CARBON EMISSION DISCLOSURE AND FIRM VALUE: DOES ECO-EFFICIENCY MODERATE THIS RELATIONSHIP?

Ajeng Rahmianingsih[1]*, Melinda Malau[2]
Universitas Trisakti, Jakarta, Indonesia[1]
Universitas Kristen Indonesia, Jakarta, Indonesia[2]
Email: ajengrahmianingsih405@gmail.com*

Abstract

The purpose of this research is to analyze the effect of Carbon Emission Disclosure and Firm Value on moderate of Eco efficiency relationship. Carbon Emission Disclosure as an independent variable is measured by dummy. Firm value as dependent variable is measured by Tobins'Q. This research using Leverage, Firm Size, profitability as control variable. The research uses 495 samples, comprising the data of 99 manufacturing companies listed on the Indonesia Stock Exchange over five years, from 2017 to 2021. The sampling method in this research is purposive sampling. The analysis technique in this study using multiple linear regression analysis. The results show that Carbon Emission Disclosure has a significant positive influence on the Firm Value, while Eco-Efficiency has a significant negative influence. The implications of this research it is hoped that investors will be increasingly concerned about the environment by considering the environmental impacts produced by companies as a consideration for determining investment decisions because investors are one of the parties that can pressure companies to implement environmental policies.

INTRODUCTION

Economic growth has increased along with marked developments in the industrial world in recent years. With the development of the industrial world today, it turns out that it is not spared from environmental issues such as global warming and carbon emissions. Issues regarding the environment are not only a topic of discussion in Indonesia, but in various parts of the world. Climate change has become the most significant environmental issue and has attracted worldwide attention

In 2030 the Meteorology, Climatology and Geophysics Agency or BMKG predicts that Indonesia will experience a temperature increase of 0.5 degrees Celsius (CNN Indonesia, 2019). Therefore, to support Indonesia's commitment to contribute to maintaining global temperature, Indonesia has started to carry out carbon trading and implementation of carbon pricing which will be carried out in Indonesia based on Presidential Decree No. 98 of 2021 (Directorate General of Climate Change Control, 2021). In implementing the UNFCC regarding climate change, several countries agreed to prevent and reduce greenhouse gases, known as the Kyoto Protocol. Countries that have ratified the Kyoto Protocol will automatically be legally bound regarding the policies in it. The purpose of the Kyoto Protocol is to maintain GHG concentrations in the atmosphere so that they are not at a level that can harm the climate system earth (Kılıç & Kuzey, 2019).

Regarding accounting practices that are currently developing in Indonesia, the government issued regulations regarding the environment, namely in the form of Environmental Law No. 46 of 2017 concerning Environmental Economic Instruments. Furthermore, the Financial Services Authority (OJK) issued OJK regulation Number 51/POJK.03/2017 concerning the implementation of sustainable finance for Financial Services Institutions in order to create a financial system that applies sustainable principles to suppress corporate responsibility to the environment. All companies must contribute and support the government's move towards reducing carbon emissions. Companies can reduce their carbon emissions by managing their business by carbon accounting (Kılıç & Kuzey, 2019; Rahmanita, 2020). The concept of carbon accounting is part of environmental accounting that provides information about carbon accounting from industrial processes, setting carbon reduction targets, reporting systems, and developing carbon reduction programs. This is also known as disclosure of carbon emissions (Karim et al., 2021).

Eco-Efficiency refers to the means of providing competitive goods and services to meet human needs and improve quality of life, while gradually reducing the entire cycle of ecological impact and resource intensity to a consistent level (Wan et al., 2015). Eco-Efficiency can be a strategic goal for sustainable development in a company's business and can make a low carbon society (Yook et al., 2017). The results of the study show that disclosure of carbon emissions has a positive and significant effect on company value because disclosing carbon emissions is a form of company concern for the environment which the market responds positively to and forms the basis for investor considerations in assessing company sustainability (Hardiansyah et al., 2021), while in other studies revealed that carbon emissions have no effect on firm value (Rachmawati, 2021).

This research is motivated by several concerns about the environment. The initial motivation in this study was to investigate carbon emission disclosures in Indonesia that could influence public judgment. Disclosure of carbon emissions will not only make it easier for companies to gain stakeholder support but also affect company value (Binti et al., 2017). Therefore, this disclosure is no longer considered as an expense because it can increase the value of the company. thus showing that Carbon Emission Disclosure has a positive and significant effect on company value because Carbon Emission Disclosure is a form of concern for the environment (Hardiyansah et al., 2021). In the previous research discussed the issue of Carbon Emission Disclosure, Green Accounting and Firm Value (Anggita et al., 2022). In this case another motivation for this research is to fill the gaps in the previous literature with a new variable that will replace Green Accounting. Because there are still contradictory results between Carbon Emission Disclosure and Firm Value. Eco-Efficiency will be a substitute for the Green Accounting variable to find out whether it can support other variables and also there is still a lack of research on Eco-Efficiency. This discrepancy has created motivation to research Carbon Emission Disclosure with firm value supported by the Eco-Efficiency variable.

