



The Effect of Eco-Efficiency and Eco-Innovation Disclosure on Firm Value: Does Profitability Matter?

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ABSTRACT: This research aims to test whether profitability strengthens the influence of eco innovation and eco efficiency disclosures on the value of mining sector companies listed on the Indonesia Stock Exchange. Research data was obtained from annual reports and sustainability reports from the Indonesian Stock Exchange website and company websites. The sample used was 39 companies that met the criteria and were listed on the Indonesia Stock Exchange in 2018 - 2021. The sample data calculation technique used the cross sectional method via the eviews application. Hypothesis testing in this research uses multiple linear regression analysis methods. The results of this research show that eco innovation and eco efficiency have a positive effect on firm value, and profitability has an effect as a moderating predictor variable in the relationship between eco innovation and eco efficiency on firm value. This study differentiates samples based on more diverse dependent variables and involves moderating variables as amplifiers. Previous research did not use the two dependent variables, namely eco innovation and eco efficiency simultaneously so that the value of the company could not be determined as a whole whether the implementation of both had an effect on the value of the company. Then the researchers found that investors considered the application of eco innovation and eco efficiency to the value of mining sector companies.

KEYWORDS: Eco Innovation, Eco Efficiency, Firm Value, Profitability

I. INTRODUCTION

Companies around the world are increasingly realizing the importance of sustainability and the need to implement environmentally friendly practices. One concept that has received great attention in recent years is eco-efficiency and eco-innovation. Both concepts are innovative and efficient ways to reduce the environmental impact of a company's operational results and products, while maintaining profitability. This concept emphasizes the importance of resource conservation, waste reduction, and the use of renewable energy sources. One sector that is closely related to natural resources is mining companies.

Mining is an important industry that provides necessary raw materials for various sectors of our economy. However, it is also one of the most environmentally damaging industries, contributing to air and water pollution, deforestation and habitat destruction. In recent years, there has been increasing awareness of the need to make the mining sector more sustainable and environmentally friendly. Agustia, et. al (2017) states that industrial waste causes additional pollution in air, water and soil to more dangerous levels. Companies as elements of the economy are expected to be more responsible towards the environment. Awareness of the need to protect the environment is regulated by the Limited Liability Company Law No. 40 Article 74 of 2007, where companies that carry out business activities in fields related to natural resources are obliged to carry out social and environmental responsibilities. Environmental performance can be seen from a general perspective, which means putting in place measures that will ensure the sustainability of environmental attributes such as water, land, air and ecosystems. In line with this law, Statement of Financial Accounting Standards (PSAK) No. 1, paragraph nine, also supports the issue of environmental disclosure reporting which states that companies can present additional reports such as reports on the environment and added value.

Awareness of protecting the environment does not create an obstacle for companies to continue to innovate, one of which is by creating innovations that are more environmentally friendly or what is usually called green innovation or eco innovation. This innovation is an investment that requires a lot of money and time, but can have a positive impact on the company in the long term. According to Dereli (2015), companies that are able to create new ways in the production, distribution process, or can create environmentally friendly products will be the company's advantage, where green innovation is one of the environmental strategies that can be implemented. Green innovation practices can be defined as energy minimization, material reduction, and pollution prevention during the entire production process environment with products of sustainable or positive environmental attributes (Li et



al., 2020). In addition, Zaman et al (2021) tested whether a company's environmental innovation influences the risk of falling stock prices. This research reviews that increasing green innovation from the 25th to 75th percentile is associated with a 17.62% reduction in the risk of stock price crashes. The results state that companies implementing eco-innovation attract more institutional investors and equity analysts to follow and disclose more information which leads to a lower risk of stock price falls.

Apart from implementing Eco Innovation, the company also carries out Eco Efficiency to reduce large costs when carrying out this innovation. Nosakhare Peter (2016) revealed that there are processes in environmental restoration that cause the emergence of eco-efficiency. The concept of eco-efficiency is the middle point between the economy and the environment. The existence of various policies in the environmental sector has led to the development of a concept that aims to find solutions to fulfill business goals and resolve environmental problems, called eco-efficiency. Eco-efficiency is an abbreviation of "ecological economic efficiency", namely a construction that shows increased productivity and simultaneously reduces costs by improving environmental performance (Meutia et al., 2019).

