MODERATING ROLE OF LEVERAGE AND PROFITABILITY IN THE RELATIONSHIP BETWEEN ECO-EFFICIENCY AND FIRM VALUE IN CONSUMER GOODS SECTOR

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Abstract

This research aims to examine the influence of firm value on eco-efficiency with leverage and profitability as moderating variables. Companies that have implemented environmentally friendly concepts in their operational activities are expected to have higher share prices which will lead to an increase in firm value. Eco-efficiency is implemented with ISO 14001 certification. Leverage is measured using Debt Equity Ratio (DER) and Profitability is measured using Return on Assets (ROA). This research also uses Earning Per Share (EPS) and Book Value (BV) as control variables. This research uses a sample of manufacturing companies in the consumer goods sector listed on the Indonesia Stock Exchange. The sample extraction technique used was purposive sampling with the criteria of companies presenting financial reports for the 2017-2021 period, resulting in 26 companies being obtained. This research is research that uses secondary data in the form of financial reports. This research uses the Moderated Regression Analysis (MRA) method. The research results show that when eco-efficiency is tested for its influence together with other variables, the results do not affect firm value, but if eco-efficiency is tested alone, the results are significantly positive for firm value. Based on the MRA test results, leverage and profitability as moderators are both unable to moderate the relationship between eco-efficiency and firm value.

INTRODUCTION

Companies operating in the manufacturing industrial sector, especially consumer goods industries, face major challenges related to global and environmental pollution. These challenges have encouraged companies to adopt the concept of eco-efficiency, which emphasizes the efficient use of natural resources and energy while maintaining sustainability and managing environmental impacts. Global issues such as climate change and resource depletion push businesses to innovate in ways that minimize their ecological

footprints (Chikmatin et al., 2019; Legawa et al., 2023; Ulil Ilv Khasanah et al., 2023).

According to Elkington (1997), companies must fulfill three key dimensions of sustainability, often referred to as the Triple Bottom Line: *profit* (economic value), *people* (social responsibility), and *planet* (environmental care). In this regard, eco-efficiency becomes a strategic response to balance economic gains with environmental stewardship.

The implementation of eco-efficiency often proxied through ISO 14001 certification not only helps companies to reduce environmental impacts but also contributes to cost efficiency, operational performance, and reputation enhancement (Hart & Milstein, 2003; Porter & van der Linde, 1995). A company's commitment to eco-efficiency can attract environmentally conscious investors and consumers, thereby influencing its firm value in the long term (Buysse & Verbeke, 2003; Clarkson et al., 2011). This highlights that environmental strategies are no longer merely compliance measures, but can serve as competitive advantages in the evolving global market.

In addition, leverage and profitability also play an important role in moderating the relationship between eco-efficiency and firm value. Leverage measures the extent to which a firm relies on debt to finance its operations and assets, potentially affecting a firm's capacity to invest more in environmental initiatives. Profitability, which is measured through ratios such as Return on Assets (ROA), reflects a firm's ability to generate profits from the assets it owns (Isnaini & Wahyuningtyas, 2022; Prasetyorini, 2013; Salwa Aden, 2023). Previous research shows that companies with high profitability tend to be better able to allocate funds to environmentally friendly activities without sacrificing long-term profits (Burritt & Saka, 2006)

Based on a literature review, several studies show that eco-efficiency has a positive impact on firm value. Research finds that companies that implement eco-efficiency well experience an increase in share prices, which reflects higher firm value. However, mixed results also emerged, as found by (Osazuwa & Che-Ahmad, 2016), which shows that leverage does not always significantly moderate the relationship between eco-efficiency and firm value. On the other hand, profitability is proven to have a stronger influence in strengthening the positive impact of eco-efficiency on firm value. This research aims to fill this gap in the literature by examining the moderating influence of leverage and profitability on the relationship between eco-efficiency and firm value in the consumer goods manufacturing sector listed on the Indonesia Stock Exchange (BEI).