This research examines manufacturing companies listed on the Indonesia Stock Exchange for a period of five years (2017 – 2021). This research period began in 2017 because in that year companies in Indonesia had started issuing Sustainability Reports by implementing the GRI Standards. The purpose of this study is to test and analyze: (1) does Carbon Emission Disclosure affect Firm Value? (2) will Eco-Efficiency strengthen the relationship between Carbon Emission Disclosure and Firm Value?

The significance of this research is to understand the relationship between Carbon Emission Disclosure and Firm Value with Eco-Efficiency as a moderating variable.

Theoretical contribution means that this research is expected to add to the academic literature by testing carbon emission disclosure on Firm Value with Eco-Efficiency as a moderating variable. Research contributions in the development of science include additional empirical evidence, contributions of ideas, thoughts and additional information for measuring the value of a company.

Furthermore, this study implies that policy makers should be aware that companies in Indonesia must disclose their carbon emissions not only as a voluntary but mandatory activity, but beneficial for companies to gain a good image and to increase the value of their companies. Carbon Emission Disclosure can be used as a government instrument to monitor the level of carbon emissions produced by companies, so that the government's goal of reducing carbon emission levels in Indonesia can be achieved properly (Hardiyansah et al., 2021).

Gray et al., (1995) says that legitimacy theory is a basis for a social contract where all business entities, including companies that live side by side with the community environment, have a social contract that is stated directly or indirectly. Legitimacy theory provides insight to companies to make social and environmental disclosures. The theory of legitimacy underlies a company that has the initiative and is voluntary in reporting or presenting information regarding the applied environment and social (Mousa, et. al., 2015). This legitimacy causes the company to avoid things that are not desirable and can increase the value of the company (Brown & Deegan, 1998). Therefore it can be concluded that the sustainability of companies will depend on the impact of their goals in allocating their economic resources to the community in repairing social inequalities and reducing the impact of environmental damage due to company operations.

Stakeholder theory is the middle theory in this study. Basically states that a company is an entity that has an obligation not only to act in its own interest but also to provide benefits to its stakeholders. Stakeholders here include creditors, suppliers, shareholders, consumers, communities, governments and other stakeholders (Hörisch et al., 2014). Stakeholder theory states that companies are not only responsible for maximizing the interests of their owners and investors, but they are also responsible for providing benefits to society, communities, and government. Stakeholders are groups or individuals who can influence or be affected by the process of achieving the goals of an organization (Harmony, 2013).

Signal theory is also the middle theory in this research. This theory is widely used for Carbon Emission Disclosure in sustainability reports. Signaling theory explains how signals of success or failure of management are communicated to owners. Signal theory is related to information asymmetry. poor performance will not be trusted by the market (Wolk et al., 2017). Signal theory was developed to solve information asymmetry problems. Complete, relevant, accurate and timely information is needed by investors as an analytical tool in making investment decisions (Connelly et al., 2011). Published information will provide a signal for investors to make decisions. If the information content is positive, market participants are expected to analyze the information as good news (Kurnia et al., 2020).

The relationship between Carbon Emission Disclosure and Firm Value can be explained through the theory of legitimacy and signaling. The value of a company reflects the views of investors on how the company manages its functions, whether it is managed properly or not. High company value makes the market more responsive and makes investors believe not only in the company's performance, but also in its future prospects. Based on the signaling theory, companies disclose information related to the environment, especially regarding disclosure of carbon emissions. Emission Disclosure has a positive effect on Firm Value (Hardiyansah

et al., 2021). Environmental responsibility is one way to increase competitive advantage for companies and investor confidence (Okpala & Iredele, 2019). Carbon Emission Disclosure can increase company value because investors are more focused on global environmental issues in the future (Desai et al., 2022) but according to research (Kurnia et al., 2020) said that the disclosure of carbon emissions has no effect on firm value. Thus, the hypothesis that can be developed as follows:

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

The relationship between Eco-Efficiency and Firm Value can be explained through Signaling and Legitimacy Theory. A company that attaches importance to legitimacy in creating or increasing corporate value today is not only concerned with pure profit, but also considers the needs of its stakeholders in a healthy environment where the company's operations meet expectations (Septianingrum, 2022). Business actors who have implemented Eco-Efficiency into their company's operations have advantages over companies that have not implemented eco-efficiency, such as a better company image, higher share price, and higher company value. Thus producing a positive relationship between eco-efficiency and firm value

(Panggau & Septiani, 2017,Rodríguez-García et al., 2022).

According to stakeholder theory, Eco-efficiency is a company's effort to get a good response from stakeholders, given the surrounding environmental conditions that force companies to be able to utilize environmental resources as efficiently as possible by carrying out resource efficiency that can harm the environment. Eco-Efficiency has a positive influence on firm value. Because when a company implements Eco-Efficiency, the company is considered to have a better future compared to companies that do not implement Eco-Efficiency (Dewi & Rahmianingsih, 2020). Likewise, with other research which states that Eco-Efficiency has a positive effect on firm value (Osazuwa & Che-Ahmad, 2015). Eco-Efficiency can strengthen the effect of Disclosure of carbon emissions on company value. This responsibility can be poured out through a sustainability report which will be published by each company. The existence of disclosure or more information on the company is an assessment for investors to invest shares in the company (Rodríguez-García et al., 2022).

