



THE RELATIONSHIP BETWEEN SUSTAINABILITY AND FIRM PERFORMANCE: THE MODERATION OF FIRM SIZE AND INDUSTRY SENSITIVITY

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Abstract

The study investigates how firm size and industry sensitivity as moderators influence the relationship between sustainability and firm performance. Using a fixed effects Moderate Regression Analysis (MRA) on 1,406 firm-year observations of non-financial Indonesian public companies listed on the Indonesia Stock Exchange, that disclose sustainability information in their annual reports for the period 2010-2023, the study concludes that sustainability has a significant and positive impact on a firm's performance. However, firm size cannot moderate the relationship between sustainability and firm performance. Industry sensitivity reveals weaknesses in the relationship between sustainability and firm performance, suggesting that this relationship varies across industries. Industry sensitivity and heightened regulatory pressure may lead firms to prioritize compliance-oriented sustainability disclosures, thereby diminishing sustainability's performance-enhancing role. As a result, such disclosure may affect lower firm performance. The study supports stakeholder theory and advises regulators (Financial Services Authority - OJK) to implement sustainability disclosure rules gradually to avoid imposing high costs on firms in high-risk industries.

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INTRODUCTION

In recent years, the concept of corporate sustainability has attracted significant attention from academics and practitioners. (Fei et al., 2022; Gracia & Siregar, 2021; Kılıç et al., 2022; Zarefar et al., 2022). Sustainability reporting has increased due to the emergence of global environmental problems, including climate change, global warming, deforestation, and declining biodiversity. (Haque & Jones, 2020; Hongming et al., 2020; Karaman et al., 2018; Kraus et al., 2020; Moshood et al., 2022; Nawawi et al., 2020; Zieba & Johansson, 2022). Since Elkington introduced the sustainability framework as a "triple bottom line" in 1994, corporate sustainability has become the most widely used concept for addressing companies' impacts, relationships, and responsibilities to society. (Giacomini et al., 2020; Jha & Rangarajan, 2020). Sustainability reporting is a form of communication between companies and stakeholders that reflects a company's respect and commitment to society. (Guidi et al., 2025; Zieba & Johansson, 2022). Several previous studies have summarized the benefits of sustainability reporting disclosure, namely as a tool for risk mitigation. (Broadstock et al., 2021; Papafloratos & Pantazi, 2025), long-term value creation (Hamdouni, 2025), reduce information asymmetry and increase transparency (Ji et al., 2023; Mohammad & Wasiuzzaman, 2021). According to Aydo et al. (2022) and Suhartini et al. (2024) Sustainability information significantly affects the company's market performance. Conversely Fahad & Busru (2021) and Jha & Rangarajan (2020) observed a negative correlation between environmental disclosure and firm performance. Contrary to Larasati & Nafiati (2025) that sustainability does not affect firm performance.

Company characteristics, such as firm size and industry sensitivity, are identified as drivers of stakeholder-based information disclosure. (Ali et al., 2022; Hamed et al., 2022). Large companies tend to disclose sustainability information under pressure from stakeholders. (Qureshi et al., 2020; Rivera et al., 2023) Furthermore, Lopes et al. (2022) explained that large companies have substantial funds, making them more likely to implement sustainability practices. Research on the relationships among firm size, sustainability disclosure, and firm performance yields mixed results. Firm size has a positive impact on sustainability disclosure (Shahab et al., 2022; Drempetic et al., 2020). Large companies tend to disclose information on their sustainability. Firm size has a significant impact on sustainability disclosure and company value. (Atif et al., 2021). Offering a contrasting perspective, Qureshi et al. (2020) argued that firm size has a significantly negative impact on sustainability disclosure.

Companies that produce high levels of pollution are required to report comprehensive information on pollution caused by their operation. (Huang & Ge, 2024; Zhang et al., 2022). According to Sanoran (2023) Sustainability has a positive impact on corporate sustainability growth only for specific industries in Thailand. Research by Ahsan et al. (2022) indicates that total sustainability disclosure in sensitive industries is positively associated with company value but negatively correlated with stock prices. Sustainability reduces company value and creates a win-lose or win-win scenario, thereby increasing company value in sensitive companies. Different results by Zaiane & Ellouze (2023) show that sustainability disclosure increases company value regardless of industry type. Sensitive companies, such as those in the mining industry, disclose higher carbon emissions, indicating lower performance than other companies. (Desai et al., 2021). In Indonesia, sensitive manufacturing companies must increase their awareness of environmental disclosure, even if their primary motivation is merely regulatory compliance. (Solikhah & Maulina, 2021).