LITERATURE REVIEW

The Effect of Eco-efficiency on Firm Value

Eco-efficiency, which was first introduced by the World Business Council for Sustainable Development (WBCSD) in 1992, is an approach that emphasizes efforts to maximize economic value while reducing the ecological impact of the production process. This concept focuses on increasing efficiency in the use of natural resources and energy as well as reducing waste generated in the product life cycle. As an international standard for environmental management, ISO 14001 is a reference for companies in implementing eco-efficiency, where companies that have this certification demonstrate their commitment to sustainability and better environmental impact management. Study (Burnett et al., 2011) shows that companies that apply eco-efficiency principles through ISO 14001 certification gain long-term benefits in the form of increased investor confidence and a better firm image, which in turn contributes to increasing firm value. According to (Elkington, 1997) further explained that the application of the triple bottom line principle (profit, people, planet) in firm strategy can produce significant benefits for the sustainability of the firm and society.

H1. Eco-efficiency has no effect on firm value

The Effect of Leverage on the relationship between Eco-Efficiency and Firm Value

Leverage refers to a firm's use of debt to finance its operations and assets, which has a significant impact on the firm's financial performance and strategic decisions. (Suryani, 2021; Wijaya et al., 2023) suggests that companies with high leverage are at greater risk in facing market fluctuations and high fixed costs. However, on the other hand, leverage can influence companies to be more proactive in seeking external funding sources, including to fund environmentally friendly initiatives such as eco-efficiency. (Orij, 2007) states that companies with high leverage are more likely to meet stakeholder demands, including demands for environmental preservation, because they have more parties involved in their operations, such as creditors who demand that the firm maintain its reputation and financial stability. Leverage can also serve as a signal to investors about a firm's ability to manage risk, but if it is too high, it can deter companies from investing in sustainability-related initiatives.

H2. Laverange has no effect on the relationship between eco-efficiency and firm value

The Influence of Profitability on the relationship between Eco-Efficiency and Firm Value

Profitability is an important measure in assessing a firm's financial performance. (Burritt & Saka, 2006) states that companies with high profitability have a greater capacity to invest in projects that focus on environmental efficiency without sacrificing short-term profits. Expert opinion (Kurniasari, 2017; Shenurti et al., 2022; Zulkarnaen, 2018) Return on Assets (ROA), which measures a firm's efficiency in generating profits from its assets, is a key indicator in assessing a firm's ability to make investments that support sustainability. (Osazuwa & Che-Ahmad, 2016) revealed that higher profitability can strengthen the positive relationship between eco-efficiency and firm value, because profitable companies are better able to allocate funds for the implementation of environmentally friendly technologies and efficient resource management. In addition, high profitability increases a firm's attractiveness in the eyes of investors, because they tend to look for companies that are not only oriented towards profits, but also towards sustainable practices that can provide long-term profits. Therefore, profitability functions as a moderator that strengthens the relationship between eco-efficiency and firm value

H3. Profitability has no effect on the relationship between eco-efficency and firm value

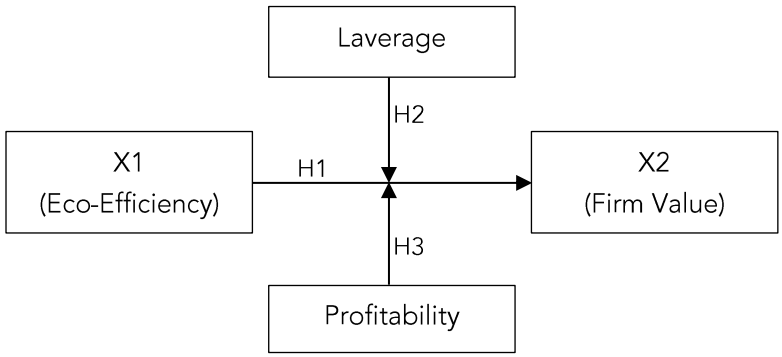

Figure 1. Framework

RESEARCH METHODS

This research uses a sample of manufacturing companies in the consumer goods sector listed on the Indonesia Stock Exchange. The technique used in this research is the sample extraction technique used is purposive sampling with the criteria of companies presenting financial reports for the 2017-2021 period, so