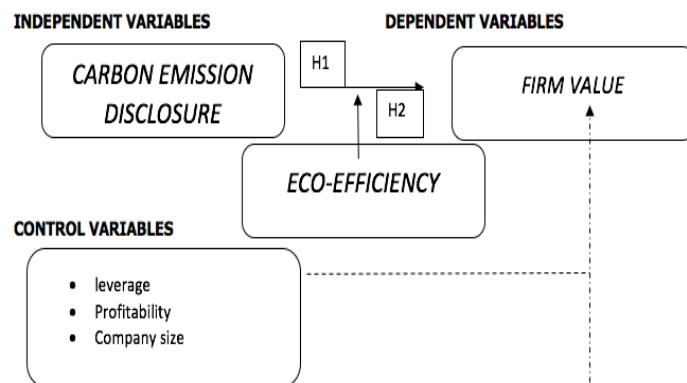**H2: Eco-Efficiency can strengthen the relationship between Carbon Emission Disclosure and Firm Value**

Figure 1. Conceptual Framework

METHOD
A. Research Design
1. Sample Section

This research is a study that discusses causal relationships or the quality of the independent and dependent variables as well as moderating variables that strengthen or weaken the interrelationships between variables. This study has the main objective of knowing the effect of Carbon Emission Disclosure and Firm Value on Eco-Efficiency as a moderating variable, namely by testing the hypotheses that have been prepared. This research is a quantitative research, namely research that is expected to be able to answer specific statements or hypotheses and be able to achieve a good validity value. The data used in this study are secondary data obtained from annual reports, sustainability reports, and company websites.

This study uses secondary data in the form of company financial reports and sustainability reports of manufacturing companies listed on the Indonesia Stock Exchange for the last five years from 2017 – 2021. To obtain the required sample, researchers use a purposive sampling technique by setting certain criteria according to the research objectives for answer research problems. Sampling criteria are as follows:

1. Manufacturing companies listed on the IDX for the last five years 2017 – 2021
2. The Company publishes complete financial statements for the annual reporting period ending December 31.
3. The company publishes an Annual Report or Sustainability Report in the period 2017 – 2021
4. The company's financial statements use IDR or Rupiah currency
5. The company explicitly discloses its carbon emissions (at least one item in the disclosure of carbon emissions).

B. Research Variables
1. Independent Variables

Disclosure of carbon emissions is measured using analytical methods. This method uses a checklist of carbon emissions adopted from research conducted by (Choi et al., 2013). To measure how a company's carbon disclosure is, Choi et al developed a checklist based on a request for information sheet provided by the CDP (Carbon Disclosure Project). There are five main disclosure groups: climate change, greenhouse gas emissions, energy consumption, reductions and costs of greenhouse gas emissions, and accountability carbon emissions. Each group of disclosures is further broken down into 18 acquisition items.

Table 1
Carbon Emission Disclosure Checklist

Category	Items	Information
Climate Change (CC/ Climate Change): Risks and Opportunities	CC1	Assessment/description of risks (both specific and general regulations/regulations) related to climate change and actions taken to manage these risks.
	CC2	Current (and future) assessment/description of the financial, business and opportunity implications of climate change.
Greenhouse Gas Emissions (GHG/ Greenhouse Gas)	GHG1	Description of the methodology used to calculate greenhouse gas emissions (eg GHG or ISO protocol).
	GHG2	Existence of external verification of the calculation of the quantity of GHG emissions by whom and on what basis.
	GHG3	Total greenhouse gas emissions (metric tons of CO2-e) generated

Category	Items	Information
	GHG4	Disclosure of scope 1 and 2, or 3 of direct GHG emissions.
	GHG5	Disclosure of GHG emissions based on origin or source (eg coal, electricity, etc.).
	GHG6	Disclosure of GHG emissions by facility or segment level.
	GHG7	Comparison of GHG emissions with previous years.
Energy Consumption (EC/Energy Consumption)	EC1	The amount of energy consumed (eg tera-joules or peta-joules).
	EC2	Calculation of energy used from renewable resources.
	EC3	Disclosure by type, facility and segment
GHG Reduction and Cost (RC/ Reduction and Cost)	RC1	Details of the plan or strategy to reduce GHG emissions.
	RC2	A breakdown of the current GHG emission reduction target level and GHG emission reduction target.
	RC3	Current emission reductions and costs or savings achieved as a result of emission reduction plans.
	RC4	Future emission costs are taken into account in capital expenditure planning.
Carbon Emissions Accountability (AEC/ Accountability of Emission of Carbon)	AEC1	An indication that the board committee (or other executive body) has responsibility for action related to climate change.
	AEC2	A description of the mechanism by which the board (or other executive body) reviews company developments related to climate change.