Environmentally sensitive firms gain several advantages from reducing carbon emissions compared to firms in non-sensitive sectors, such as improved market performance, which reflects investor expectations and future performance (Ghose et al., 2023). Firms with less corporate social responsibility (CSR) disclosure tend to perform better because excessive CSR disclosure can create public skepticism, reducing customer confidence and weakening management's reputation (Zhang et al., 2024). Based on the background, we delineate how firm size and industry sensitivity moderate the

relationship between sustainability and firm performance in Indonesia. Prior research has shown that firm size plays a critical explanatory factor in differentiating environmentally proactive firms from less proactive ones (Seroka-Stolka, 2020). Zaiane & Ellouze (2023) explained that a firm's industry type and its unique capabilities determine the firm's response to stakeholders' demand for sustainability. Research by Gracia & Siregar (2021) and Qureshi et al. (2020) indicates that companies in environmentally sensitive sectors often perform better than those in non-sensitive sectors because they must adhere to rigorous sustainability obligations. Evidence from Europe indicates that in non-sensitive industries, CSR practices are frequently symbolic for large firms but more substantive for small firms (Zaiane & Ellouze, 2023). This study's novelty lies in its use of the GRI framework to analyze environmental disclosure, shifting the focus from broader corporate social responsibility (CSR) disclosure emphasized in prior research.

Stakeholder theory focuses on the relationships between a company and all stakeholders in its business domain, including employees, customers, suppliers, and other parties. (Husnaini et al., 2023; Qureshi et al., 2020; Shakil, 2021; Tiron-Tudor et al., 2020). A company's sustainability depends heavily on its relationship with stakeholders, so it must meet their needs and desires. (Abdi et al., 2022; Karaman et al., 2018; Qureshi et al., 2020; Velte, 2022; Wu et al., 2023). Stakeholder theory directly links sustainability issues to firm performance; companies that disclose sustainability information in their annual reports or standalone reports tend to improve their firm performance. (Hamed et al., 2022).

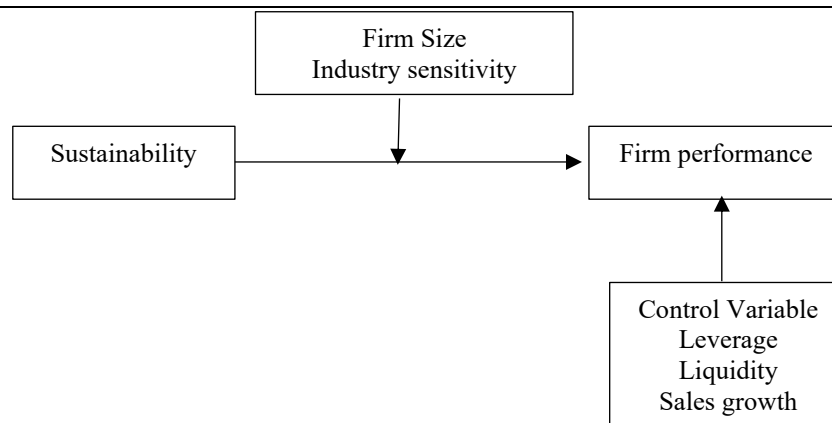
Stakeholder theory assumes that sustainability improves firm performance. (Pablo et al., 2020). This is achieved through sustainability disclosure, which mitigates information asymmetry between principals (stakeholders) and agents (management). Such disclosure provides investors with an overview of the company's performance and firm value. (Akyuni & Oktaryani, 2025; Aydo et al., 2022; Chen & Xie, 2022; Imana & Rosiyana, 2025; Mohammad & Wasiuzzaman, 2021). Many previous studies have highlighted the association between sustainability and firms' future performance. Bansal et al. (2021), Khanchel et al. (2023) and Sardana et al. (2020), who found that sustainability and environmental disclosure enhance firms' performance. According to Mohammad & Wasiuzzaman (2021) 90 percent of the studies report a positive association between sustainability and performance. However, Baci (2023) argues that a firm's adoption of the GRI framework is positively associated with a firm's performance. Based on this explanation, the hypothesis in this study is:

H₁: Sustainability improves future firm performance

Ahsan et al. (2022) found that companies that are sensitive to environmental activities tend to increase their long-term value compared to short-term performance. Environmentally sensitive companies benefit more from reducing carbon emissions than companies from non-sensitive sectors, as market performance reflects investor expectations and future performance. (Ghose et al., 2023). The same condition is observed in environmentally sensitive companies across the ASEAN and European regions, which outperform non-sensitive industries. (Qureshi et al., 2020; Gracia & Siregar, 2021). Large companies are more likely to benefit from commitments to sustainability disclosure because they typically do not face financial constraints, enabling them to improve performance relative to small companies. (Zaiane & Ellouze, 2023). According to Zaiane & Ellouze (2023) Firm size moderates the influence of sustainability on firm performance, and internal sustainability practices have a significant positive impact on the performance of both large and small companies. The results of Pablo et al. (2020) revealed that sustainability activities show an increase in economic performance moderated by the size of the firm; the larger the size, the stronger the relationship. Based on this explanation, the hypothesis in this study is:

H₂: Firm size moderates the relationship between sustainability and firm performance

H₃: Industry sensitivity moderates the relationship between sustainability (SR) and firm performance



Source: Author's own work, 2025

Figure 1. Research framework

RESEARCH METHODS

The study's population comprised all publicly listed non-banking companies and financial institutions for the period 2010-2023. The final dataset, consisting of 1,406 observations, was constructed using secondary data extracted from company annual reports and sustainability reports on the official website of the Indonesia Stock Exchange-IDX (www.idx.co.id) and each company's website.

The definition of operational and measurement of variables:

Sustainability is the disclosure of corporate environmental information using content analysis, which is a binary variable, represented by one (1) if disclosed and zero (0) if undisclosed. Then, the environmental disclosure index for each company is calculated by summing the individual scores and dividing by the total disclosed by GRI across 34 items. Sustainability based on the Global Reporting Initiative (GRI) (Fahad & Busru, 2020; Khunkaew et al., 2023; Husnaini & Basuki, 2020).

$$(ED_GRI)_{i,j} = \frac{\sum X}{N_j} \dots\dots\dots(1)$$

ED_GRI = Environmental Disclosure Index

X_j = Number of environmental items disclosed by the company

N_j = Number of environmental disclosure items according to GRI

Firm performance is measured using Return on Assets (ROA) (Yousaf, 2025).

$$ROA_{i,t+1} = \frac{\text{Net Profit Before Tax}_{i,t+1}}{\text{Total Asset}_{i,t+1}} \dots\dots\dots(2)$$

Firm size is measured using a dummy variable. Firm size is distinguished into two categories: large and small, based on the median value. If firms with values above the median are categorized as large and take a value of 1, and 0 otherwise (Ghose et al., 2023).

Industry sensitivity is measured using a dummy variable. Companies classified as belonging to sensitive industries are assigned a value of 1, and 0 otherwise. Industries considered sensitive include energy, utilities, pulp and paper, mining, chemicals, metals, machinery, cement, glass, and transportation. (Ghose et al., 2023; Gracia & Siregar, 2021).

Leverage is measured using the ratio of total debt to total assets. (Abdi et al., 2022; Ghose et al., 2023; Qureshi et al., 2020; Zaiane & Ellouze, 2023).

$$LEV_{i,t} = \frac{\text{Total Debt}_{i,t}}{\text{Total Asset}_{i,t}} \dots\dots\dots(3)$$

Liquidity is measured by the ratio of total current assets to total assets (Zaiane & Ellouze, 2023).

$$Li_{i,t} = \frac{\text{Total Current Asset}_{i,t}}{\text{Total Asset}_{i,t}} \dots\dots\dots(4)$$

Sales Growth is measured as the difference between current-period sales and previous-period sales, divided by the previous year's sales. (Ghose et al., 2023; Zaiane & Ellouze, 2023).

$$\text{Sales Growth}_{i,t} = \frac{\text{Total Sales}_{i,t} - \text{Total Sales}_{i,t-1}}{\text{Total Sales}_{i,t-1}} \dots\dots\dots(5)$$

Hypothesis testing is conducted using Moderated Regression Analysis (MRA). This method allows for a comprehensive examination of the effects of the independent variables and the interaction of the moderating variable, while accounting for the influence of control variables on the dependent variable. The regression equations in this study are as follows.