that 26 companies were obtained. This research uses secondary data in the form of financial reports. This research uses Multiple Linear Analysis with the Moderated Regression Analysis (MRA) method. The research results show that when eco-efficiency is tested for its influence together with other variables, the results do not affect firm value, but if eco-efficiency is tested alone, the results are significantly positive for firm value.

The data analysis techniques used in this research are quantitative descriptive statistical data, multiple linear regression analysis, moderated regression analysis (MRA). Moderated Regression Analysis (MRA) or interaction test is a type of multiple linear regression analysis that tests whether the influence of an independent variable on the dependent variable is influenced by the moderator variable. In this context, MRA is used to test whether variables such as profitability and leverage can moderate (strengthen or weaken) the relationship between eco-efficiency and firm value. This model is often implemented using regression techniques such as those in SPSS software, for example using the Hayes process to handle the interaction of these variables.
There are 3 analysis models that we use, among others:

Model 1:

$$Pit = \alpha + \beta 1\ ECOit + eit$$
$$P = 6.402 + 0.735\ ECO + 0.001\ EPS + 0.000\ BV + \varepsilon$$

Model 2:

$$Pit = \alpha + \beta 1 ECOit + \beta 2\ LEVit + \beta 3\ PROFit + eit$$
$$P = 6.107 + 0.321\ ECO + 0.001\ LEV + 0.057\ PROF - 0.0000697\ EPS + 0.002\ BV + \varepsilon$$

Model 3:

$$Pit = \alpha + \beta 1\ ECOit + \beta 2\ LEVit + \beta 3\ PROFit + \beta 4\ ECOLEVit + \beta 5\ ECOPROFit + \beta 6\ EPSit + \beta 7\ BVit + \varepsilon it$$

Where: α: Constant, ECOit : Eco-Efficiency of firm i year t, Pit: Firm value for firm i year t, LEVit : Leverage for firm i year t, PROFit: Profitability for firm i year t, EPSit: Net income per share for firm i year t, BVit: Book value for firm i year t, εit : Error equation for firm i in period t

RESULTS AND DISCUSSION

This section presents the empirical findings and interprets the results in the context of the study's objectives. The analysis was conducted to examine the moderating effects of leverage and profitability on the relationship between eco-

efficiency and firm value. The findings are discussed based on statistical outputs and supported by relevant previous research. The results provide insights into how internal financial factors influence the extent to which environmental performance impacts a company's valuation in the consumer goods manufacturing sector. Implications of these findings for corporate sustainability strategies are also explored.

Descriptive Analysis

The following is an overview of the average Price, DER, ROA, EPS, AND BV.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
PRICE	130	4.326	11.224	7.1175	1.565
ECO	130	0.00	1.00	.485	0.502
LEV	130	16.35	298.15	80.765	59.145
PROF	130	-21.40	92.10	7.010	13.270
EPS	130	-483	5655	250.02	818.603
BV	130	139	30814	2014.34	5294.431
Valid N (listwise)	130				

Based on the results of descriptive statistical tests carried out on various variables in this research, it can be concluded that the data showing firm value, leverage and eco-efficiency have varying characteristics. Firm value and leverage tend to be homogeneous, which means that management's ability to increase firm value and use capital is relatively the same across all sample companies. In contrast, eco-efficiency shows a very high level of variation, indicating that the implementation of eco-efficiency systems varies between companies, with some companies being superior in terms of environmental efficiency than others.

Meanwhile, control variables such as profitability (ROA), earnings per share (EPS), and book value (BV) show a very high level of variation, which means there are significant differences in the ability of firm management to generate profits, earnings per share, and book value per share. This reflects differences in how companies manage their resources and generate profits, as well as how they manage their balance sheets. Overall, although there are similarities in some managerial aspects, firm management between samples shows considerable variation in several important variables, reflecting the diversity of firm strategies and performance.