Source: Choi et al. (2013)

$$CED = \frac{The\ number\ of\ items\ disclosed}{The\ number\ of\ disclosure\ items} \times 100\%$$

2. Dependent Variables

Firm value is the value obtained by the company where this value is used to measure the quality of the company and the prosperity of its shareholders or investors (Kurnia et al., 2020). The dependent variable used in this study is company value. Firm value is measured using the Tobin's Q ratio which compares the ratio of stock market value to book value. Tobin's Q measurement was adopted through research (Desai et al., 2022) formulated as follows:

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

The market value of equity is calculated from the closing share price multiplied by the number of shares outstanding. The book value of debt is calculated from the total working capital, inventory book value, and long-term debt.

3. Moderating Variables

Moderating variables (moderating variables) are variables that have a strong dependency effect on the relationship between the dependent variable and the independent variable, according to Pratiwi and Zulaikha (2016). In this study, Eco-Efficiency as a moderating variable will be measured using ISO 14001. The presence of ISO 14001 assures all stakeholders that the company has fulfilled its obligations to the environment. Information regarding the company's participation in following ISO 14001 is obtained from the annual report or sustainability report and other sources. Eco-efficiency is measured using a dummy referring to the research (Osazuwa & Che-Ahmad, 2016) by giving a value of 1 to eco-efficient companies and 0 to non-eco-efficient companies.

4. Control Variables
a. Leverage

The leverage ratio in this study is proxied by the Debt to Assets Ratio (DAR). Debt to Assets Ratio (DAR) simply means the comparison between the total debt owned by the company and the total assets owned by the

company (Malau & Murwaningsari, 2018; Miloud, 2022).

b. Profitability

Profitability has an important meaning for the company because it is one of the bases for assessing the condition of a company. Profitability in this study is proxied by return on assets (ROA). ROA is a ratio that shows the return on total assets used in a company and can show the value of a company in obtaining management effectiveness in managing its assets. This variable is adopted through research (Dewi, 2021; Malau, 2019; Yadav, 2022).

c. Firm Size

Company size (size) is the scale of a company can be seen from the size of the total assets, log size, stock market value and others). The size of a company can affects the ability to bear risks that may arise from the risks that will be faced. In this study, firm size was adopted through research (Ho et al., 2019; Sudha, 2020; Malau, 2020). This research is formulated as follows:

$$Firm\ Size = \ \log\ (Total\ Asset)$$

d. Research Models

The method used in this research is multiple linear analysis with one dependent variable, one independent variable, one moderating variable, and 3 controlling variables. This research has the following regression model equation:

$$FV = \ \alpha + \ \beta1CED + \ \beta2ECO + \beta3(CEDXECO) + \beta4Age + \beta5ROA + \beta6Size + e$$

Information:
FV = Firm Value
α = Constant
CED = Carbon Emissions Disclosure
ECO = Eco-Efficiency
R&D = Research & Development
Age = Firm Age
ROA = Return on Assets (proxy of profitability)
Size = Company Size
e = Errors
β = Coefficient of each variable

RESULTS AND DISCUSSION

Of the 178 manufacturing companies listed on the IDX, however, there were 79 companies that did not meet the criteria, so there were only 99 companies that were used as research samples. During the study period (five years), there were 495 samples, but from the outlier testing carried out on these 495 samples using the Studentized Deleted Residual (SDR) method, there were 194 data that had values > 1.96 and <1.96 so that the remaining samples 301 which was finally used for further testing.

Table 2
Number of data used as samples

Information	Amount
Manufacturing companies listed on the IDX 2017-2021	178
Companies that do not meet the Criteria	79
Companies that are used as samples	99
Number of samples over a 5 year period (5 x 99 companies)	495
Total Sample Outliers	(194)
Overall total sample	301

A. Descriptive Statistics

Descriptive statistics for this study were used to describe each research variable using the average (mean), median, maximum value, minimum value, and standard deviation. In total, there were 495 samples studied (99 companies in the 5 years study period). This data was analyzed using SPSS Ver.25.

1. Nominal Variables

Table 3
Nominal Variables

		frequency	percent	Valid Percent	Cumulative Percent
	ECO				
Valid	Non Eco-Efficiency	167	55.5	55.5	55.5
	Eco-Efficiency	134	44.5	44.5	100.0
	Total	301	100.0	100.0	

From the results of Table 3 of a total of 301 companies, it was identified that 167 data belonged to non-eco-efficiency companies with a validity rate of 55.5% and 134 data belonged to eco-efficiency with a validity level of 44.5%.

2. Ratio Variable

Table 4
Variable Ratio

Descriptive Statistics					
	N	Minimum	Maximum	Means	std. Deviation
FV	301	.18	3.22	.8918	.33731
CED	301	.00	.94	.2431	.11873
CED*ECO	301	.00	.94	.1160	.15910
PROFITABILITY	301	-37.53	1.52	-.1265	2.20012
SIZE	301	10.95	14.57	12.3151	.72472
LEVERAGE	301	.06	2.82	.5145	.31464
Valid N (listwise)	301				

Based on the data in Table 4, the Fair Value (FV) variable has the lowest value of 0.18 and the largest value of 3.22. The Carbon Emission Disclosure (CED) variable has the lowest value of 0.00 and the largest value of 0.94.

