate in the period previously in linear regression models. In this study, the testing of autocorrelation using the Durbin-Watson (DW Test) is conducted.

Table 7. Autocorrelation Test Results

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,651a	0,424	0,366	0,23336	1,691

Based on Table 5, the autocorrelation test results show that the DW value is 1.691, which is between DU of 1.6819 and 4-DU of 2.3181. This means that the DW value is greater than that of DU and smaller than that of 4-DU, which has qualified for the autocorrelation test; therefore, the multiple linear regression model of this study does not experience autocorrelation.

4.3. Heteroscedasticity Test

The heteroscedasticity test in this study aims to test whether or not there is variance of variance from the residual of one observation from another observation in this regression model. The results of heteroscedasticity can be seen in the following figure:

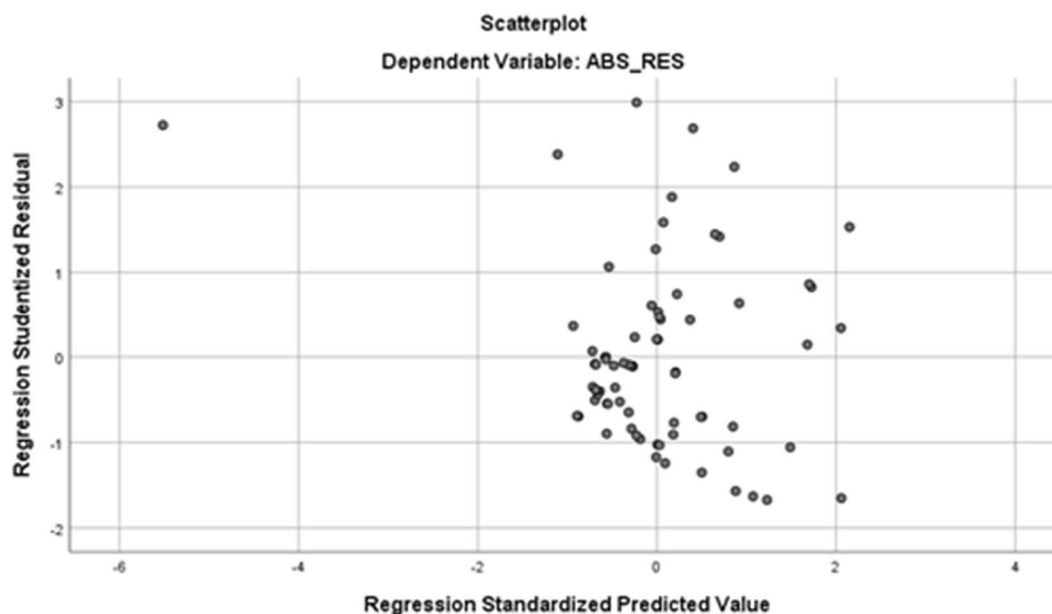


Figure 1. Heteroscedasticity Test Results

Figure 1 shows the scatterplot chart showing that there is no clear pattern and the scattered points above and below the number 0. This means that there is no heteroscedasticity in the regression equation model, so the regression model is feasible to use to predict the value of the firm.

4.4. Hypothesis Testing

a. Multiple Linear Regression Analysis Test

Multiple linear regression analysis aims to find out the influence of independent variables and dependent variables.

Table 8. Results of Linear Regression Analysis Test

Model		Coefficients ^a			t	Sig.
		Unstandardized Coefficients	Standardized Coefficients			
		<i>B</i>	<i>Std. Error</i>	<i>Beta</i>		
1	(Constant)	-0,640	0,122		-5,260	0,000
	Carbon Emission Disclosure	-0,085	0,037	-0,356	-2,306	0,026
	Green Innovation	0,259	0,056	0,571	4,619	0,000

	X1_Z	-0,041	0,057	-0,277	-0,710	0,482
	X2_Z	0,039	0,076	0,204	0,510	0,613

a. Dependent Variable: Firm Value

From the results of the linear regression analysis above, the equation model developed in this study is as follows:

$$FV = -0,640 - 0,085CED + 0,259GI - 0,041(CED \times GI) + 0,039(CED \times GI)$$