Classical Assumption Test

Normality Test

Is.	N	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)	Conclusion
Model 1	130	0.898	0.396	Normal
Model 2	130	1.247	0.089	Normal
Model 3	130	1.102	0.176	Normal

Information:
Model 1: Effect of ECO on PRICE
Model 2: Effect of ECO, LEV, PROF on PRICE
Model 3: Effect of ECO, LEV, PROF, ECOLEV, ECOPROF, EPS, BV on PRICE

The results of the data from the three models above show that the linear regression model built in this research has normally distributed data. This is shown in the value *Asymp. Say.* (2- tailed) >0,05.

Multicollinearity Test

VARIABLES	MODEL 1		MODEL 2		MODEL 3	
	TOLL	VIF	TOLL	VIF	TOLL	VIF
ECO	0.949	1.054	0.841	1.189	0.245	4.088
LEV	-	-	0.901	1.109	0.482	2.073
PROF	-	-	0.813	1.230	0.149	6.690
ECOLEV	-	-	-	-	0.143	7.005
ECOPROF	-	-	-	-	0.146	6.836
EPS	0.179	5.600	0.162	6.183	0.288	3.476
BV	0.175	5.725	0.160	6.260	0.145	6.906

It can be concluded that these variables are free from multicollinearity or that there are no symptoms of multicollinearity between the independent variables and moderating variables in the regression model because the VIF value is <10 and the tolerance value is >0.1, which means that there are no symptoms of multicollinearity.

Heteroscedasticity Test

The results of the heteroscedasticity test in Table 13 have significant

VARIABLES	Say.		
	MODEL 1	MODEL 2	MODEL 3

ECO	0.790	0.076	0.582
LEV	-	0.858	0.089
PROF	-	0.501	0.792
ECOLEV	-	-	0.271
ECOPROF	-	-	0.128
EPS	0.141	0.331	0.686
BV	0.218	0.400	0.371

values for all model variables that are >0.05. It can be concluded that all variables are free from heteroscedasticity or do not experience symptoms of heteroscedasticity

Autocorrelation Test

Is.	OF	DW	4-DU	Conclusion
MODEL 1	1.7610	1.796	2.239	Autocorrelation does not occur
MODEL 2	1.7941	1.835	2.260	Autocorrelation does not occur
MODEL 3	1.8282	1.829	2.172	Autocorrelation does not occur

Information:

Model 1: Effect of ECO on PRICE

Model 2: Effect of ECO, LEV, PROF on PRICE

Model 3: Effect of ECO, LEV, PROF, ECOLEV, ECOPROF, EPS, BV on PRICE

Based on the Durbin-Watson test results in Table 12, the three models meet the requirements of dU < DW < 4-dU. The DW values in model one (1.796), model two (1.835), and model three (1.829) are all between the dU and 4-dU limits of each model. Thus, it can be concluded that in models one, two, and three there are no symptoms of autocorrelation.

Multiple Linear Analysis Test

Variable	Model (1)	Model (2)	(Model 3)
Independent			
ECO	0.735 (0.218) (0.001) ***	0.321 (0.192) (0.097) *	0.2876 (0.2020) (0.1571)
Moderator			
Leverage		0.001(0.002) (0.427)	0.0032 (0.0022) (0.1418)

Profitability		0.057 (0.007) (0.000) ***	0.0670 (0.0208) (0.0017) ***
Control			
EPS	0.001 (0.000) (0.087) *	-0.000 (0.000) (0.795)	-0.0001 (0.0003) (0.6316)
BV	0.000 (0.000) (0.000) ***	0.000 (0.000) (0.000) ***	0.0002 (0.0000) (0.0000) ***
Interaction			
ECO→LEV			-0.0042 (0.0032) (0.1933)
ECO→PROF			-0.0102 (0.0217) (0.6388)
$_{R}2$	0.416	0.606	0.612
F	29.871	38.182	27.467
ΔR^2	0.402	0.590	0.590