B. Normality test

The normality test uses the Kolmogorof Smirnof statistical test. The results of descriptive statistical tests on all variables can be seen in table 5 below:

Table 5
One-Sample Kolmogorov Smirnov Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residuals
N		495
Normal Parameters, b	Means	.0000000
	std. Deviation	2.11214173
Most Extreme Differences	absolute	.221
	Positive	.221
	Negative	-.179
Test Statistics		.221
asymp. Sig. (2-tailed)		.000c
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		

Based on the output results from the normality test above, it shows that the Asymp. Sig (2-tailed) in the Unstandardized Residual column is at a value of 0.00. It can be concluded that the Asymp value. Sig (2-tailed) which has a value less than 0.05 so that the research data does not pass the normality test so that data affected by outliers is deleted

1. After removing Outliers (Referring to Theorama Central Limit)

Table 6
One-Sample Kolmogorov-Smirnov Test (outliers)

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residuals
N		301
Normal Parameters, b	Means	.0000000
	std. Deviation	.20325943
Most Extreme Differences	absolute	099
	Positive	099
	Negative	-.068
Test Statistics		099
asymp. Sig. (2-tailed)		.000c

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

After removing the outliers, from the remaining 301 data the asymp sig 2 tailed value still shows 0.000 <0.05, it still has not passed the normality test, but referring to the central limit theorama says that if the data studied is more than 30, it can be concluded that the research data passed normality test.

2. Heteroscedasticity Test

Table 7
Heteroscedasticity

Coefficientsa					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	std. Error	Betas		
1 (Constant)	013	.110		.116	.908
CED	-.104	080	-.123	-1,299	.195
ECO	-.022	.027	-.112	-.830	.407
CED*ECO	.098	.101	.155	.963	.336
PROFITABILITY	.004	003	091	1,550	.122
SIZE	014	.009	.103	1,552	.122
LEVERAGE	.025	.019	079	1,350	.178
a. Dependent Variable: Absres					

In this study the heteroscedasticity test used the glacier method. This test aims to determine whether in the regression model there is an inequality of variance from the residual of one observation to another. Following are the results of the heteroscedasticity test from the regression model in Table 7. From the table above it shows that the sig value of each study is more than 0.05, it can be concluded that the research data has passed the heteroscedasticity test.

3. Multicollinearity Test

Table 8
Multicollinearity

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	std. Error	Betas			tolerance	VIF
1	(Constant)	.486	.225		2.156	032		
	CED	.218	.164	077	1,329	.185	.370	2,702
	ECO	-.035	056	-.051	-.625	.532	.183	5,460
	CED*ECO	.172	.208	081	.827	.409	.128	7,795
	PROFITABILITY	-.002	005	-.015	-.409	.683	.967	1,034
	SIZE	-.007	.019	-.015	-.377	.706	.755	1,324
	LEVERAGE	.847	038	.790	22,201	.000	.975	1,026

a. Dependent Variable: FV

The results of the multicollinearity test in this regression model are presented in Table 8. Based on the output results on the multicollinearity test, it can be seen that the value of the variance inflation factor or VIF from the table above has a calculated VIF value of less than 10 and a tolerance value of more than 0.10. concluded that there is no multicollinearity between independent variables in this regression model.

C. Autocorrelation Test

The autocorrelation test is intended to test whether there is a correlation between errors in period t with errors in the previous period t-1, this test uses the Durbin Watson Test criteria. The results of the autocorrelation test for all variables can be seen in Table 9.

1. Preliminary data

Table 9
Autocorrelation

Summary model[b]

Model	R	R Square	Adjusted R Square	std. Error of the Estimate	Durbin-Watson
1	.798a	.637	.629	.20532	.787

a. Predictors: (Constant), LEVERAGE, CED, ECO, PROFITABILITY, SIZE, CED*ECO

b. Dependent Variable: FV

Based on the table above, we know that a lower limit dL value of 1.692 can be obtained. The results of the autocorrelation test above can be seen and it can be concluded that the Durbin Watson value is 0.787 which is still lower than dL, therefore healing will be carried out using the Cochranne Orcutt method.

2. After healing with the Cochranne Orcutt method

Table 10
Autocorrelation (Cochranne Orcutt)

Summary model[b]

Model	R	R Square	Adjusted R Square	std. Error of the Estimate	Durbin-Watson
1	.814a	.662	.655	.15994	1,808

a. Predictors: (Constant), Lag_LEVERAGE, Lag_ECO, Lag_CED, Lag_PROFITABILITY, Lag_SIZE, Lag_CED*ECO

b. Dependent Variable: Lag_FV

The existence of autocorrelation in linear regression causes the sample variance to not

be able to describe the population variance also causes the resulting regression model to be used to estimate the value of the dependent variable from the value of certain variables, the regression coefficients obtained are less accurate. Therefore, in this study the researchers decided to use the Cocrane Orcutt method. After carrying out the transformation using the Cocrane Orcutt it turns out that the Durbin Watson result is 1.808 where the value is actually greater than the dL, so that this research passes the Autocorrelation test.