With the interpretation of the above equation as follows:

- 1) The value of the constant (α) in this regression model is -0.640. This shows that if the independent variable in the study is 0, then Tobin's Q value is -0.640.
- 2) The value of the Carbon Emission Disclosure variable coefficient is -0.085. This suggests that any 1% increase in Carbon Emission Disclosure will be followed by a decrease in Tobin's Q of -0.085, assuming that other independent variables are constant.
- 3) The value of the variable coefficient of Green Innovation is 0.259. This suggests that any 1% increase in Green Innovation will be followed by a decrease in Tobin's Q of 0.259, assuming that other independent variables are constant.
- 4) The value of the variable coefficient of CED*Profitability is -0.041. This suggests that any 1% increase in the CED*Profitability will be followed by a decrease in Tobin's Q by -0.041, assuming that the other independent variables are constant.
- 5) The value of the variable coefficient of GI*Profitability is 0.039. This suggests that any increase in GI*Profitability of 1% will be followed by a decrease in Tobin's Q of 0.039, assuming that the other independent variables are constant.

b. F-Test

This test is carried out to determine if all the independent variables (free) inserted in the model influence dependent (bound) variables. Significant level of the F-test in research: This is 5% (0.05).

Table 9. F Test Results

ANOVA ^a			
Model		F	Sig.
1	Regression	7,363	,000b
	Residual		
	Total		

The F test in this study used a significance level of 5% or 0.05. If the significance value of $F < 0.05$, then the regression coefficient is feasible. Based on Table 7 above, the results of the F test show a value of 0.000 (< 0.05). Therefore, the variables of Carbon Emission Disclosure and Green Innovation simultaneously affect the Firm value significantly with the moderation variable, namely Profitability.

c. T-Test

The provisions in this test are that if the sig value < 0.05 , then the independent variable partially has an impact on the dependent variable. Meanwhile, if the sig value > 0.05 , the results in a partially independent variable do not have an impact on the dependent variable.

Table 10. T-Test Results

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Conclusion	
	B	Std. Error	Beta				
1	(Constant)	-0,640	0,122		-5,260	0,000	
	Carbon Emission Disclosure	-0,085	0,037	-0,356	-2,306	0,026	H1 Accepted
	Green Innovation	0,259	0,056	0,571	4,619	0,000	H2 Accepted
	X1_Z	-0,041	0,057	-0,277	-0,710	0,482	H3 Rejected
	X2_Z	0,039	0,076	0,204	0,510	0,613	H4 Rejected

a. Dependent Variable: Firm Value

Source: Processed Data with SPSS 26 (2025)

4.5. Discussion

a. Carbon Emission Disclosure and Firm Value

Based on the results of the above research, it can be concluded that partially Carbon Emission Disclosure has a positive influence on the firm value, with an unstandardized beta coefficient of -0.085 and a significance level of 0.026, which is smaller than 0.05. These findings support the first hypothesis (H1), which states that "Carbon Emission Disclosure has a positive effect on Firm value". These results are in line with the Signaling Theory, which states that financial statements and sustainability reports can serve as signals for companies. The information contained in the report reflects the value of the firm and sends positive signals to investors, creditors, and other related parties, thus influencing their decision to invest. Carbon Emission Disclosure in the sustainability report is expected to provide convincing information for stakeholders, so that it has an impact on investors' choices in determining companies that are suitable to be used as a place to invest.

In line with research conducted by Hardianti & Mulyani (2023), it was found that Carbon Emission Disclosure has a significant positive influence on firm value. A firm's behavior in disclosing carbon emissions is closely related to the availability of resources, especially in developing countries. This disclosure is driven by management's motivation to provide transparent information to stakeholders, so that the firm's financial statements look more attractive and of high quality. Public awareness of the environmental impacts caused by the firm's operational activities, such as air pollution, is increasing. Social awareness and tendencies that support a friendly environment turn out to have an important influence on businesspeople. Stakeholders now not only assess the business in terms of profits, but also pay attention to the firm's responsibility to the environment. Investors tend to consider investing in companies that show a good commitment to the environment, given that the issue of climate change has become a global concern.