Notes: *N* = 130 for all models; the numbers in parentheses are *standard errors*; *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

DISCUSSION

The influence of CEO efficiency on firm value. This research concludes that individually, *eco-efficiency* positive and significant effect on firm value. This shows that the firm is implementing the concept *eco-efficiency* able to increase its competitiveness and attract investor interest through its reputation as an environmentally friendly firm. Implementation *eco-efficiency* be a positive signal for the market, which can encourage an increase in firm value because it is perceived as a form of social responsibility and business sustainability. These findings are also confirmed by research (Burnett et al., 2011; Osazuwa & Che-Ahmad, 2016) which shows that the adoption of environmentally friendly business practices is associated with increasing firm value in the eyes of the public and capital markets.

However, when *eco-efficiency* tested simultaneously with other variables such as leverage and profitability, their effect on firm value is not significant. This confirms that firm value is influenced by various factors, not just environmental sustainability aspects. Investors in making investment decisions are more likely to consider a combination of several factors, especially fundamental financial factors such as profitability which reflects the firm's real financial performance.

Thus, reflecting the complexity of investors' assessments of firm value. Therefore, *eco-efficiency* function more as a complement (*supporting factor*) in increasing firm value, not as a single dominant factor, even though it is implemented *eco-efficiency* It is important to improve the firm's image and long-term potential, companies also need to ensure good financial performance in order to truly increase the value of their firm in the eyes of investors.

The influence of leverage on the relationship between eco-efficiency and firm value. Based on research results, leverage is proven to be unable to moderate the relationship between eco-efficiency and firm value. A significance value greater than 0.05 and a negative t-value indicates that the presence of leverage actually weakens, not strengthens, the effect of eco-efficiency on firm value. This means that even though companies apply the eco-efficiency concept to improve environmental and operational performance, the high level of debt they hold remains a concern for investors and can reduce the positive impact of eco-efficiency on firm value. In other words, implementing environmentally friendly principles alone is not enough if the firm's funding structure is too dependent on debt.

This illustrates that investors in assessing the firm's prospects and value pay attention to financial risk factors other than sustainability factors (Adi, 2013). Companies with high levels of leverage are considered to have a greater risk of debt repayment, which can have an impact on the firm's financial stability in the future. This research is consistent with the findings (Osazuwa & Che-Ahmad, 2016), which states that leverage does not strengthen the relationship between eco-efficiency and firm value. Therefore, to increase firm value optimally, management not only needs to focus on implementing eco-efficiency, but also must manage the firm's financial structure carefully so as not to create a risk of trust in the eyes of investors.

One reason is that implementation *eco-efficiency* (which in this study is measured through possession of an ISO 14001 certificate) is a commitment to international standards that must be met by companies regardless of financial conditions, including the level of leverage. Practice *eco-efficiency* is more related to compliance with global environmental standards and long-term sustainability than to a firm's funding sources. This is also in line with the principles resulting from the declaration (rio, 1992) where the firm's commitment to environmental protection is established as part of its global responsibility towards sustainable development.

The influence of profitability on the relationship between eco-efficiency and firm value. The research results show that profitability is unable to moderate the relationship between eco-efficiency and firm value. This is evidenced by the

significance value being greater than 0.05 and the negative t-value, which means that profitability weakens, not strengthens, the relationship. Thus, the level of firm profits, whether high or low, has no effect on the effectiveness of implementing eco-efficiency in increasing firm value. This indicates that the adoption of environmentally friendly concepts by companies is based more on a commitment to sustainability and social legitimacy rather than a motivation to increase short-term profitability.