D. Moderation Analysis Test

1. Determination Correlation Test (R2)

The coefficient of determination test is used to measure how far the model's ability to explain the variation of the independent variable to the dependent variable. The coefficient of determination is shown by the R^2 value of the regression model used to determine the variability of the dependent variable which can be explained by the independent variables.

Table 11
Coefficient of Determination

Summary models				
Model	R	R Square	Adjusted R Square	std. Error of the Estimate
1	.814a	.662	.655	.15994
a. Predictors: (Constant), Lag_LEVERAGE, Lag_ECO, Lag_CED, Lag_PROFITABILITY, Lag_SIZE, Lag_CED*ECO				

From Table 11 the value of Adj. R square of 0.655, it can be concluded that the independent variables, moderation and interaction of moderation have an influence of 65.5% on the dependent variable.

2. F test

The F test functions to find whether or not there is a simultaneous (simultaneous) effect between the independent variables on the dependent variable.

Table 12
Simultaneous Test

ANOVAa					
Model		Sum of Squares	df	MeanSquare	F	Sig.
1	Regression	14,687	6	2,448	95,689	.000b
	residual	7,495	293	.026		
	Total	22,183	299			
a. Dependent Variable: Lag_FV						
b. Predictors: (Constant), Lag_LEVERAGE, Lag_ECO, Lag_CED, Lag_PROFITABILITY, Lag_SIZE, Lag_CED*ECO						

The test results of multiple linear regression analysis show that there is a sig value indicating the number 0.00 <0.05, which means that the independent variables, moderation, interaction of moderation and control have a significant effect simultaneously on the dependent variable.

3. T test

Partial test (t test) is used to determine whether the independent variable has a significant effect on the dependent variable. The decision requirement for the t test is that if the sig t value <0.05, the independent variable partially affects the dependent

variable (Ho is rejected) and vice versa. In this study the t test used LAG due to data abnormality so that it was

transformed so that the data was normal.

Table 13
Partial Test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	std. Error	Betas		
1 (Constant)	.349	.110		3,182	002
Lag_CED	.317	.164	.115	1940	053
Lag_ECO	039	055	.049	.712	.477
Lag_CED*ECO	-.160	.198	-.071	-.808	.420
Lag_PROFITABILITY	-.001	.004	-.014	-.386	.699
lag_SIZE	-.043	.023	-.071	-1,913	057
Lag_LEVERAGE	.912	039	.803	23,253	.000

a. Dependent Variable: Lag_FV

3. Moderated Multiple Linear Regression Analysis

Based on the results of the regression analysis on the t test, the regression equation can be obtained as follows:

Y = 0.349 + 0.317X1 − 0.160X2

The partial test results are as follows:

a) Effect of Carbon Emission Disclosure on Firm Value

Based on the results of the t test on the regression model, the t value was 1.940 with a significance of 0.053/2 = 0.027 <0.05. These results show a positive direction with an unstandardized beta coefficient of 0.317. So, it can be concluded that H1 is accepted

b) Eco-Efficiency as a Moderator of Carbon Emission Disclosure of Firm Value

Based on the results of the t test on the regression model, the t value is -0.808 with a significance of 0.420/2 = 0.210 > 0.05. This result shows a negative direction with an unstandardized beta coefficient of -0.160. So it can be concluded that H2 is rejected, which means that Eco-Efficiency does not strengthen the

effect of Carbon Emission disclosure on Firm Value

CONCLUSION

This paper has explained the relationship between Carbon Emission Disclosure and Firm Value with Eco-Efficiency as a moderating variable. This study shows that carbon emission disclosure has a positive effect on firm value, but eco-efficiency cannot moderate this relationship. Based on these results, we know that carbon disclosure greatly influences stakeholder assessment of a company. This study only uses three control variables that can affect firm value, namely, leverage, firm size and profitability.

The limitations that can be refined in further research are the first regarding scoring level of disclosure using the criterion 1 to be disclosed and 0 if not disclosed. This assessment has not considered based on information in the priority order of importance of financial disclosure items. There are also several implications in this research including that with this research it is hoped that investors will be more concerned about the environment by considering the environmental impacts produced by companies as a consideration for determining investment decisions because investors are one of the parties that can pressure

companies to implement environmental policies. For accounting and environmental regulators, it is expected to be able to create reporting standards that are relevant to the needs of accounting parties and stakeholders, as well as to make regulations for industry players related to the environment must be realized immediately.

The recommendations that can be given for use in further research include bfor companies to disclose carbon emissions included in the Sustainability Report so as to increase the value of the company. For Further Research Increase the number of research samples by adding observation periods and other industrial sectors, then changing proxies in the calculation of each variable using the latest proxies. companies that disclose carbon, then compare the effect directly between companies that are intensive in carrying out carbon disclosure emissions or not.