Implementing eco-efficiency and Eco Innovation is an effort to increase firm value. Eco efficiency will function as a management controller to reduce the company's impact on the environment and simultaneously create more value for shareholders (Dewi & Rahmianingsih, 2020). This statement is in line with Panggau & Septiani (2017) which shows the results that companies that implement eco-efficiency as an environmental strategy will increase firm value. Apart from that, research conducted by Satrio (2020) showed that eco-efficiency has a positive effect on firm value. High share prices will increase firm value and investor prosperity will be higher. Apart from eco-efficiency, firm value is also influenced by profitability and eco-innovation. This is proven by research conducted by Rasyid (2015), showing that profitability has a significant effect on firm value.

II. LITERATURE REVIEW

A. *Legitimacy Theory*

Legitimacy theory is a theory of the two-way relationship between a company and the environment which underlies an entity's initiative to voluntarily report or present information regarding the environmental and social issues applied (Anggraeni, 2015). The application of legitimacy theory provides the basis that companies must comply with the norms that apply in the community where the company is located so that company operations can run smoothly without any conflict with the surrounding community (Ekaputri et al., 2018).

B. *Eco Innovation*

Eco-innovation is defined as a form of a company's ability to innovate related products and services without causing impact or damage to the environment. If the company is able to improve environmental conditions in operational activities, this step can increase share prices and firm value (Aviyanti and Isbanah, 2019). Eco Innovation also influences the decisions of institutional investors and equity analysts under the influence of clients through SRI (Socially Responsible Investment) investment strategies which pay more attention to eco-innovation companies and help limit information asymmetry and reduce the risk of falling stock prices (Zaman et al, 2021).

C. *Eco Efficiency*

Eco efficiency is a concept that encourages companies to develop a level of environmental performance or at least equal to economic performance. The application of eco efficiency can reduce environmental impacts and excessive resource consumption (Putri and Sari, 2019). Che Ahmad and Osazawa (2015) explained that eco-efficiency is a business strategy that leads to better firm value. The results of this research show that eco-efficiency has a positive effect on firm value. Research on eco-efficiency uses measurements in the form of ISO 14001 which can help companies carry out operations more effectively because they save working time and costs. So it can be concluded that companies that implement eco-efficiency can increase profitability and firm value.

D. *Firm Value*

Firm value is the present value of expected future income and reflects the impact of decisions taken by financial managers regarding the company's share price (Kohar & Akramunnas, 2017). Firm value is an important concept for investors because it can be an indicator for the market to assess the company as a whole which is reflected in the share price. If the firm value is high, it will increase investors' confidence in the company because investors' assessment of the company's prospects in the future can be seen



from the price. high shares. The share price used generally refers to the closing price of shares, and is the price that occurs when shares are traded on the market (Alfinur, 2016).

E. Profitability

Profitability is one of the important parameters that investors pay attention to when assessing the performance of a company because it can show the company's ability to earn profits and the level of return that investors will receive (Kusumandari, 2016). Profitability is one of the factors that can influence firm value besides eco-efficiency (Osazuwa & Che-Ahmad, 2016). Profitability is the net result of a series of policies and decisions that can be determined using benchmarks, namely financial ratios as one of the analyzes in analyzing the financial condition and level of profitability of a company (Brigham & Houston, 2009).

III. RESEARCH METHODOLOGY

Researchers want to know the effect of the independent variables, namely eco innovation and eco efficiency, on the dependent variable, namely the value of mining companies listed on the Indonesia Stock Exchange (BEI). Apart from that, researchers also added calculations of moderating variables which have a strong dependent (strengthening or weakening) influence on the relationship between the independent variable and the dependent variable. The moderating variable in this research uses Profitability. To further strengthen the data processing results obtained. A control variable is a variable that is controlled so that the influence of the independent variable on the dependent variable is not influenced by external factors that are not examined. The function of the control variable is to prevent biased calculation results. The data source in this research is secondary data, namely data that refers to information collected from existing sources. This type of research is quantitative research and data processing using the E-Views application.