b. Green Innovation and Firm Value

Based on Table 7 above, it can be concluded that partially Green innovation has a positive influence on the value of the firm, with a significance level of 0.000, which is smaller than 0.05. These findings support the second hypothesis (H2). Green innovation has a positive influence on firm value, especially in the transportation and logistics sectors, as these innovations encourage companies to adopt more environmentally friendly and efficient practices in the use of resources. By implementing green innovation, companies can not only reduce negative impacts on the environment, such as carbon emissions, but also improve operational efficiency, leading to cost savings and increased competitiveness. This is in line with stakeholder theory that emphasizes the importance of companies meeting the expectations and needs of

various stakeholders, including investors, customers, the community, and the government. Stakeholders are now increasingly prioritizing aspects of sustainability and environmental responsibility in assessing firm performance. Therefore, companies that are able to demonstrate a commitment to green innovation will gain more trust from stakeholders, which ultimately increases the firm's value through increased reputation, customer loyalty, and access to capital. Thus, green innovation is not only a business strategy for environmental sustainability, but also an important tool in creating added value for all stakeholders in accordance with the principles of stakeholder theory. The results of the study (Agustia et al., 2019) Strengthen the argument that green innovation can increase firm value when accompanied by good environmental management, in line with the sustainability efforts expected by stakeholders in stakeholder theory. Stakeholders, including investors, customers, and regulators, increasingly demand that companies not only be financially profit-oriented but also environmentally responsible, so that the integration of green innovation and environmental management is key in creating sustainable corporate value.

c. Profitability moderates Carbon Emission Disclosure against Firm Value

Based on Table 7 above, the third hypothesis (H3) is rejected because the results of the study show a significance of 0.482, which is greater than 0.05. This means that the high profitability of a firm does not necessarily guarantee that the firm will utilize the resources it has to disclose carbon emissions that can increase the firm's value. This is because increased profitability is not always followed by a firm's commitment to allocate funds or resources in support of environmentally friendly activities that contribute to increasing the firm's value. This is in line with research. (Hariadi & Nurwanda, 2024) and (Herawaty & Marini, 2024) This can happen because companies with high profitability do not necessarily use carbon emission disclosure to increase environmental transparency or eco-friendly activities that can increase firm value. This is not in line with signal theory and stakeholder theory, which generally assume that Carbon Emission Disclosure serves as a positive signal for stakeholders and investors, so that more profitable companies will be better able and motivated to make more transparent and comprehensive disclosures, which ultimately increases the firm value.

d. Profitability moderates Green Innovation against Firm Value

Based on Table 7 above, the fourth hypothesis (H4) is rejected because the results of the study show a significance of 0.613, which is greater than 0.05. This hypothesis states that corporate profitability does not strengthen or weaken the relationship between green innovation and corporate value, which means that the influence of green innovation on corporate value runs directly without being influenced by the level of profitability. This is not in line with signal theory and stakeholder theory, which generally assume that companies with high profitability will be more able and motivated to carry out green innovation optimally, so that the positive signals sent to stakeholders become stronger and have an impact on increasing the firm value. Signal theory emphasizes that green innovation signals to investors and markets that companies are committed to sustainability, while stakeholder theory asserts that companies must meet the expectations of stakeholders who are increasingly demanding social and environmental responsibility. Based on research (Rahmawati, 2024), profitability does not moderate the relationship significantly. This study shows that the influence of green innovation on firm value is more likely to run through other variables.

V. Conclusion

This study aims to examine variables that affect the value of the firm. The variables tested included Carbon Emission Disclosure, Green Innovation, Firm value, and Profitability. The research sample consists of 19 business entities in the transportation and logistics sectors listed on the Indonesia Stock Exchange (IDX) during the period 2021 - 2024, so the total sample used is 76 companies. From the results of the research, it can be concluded that partially, Carbon Emission Disclosure and Green Innovation have a positive and significant influence on the Firm value. In addition, profitability as a moderation variable does not strengthen

or weaken the relationship between Carbon Emission Disclosure and Green Innovation on the firm value. Therefore, it is suggested that further research can expand the number of samples by involving other sectors and extend the research period to produce more comprehensive and effective findings.

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