REFERENCES

Bae Choi, B., Lee, D., & Psaros, J. (2013). An analysis of Australian company carbon emission disclosures. *Pacific Accounting Review*, *25*(1), 58–79. https://doi.org/10.1108/0114058131131 8968 Google Scholar

Binti Abd Rahman, N. R., Binti Johari, N. H., & Binti Mohamad, N. E. A. (2017). Carbon Emission Disclosure and the Cost of Capital: An Analysis of Malaysian Capital Market. *SHS Web of Conferences*, *36*, 00020. https://doi.org/10.1051/shsconf/201736 00020 Google Scholar

Brown, N., & Deegan, C. (1998). The Public Disclosure of Environmental Performance Information (A dual Test of Media Agenda Setting Theory and Legitimacy Theory). *Accounting and Business Research*, *29*, 21–41. Google Scholar

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). *Signaling Theory : A Review and Assessment.* https://doi.org/10.1177/0149206310388 419 Google Scholar

Desai, R., Raval, A., Baser, N., & Desai, J. (2022). Impact of carbon emission on financial performance: empirical evidence from India. *South Asian Journal of Business Studies*, *11*(4), 450–470. https://doi.org/10.1108/SAJBS-10-2020-0384 Google Scholar

Dewi, C. R. (2021). *The Effect of Profitability , Liquidity , and Asset Structure on Capital Structure with Firm Size as Moderating Variable.* *10*(1), 32–38. https://doi.org/10.15294/aaj.v10i1.4451 6 Google Scholar

Dewi, R., & Rahmianingsih, A. (2020). Meningkatkan Nilai Perusahaan Melalui Green Innovation Dan Eco-Effisiensi. *Ekspansi: Jurnal Ekonomi, Keuangan, Perbankan Dan Akuntansi*, *12*(2), 225–243. https://doi.org/10.35313/ekspansi.v12i2 .2241 Google Scholar

Direktorat jenderal pengendalian perubahan iklim. (2021). *Enhanced Nationally Determined Contribution (Endc): Komitmen Indonesia Untuk Makin Berkontribusi Dalam Menjaga Suhu Global.* http://ditjenppi.menlhk.go.id/beri ta-ppi/4357-enhanced-ndc-komitmen-indonesia-untuk-makin-berkontribusi-dalam-menjaga-suhu-global.html

Germanwatch. (2021). *Climate Change Performance Index (CCPI) 2022. RESULTS. Monitoring Climate Mitigation Efforts of 60 Countries plus the EU – covering 92% of the Global Greenhouse Gas Emissions.* https://ccpi.org/download/climate-change-performance-index-2022-2/ Google Scholar

Gray, R., R., K., & Lavers, S. (1995). Corporate social and environmental reporting: a review of the literature and a longitudinal study of UK disclosure. *Accounting, Auditing & Accountability Journal*, 47–77. Google Scholar

Hardiyansah, M., Agustini, A. T., &

Purnamawati, I. (2021). The Effect of Carbon Emission Disclosure on Firm Value: Environmental Performance and Industrial Type. *Journal of Asian Finance, Economics and Business*, *8*(1), 123–133. https://doi.org/10.13106/jafeb.2021.vol8.no1.123 Google Scholar

Harmoni, A. (2013). Stakeholder-Based Analysis of Sustainability Report: A Case Study on Mining Companies in Indonesia. *International Conference on Eurasian Economies 2013*, *40*, 204–210. https://doi.org/10.36880/c04.00704 Google Scholar

Ho, F. N., Wang, H. D., Ho-dac, N., Vitell, S. J., & Wang, H. D. (2019). *Nature and relationship between corporate social performance and fi rm size : a cross-national study*. *15*(2), 258–274. https://doi.org/10.1108/SRJ-02-2017-0025 Google Scholar

Hörisch, J., Freeman, R. E., & Schaltegger, S. (2014). Applying Stakeholder Theory in Sustainability Management: Links, Similarities, Dissimilarities, and a Conceptual Framework. *Organization and Environment*, *27*(4), 328–346. https://doi.org/10.1177/1086026614535786 Google Scholar

Karim, A. E., Albitar, K., & Elmarzouky, M. (2021). A novel measure of corporate carbon emission disclosure, the effect of capital expenditures and corporate governance. *Journal of Environmental Management*, *290*(January), 112581. https://doi.org/10.1016/j.jenvman.2021.112581 Elsevier

Kılıç, M., & Kuzey, C. (2019). The effect of corporate governance on carbon emission disclosures: Evidence from Turkey. *International Journal of Climate Change Strategies and Management*, *11*(1), 35–53. https://doi.org/10.1108/IJCCSM-07-2017-0144 Google Scholar

Kurnia, P., Darlis, E., & Putra, A. A. (2020). Carbon Emission Disclosure, Good Corporate Governance, Financial Performance, and Firm Value. *Journal of Asian Finance, Economics and Business*, *7*(12), 223–231. https://doi.org/10.13106/JAFEB.2020.VOL7.NO12.223 Google Scholar