The data obtained for processing research object data is mining sector companies listed on the Indonesian Stock Exchange (IDX). Data on mining sector companies that meet the research sample criteria are 142 companies with the research period 2018 - 2021.

A. Operational Research Variable

The independent and dependent variables in this study are as follows:

Variabel	Indikator	scale	source
Firm Value (Y)		The Interpretation Score assessment (Tobin, 1969) is as follows: - Tobin's $q < 1$ - Tobin's $q = 1$ - Tobin's $q > 1$	(Kohar & Akramunnas, 2017)
Eco Innovation (X1)	The dummy variable	In this research, it was measured using three indicators, namely: the production process uses new technology to reduce energy, water and waste, the product uses a small amount of non-hazardous or environmentally friendly materials, and the composition used in the production process can be recycled. The values for each indicator are 0 and 1. A value of 0 is given if the company does not disclose one of the items from the indicator and a value of 1 is given if the company discloses an item from the indicator. After that, the values for each indicator are added up.	(Szutowski, 2018)
Eco Efficiency (X2)	The dummy variable	The dummy variable for companies that have ISO 14001 certification is given a value of 1, while companies that do not have ISO 14001 certification are given a value of 0.	(Osazuwa & Ahmad, 2016)
Profitability (X3)		The classification of moderating variable types is divided into 4 types (Sharma et.,al 1981), as follow: a. Predictor Moderator b. Homologiser Moderator c. Quasi Moderator d. Pure Moderator	(Amalia et al., 2017)



B. Analysis Method

The analytical method used in this research is the multiple linear regression analysis method; The data obtained will be processed and analyzed so that the data can be utilized. This data can be used as a basis for decision making. The purpose of this analysis method is to provide interpretation and interest. The data collected in this research will be analyzed using quantitative analysis methods using the Eviews program. So that the regression model for this research is consistent and unbiased, several classic assumption tests were carried out, namely the normality test, multicollinearity test and heteroscedasticity test. The analysis model in this research uses multiple linear regression with the equation:

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$$TOBINSQ_{it} = \alpha + \beta_1 EI_{it} + \beta_2 EF_{it} + \beta_3 PROF_{it} + \beta_4 FS_{it} + \beta_5 LEV_{it} + \beta_6 LIQ_{it} + \beta_7 KAP_{it} + \epsilon_{it}$$

Information:

TOBINSQ_{it} : firm value for company i year t

α : Konstanta

EI_{it} : *Eco-innovation* of company i year t

EF_{it} : *Eco-effeciency* of company i year t

$PROF_{it}$: Profitability of company i year t

FS_{it} : Firm Size of company i year t

LEV_{it} : Leverage of company i year t

LIQ_{it} : Likuidity of company i year t

KAP_{it} : External audit office of company i year t

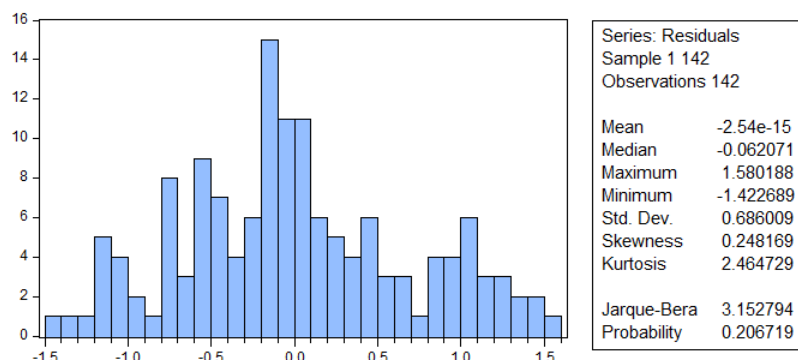
ϵ_{it} : error of company i year t

C. Hypothesis Testing Design

After the regression model used in this study is confirmed to be in accordance with the requirements of the classical assumption test, then hypothesis testing can then be carried out. The process of testing the hypothesis will be decided whether the research hypothesis will be accepted or rejected.