However, when profitability is tested as a direct predictor of firm value, the results show a positive and significant relationship. This means that investors still consider profitability as the main factor in assessing firm performance and prospects, regardless of the firm's efforts to adopt eco-efficiency. This finding is in line with research (Dwi & Septiani, 2017), which emphasizes that a firm's survival is determined more by the support of the surrounding community and financial performance, not just by high profits alone. Therefore, companies need to balance healthy financial performance and commitment to sustainable practices to maintain the value of their firm in the eyes of investors.

So high profitability can indeed be attractive to investors because it shows the firm's ability to generate profits, but in context *eco-efficiency*, profitability is not a determining factor. The implementation of environmentally friendly practices is seen as a form of corporate social responsibility to gain community support, which also contributes to the long-term sustainability of the firm's operations, regardless of its financial condition.

The influence of the control variables EPS and BV on firm value. Based on the research results, the control variable Earnings per Share (EPS) shows that in the initial model (without moderating variables), EPS has a positive and significant effect on firm value. This means that the higher the EPS produced, the greater the investor's interest in buying shares in the firm, which ultimately drives up share prices. However, when EPS is tested simultaneously with other moderating variables, the effect of EPS on firm value becomes insignificant. This indicates that other factors, such as leverage and profitability, can reduce the dominant influence of EPS on firm value in multivariate analysis.

Meanwhile, Book Value (BV) consistently shows a positive and significant influence on firm value in all models tested. This indicates that the higher the book value per share of the firm, the higher the market's confidence in the firm's future prospects (Gitman & Zutter, 2015). A strong BV signals to investors that the firm has strong enough assets to support the value of its shares. Thus, in the context of this research, BV is more stable and more influential than EPS on the formation of firm value, especially when considering many factors at once in making investment decisions.

EPS shows profitability per share, so it is natural that under certain conditions investors react positively to high EPS. However, in a multivariate model, other stronger variables can reduce the influence of EPS. Meanwhile, BV reflects the strength of the firm's assets, which is an important basis for investors in assessing the stability and long-term prospects of the firm, so that BV continues to have a significant effect on firm value in all analysis models.

CONCLUSION

Based on the results of research on manufacturing companies in the consumer goods industrial sector, it was found that almost all companies have implemented the eco-efficiency concept, which has a significant positive effect on firm value when tested alone. This shows that the application of eco-efficiency can provide a positive signal for investors and increase firm value. However, when other variables such as leverage and profitability are entered into the testing model simultaneously, the effect of eco-efficiency on firm value becomes insignificant. This means that in making investment decisions, investors not only consider environmental aspects, but also the firm's overall financial performance.

Furthermore, the results of the Moderated Regression Analysis (MRA) test show that neither leverage nor profitability are able to moderate the relationship between eco-efficiency and firm value. In fact, leverage tends to weaken this relationship, indicating that companies remain committed to environmental standards such as ISO 14001, without being affected by the debt structure or the level of profits obtained. This indicates that the implementation of eco-efficiency is based more on the need to maintain social legitimacy and environmental responsibility, not solely for short-term profits. Overall, eco-efficiency remains an important element for a firm's long-term sustainability and competitiveness, while investors tend to look at overall financial performance as well as a firm's relationship with society and the environment when making investment decisions.

Based on the findings of this study, several suggestions can be proposed for future research and practical applications. First, companies in the consumer goods manufacturing sector are encouraged to continuously improve their eco-efficiency practices, such as through ISO 14001 certification or green innovation, as these efforts not only reduce environmental impact but also contribute to long-term firm value. Second, financial decision-makers should carefully consider the role of leverage and profitability in their sustainability strategies, as these variables can significantly influence the effectiveness of eco-efficiency in enhancing firm performance.

For future research, it is recommended to expand the scope by including other sectors or using longitudinal data to capture long-term effects. Researchers may also consider adding other moderating variables such as corporate governance or market competition to gain a deeper understanding of the dynamics between environmental initiatives and firm value. Finally, qualitative approaches or case studies could complement quantitative results and provide richer insights into the strategic implementation of eco-efficiency at the managerial level.

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