Malau, M. (2019). The Effect Of Earnings Persistence And Earnings Transparency On Company Performance With Corporate Governance As Moderating Variable (Empirical Study in Manufacturing Company that Listed in Indonesia Stock Exchange in 2014-2016). *Eaj (Economics and Accounting Journal)*, *2*(2), 86. https://doi.org/10.32493/eaj.v2i2.y2019.p86-94 Google Scholar

Malau, M., & Murwaningsari, E. (2018). The effect of market pricing accrual, foreign ownership, financial distress, and leverage on the integrity of financial statements. *Economic Annals*, *63*(217), 129–139. https://doi.org/10.2298/EKA1817129M Google Scholar

Miloud, T. (2022). Corporate governance and the capital structure behavior: empirical evidence from France. *Managerial Finance*, *48*(6), 853–878. https://doi.org/10.1108/MF-12-2021-0595 Google Scholar

Mousa, et. al., G. A. (2015). Legitimacy Theory and Environmental Practices: Short Notes. *International Journal of Business and Statistical Analysis*, *2*(1), 41–53. https://doi.org/10.12785/ijbsa/020104 Google Scholar

Okpala, O. P., & Iredele, O. O. (2019). Corporate Social and Environmental Disclosures and Market Value of Listed Firms in Nigeria. *Copernican Journal of Finance & Accounting*, *7*(3), 9. https://doi.org/10.12775/cjfa.2018.013 Google Scholar

Osazuwa, N. P., & Che-Ahmad, A. (2016). The moderating effect of profitability and leverage on the relationship between eco-efficiency and firm value in publicly traded Malaysian firms. *Social*

Responsibility Journal, 12(2), 295–306. https://doi.org/10.1108/SRJ-03-2015-0034 Google Scholar

Panggau, N. dwi, & Septiani, A. (2017). Pengaruh Eco-Efficiency Terhadap Nilai Perusahaan Variabel Moderasi. Diponegoro Journal of Accounting, 6, 1–8. Google Scholar

Rachmawati, S. (2021). Green Strategy Moderate the Effect of Carbon Emission Disclosure and Environmental Performance on Firm Value. International Journal of Contemporary Accounting, 3(2), 133–152. https://doi.org/10.25105/ijca.v3i2.12439 Google Scholar

Rahmanita, S. (2020). Pengaruh Carbon Emission Disclosure Terhadap Nilai Perusahaan Dengan Kinerja Lingkungan Sebagai Variabel Pemoderasi. Akuntansi : Jurnal Akuntansi Integratif, 6(01), 54–71. https://doi.org/10.29080/jai.v6i01.273 Google Scholar

Rodríguez-García, M. del P., Galindo-Manrique, A. F., Cortez-Alejandro, K. A., & Méndez-Sáenz, A. B. (2022). Eco-efficiency and financial performance in Latin American countries: An environmental intensity approach. Research in International Business and Finance, 59(September 2021). https://doi.org/10.1016/j.ribaf.2021.101547 Elsevier

Septianingrum, R. (2022). the Influence of Eco-Efficiency on Firm Value With Funding Structure As a Moderating Variable. Jurnal Akuntansi Dan Ekonomi, 7(1), 82–94. https://doi.org/10.29407/jae.v7i1.16165 Google Scholar

Sudha, S. (2020). Corporate environmental performance–financial performance relationship in India using eco-efficiency metrics. Management of Environmental Quality: An International Journal, 31(6), 1497–1514. https://doi.org/10.1108/MEQ-01-2020-0011 Google Scholar

Wan, L., Luo, B., Li, T., Wang, S., & Liang, L. (2015). Effects of technological innovation on eco-efficiency of industrial enterprises in China. Nankai Business Review International, 6(3), 226–239. https://doi.org/10.1108/NBRI-01-2015-0003 Google Scholar

Wenni Anggita, Ari Agung Nugroho, & Suhaidar. (2022). Carbon Emission Disclosure And Green Accounting Practices On The Firm Value. Jurnal Akuntansi, 26(3), 464–481. https://doi.org/10.24912/ja.v26i3.1052 Google Scholar

Wolk, H. I., Dodd, J. L., & Rozycki, J. J. (2017). Accounting Theory: Conceptual Issues in a Political and Economic Environment. Accounting Theory: Conceptual Issues in a Political and Economic Environment. https://doi.org/10.4135/9781506300108 Google Scholar

Yadav, I. S. (2022). The nexus between firm size , growth and profitability : new panel data evidence from Asia – Pacific markets. 31(1), 115–140. https://doi.org/10.1108/EJMBE-03-2021-0077 Google Scholar

Yook, K. H., Song, H., Patten, D. M., & Kim, I. W. (2017). The disclosure of environmental conservation costs and its relation to eco-efficiency: Evidence from Japan. Sustainability Accounting, Management and Policy Journal, 8(1), 20–42. https://doi.org/10.1108/SAMPJ-07-2016-0039 Google Scholar