IV. RESEARCH RESULT

A. Normality test



Based on the results of the normality test, it is known that the significance value is 0.206719 > 0.05, so it can be concluded that the residual value is normally distributed.



B. Multicollinearity Test

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.488768	140.1577	NA
EI	0.033252	7.655043	1.509445
EF	0.024842	5.217404	1.396207
PROF	0.335199	1.427054	1.161766
FS	0.001889	131.9513	1.699335
LEV	0.000262	1.659944	1.258419
LIQ	0.001942	2.871329	1.243060
KAP	0.028660	2.315080	1.662945

It can be seen that there is no multicollinearity between the independent variables, because the results of calculating the tolerance value for each independent variable do not show a result < 0.10 and the results of calculating the variance inflation factor (VIF) value also show that none of the results for each independent variable is > 10 .

Therefore, it can be concluded that there is no multicollinearity between the independent variables in this regression model.

C. Heteroscedasticity Test

Heteroskedasticity Test: Glejser

F-statistic	1.060240	Prob. F(7,134)	0.3927
Obs*R-squared	7.452031	Prob. Chi-Square(7)	0.3834
Scaled explained SS	7.127269	Prob. Chi-Square(7)	0.4158

The probability chi-square value of Obs*R Squared is 0.3834 which is greater than 0.05. so there is no heteroscedasticity problem.

D. Autocorrelation Test

R-squared	0.052479	Mean dependent var	0.543317
Adjusted R-squared	0.002982	S.D. dependent var	0.416319
S.E. of regression	0.415698	Akaike info criterion	1.136974
Sum squared resid	23.15586	Schwarz criterion	1.303500
Log likelihood	-72.72516	Hannan-Quinn criter.	1.204643
F-statistic	1.060240	Durbin-Watson stat	1.848310
Prob(F-statistic)	0.392693		

According to the eviews calculation results in the table above, the probability value is $0.392693 \geq 0.05$. So it can be concluded that there is no autocorrelation between variables.

E. Panel Data Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.40612	0.699119	20.60610	0.0000
EI	0.495806	0.182351	2.718964	0.0074
EF	0.656195	0.157615	4.163280	0.0001



PROF	4.085626	0.578964	7.056792	0.0000
FS	-0.154546	0.043462	-3.555909	0.0005
LEV	-0.026514	0.016183	-1.638438	0.1037
LIQ	0.041203	0.044063	0.935082	0.3514
KAP	0.062414	0.169293	0.368671	0.7130
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R-squared	0.574742	Mean dependent var	13.12959	
Adjusted R-squared	0.552527	S.D. dependent var	1.051971	
S.E. of regression	0.703699	Akaike info criterion	2.189757	
Sum squared resid	66.35580	Schwarz criterion	2.356283	
Log likelihood	-147.4728	Hannan-Quinn criter.	2.257426	
F-statistic	25.87184	Durbin-Watson stat	2.213138	
Prob(F-statistic)	0.000000			

Based on these calculations, it can be seen that the Prob (F-statistic) result is $0.0000 < 0.05$. So eco innovation, eco-efficiency, profitability, company size, leverage, liquidity and external audit quality simultaneously influence the value of mining sector companies listed on the Indonesia Stock Exchange (BEI) for the 2018-2021 period. The resulting influence is R-squared 0.574742 or equal to 57.47%.

F. Data Analysis of Moderating Variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.86185	0.153180	77.43717	0.0000
EI	0.744401	0.184598	4.032557	0.0001
EF	0.617156	0.169772	3.635196	0.0004
PROF	0.902009	2.728909	0.330538	0.7415
EI_PROF	6.026467	3.104024	1.941502	0.0543
EF_PROF	-2.761520	2.654045	-1.040495	0.3000
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R-squared	0.512979	Mean dependent var	13.12959	
Adjusted R-squared	0.495073	S.D. dependent var	1.051971	
S.E. of regression	0.747511	Akaike info criterion	2.297200	
Sum squared resid	75.99316	Schwarz criterion	2.422094	
Log likelihood	-157.1012	Hannan-Quinn criter.	2.347952	
F-statistic	28.64971	Durbin-Watson stat	2.205045	
Prob(F-statistic)	0.000000			

The results of data calculations using moderating variables show that profitabilty has a significant positive effect on the value of eco innovation and has no effect on eco efficiency. This is shown by the calculation results of Prob EI_PROF $0.05 = < 0.05$ and Prob EF_PROF $0.3 > 0.05$. Based on these calculations, the type of moderating variable produced using the Moderated Regression Analysis (MRA) method is a Moderation Predictor Variable. This explains that the moderating variable has an effect on X1 (Eco Innovation) and has no effect on X2 (Eco Efficiency).



V. DISCUSSION

A. *The Effect of Eco – Innovation on Firm Values*

Based on the results of dummy eco innovation data calculations through eviews and accompanied by an explanation of each type of innovation implemented by the company. It can be concluded that a high level of environmental innovation leads to a greater increase in stock returns and has a positive effect on firm value. This result is in accordance with the research results of Zaman et al (2021) which states that a company's eco-innovation commitment improves business performance (Cheng et al., 2014; Hojnik & Ruzzier, 2017), and produces higher stock returns (Szutowski, 2020), also improves environmental performance (Fernando & Wah, 2017), resulting in greater transparency and disclosure (García et al, 2021).

B. *The effect of Eco_Efficiency on Firm Values*

The eco efficiency value in the calculation results table shows a significance of $0.0001 < 0.05$. The results of the eviews calculations show that eco efficiency has quite an influence on firm value. So hypothesis 2 (two) states that eco-efficiency has a positive effect on firm value and can be accepted. Company efforts in implementing an internationally standardized environmental management system can make the company considered more sustainable and can increase firm value (Ong et al., 2016). The results of this research show that eco-efficiency has a positive effect on firm value. Using ISO 14001 measurements can help companies or business people to be more effective because they save work time and costs in running their business. Therefore, companies that implement eco-efficiency practices can increase profitability and firm value.

C. *The Profitability Moderates Effect between Eco-Efficiency and Eco-Innovation on Firm Value*

The third hypothesis in this research is that profitability moderates the relationship between eco efficiency and eco innovation on firm value. The calculation results show that Prob EI_PROF is 0.0543 and Prob EF_PROF is 0.3000. Then Prob(F-statistic) $0.000000 < 0.05$ which shows that profitability moderates the relationship between eco efficiency and eco innovation on firm value. So, the third hypothesis in this research can be accepted. These results indicate that in mining sector companies, the value of a company can be influenced by the high or low value of the company's profitability.

VI. CONCLUSION

Based on the results of the study, it can be concluded that:

1. Eco Innovation influences the value of mining sector companies listed on the Indonesian Stock Exchange.
2. Eco Efficiency influences the value of mining sector companies listed on the Indonesian Stock Exchange.
3. Profitability has an effect as a moderating variable on the value of mining sector companies listed on the Indonesian Stock Exchange.
4. Several forms of eco innovation carried out by companies as data samples in this research are:
 - a. Waste quality management,
 - b. Mining mud management.
 - c. Use of natural gas which is more environmentally friendly
 - d. Reducing the use of fuel which has an impact on excessive pollution.
 - e. Carry out integrated waste management arrangements.
 - f. Carry out monitoring and inspection of water quality.
 - g. Operation of hydroelectric power plants
5. The form of implementing eco efficiency implemented by mining sector companies registered on the Indonesian stock exchange is having ISO 14001 certification or meeting the PROPER (Public Disclosure Program for Environmental Compliance) assessment from the Ministry of the Environment of the Republic of Indonesia.

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