$$ROA_{it+1} = \beta_0 + \beta_1 SR_{it} + \beta_2 FS_{it} + \beta_3 SI_{it} + \beta_4 LEV_{it} + \beta_5 Liq_{it} + \beta_6 SalGrow_{it} + \beta_7 year - \text{fixed effect} + e_{i,t} \dots\dots\dots(6)$$

$$ROA_{it+1} = \beta_0 + \beta_1 SR_{it} + \beta_2 FS_{it} + \beta_3 SI_{it} + \beta_4 SR * FS_{it} + \beta_5 SR * INDUSTRY_{it} + \beta_6 LEV_{it} + \beta_7 Liq_{it} + \beta_8 SalGrow_{it} + \beta_9 year - \text{fixed effect} + e_{i,t} \dots\dots\dots(7)$$

Notes:

ROA = Return on Assets; SR = Sustainability; FS = Firm Size; SI = Industry Sensitivity; LEV = Leverage; Liq = Liquidity; SalGrow = Sales Growth; α and β = Regression Coefficients; e = Error Term.

RESULTS AND DISCUSSION

Tables 1, 2, and 3 describe the descriptive statistics of all variables.

Table 1.
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	1,406	0.06	0.132	-0.439	0.54
ENV	1,406	0.412	0.238	0.031	1
LEV	1,406	0.479	0.293	0.034	1.923
LIQ	1,406	0.43	0.225	0.05	0.939
SALGRO	1,406	0.134	0.448	-0.71	2.644

Note(s): This table presents the summary statistics of firm performance (ROA), sustainability (ENV), leverage (LEV), Liquidity (LIQ), and sales growth (SALGRO) for the sample of manufacturing firms in the Indonesia Stock Exchange (IDX). The final study sample consists of an unbalanced panel of 1,406 firm-year observations for the period of 2010 to 2023.

Source: Author's own work, 2025

Table 2.
Descriptive Statistics of Firm Size

Asset	Freq.	Percent	Cum.
0	648	46.09	46.09
1	758	53.91	100.00
Total	1,406	100.00	

Note(s): This table presents the description of firm size.

Source: Author's own work, 2025

Table 3.
Descriptive statistics of the Sensitivity Industry

Industry	Freq.	Percent	Cum.
0	382	27.17	27.17
1	1,024	72.83	100.00
Total	1,406	100.00	

Note(s): This table presents descriptive statistics of the sensitivity industry

Source: Author's own work, 2025

Table 1 shows that firm performance, measured using ROA_{t+1}, has an average of 0.06. Sustainability, measured using environmental disclosure (ENV), has an average value of 0.412, with a minimum of 0.031 and a maximum of 1. A higher ENV value indicates that the company discloses more environmental information in line with GRI standards. A value of 1 indicates that the company discloses all aspects of sustainability in accordance with the GRI guidelines. The leverage variable has an average of 0.134. Sales growth has an average of 0.134, where negative values indicate a decrease in sales compared to the previous year. The liquidity (LIQ) variable has an average of 0.43.

Table 2 presents the descriptive data for firm size, indicating that large companies (with total assets exceeding the sample median) comprise 758 observations, or 53.91 percent of the total. Small companies (total assets < sample median) comprise 648 observations, or 46.09 percent, which means that the proportion of large and small companies is relatively balanced. Table 3 illustrates industry sensitivity, where 72.83 percent (1,024 observations) are environmentally sensitive industries, while the remaining 27.17 percent (382 observations) are non-sensitive industries.

Pearson's correlation measures the relationship between each independent variable and the dependent variable. The higher the correlation value, the stronger the relationship between the independent and dependent variables, as well as with other independent variables.

Table 4.
Pairwise Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) ROA	1.000						
(2) ENV	0.146*	1.000					
(3) TA	0.156*	0.227*	1.000				
(4) SI	0.061	0.091*	0.099*	1.000			
(5) LEV	-0.231*	-0.046	0.134*	0.101*	1.000		
(6) LIQ	0.111*	-0.041	-0.220*	0.000	-0.156*	1.000	
(7) SALGRO	0.120*	-0.050	-0.057	-0.053	0.005	-0.011	1.000

* shows significance at $p < .01$

Source: Author's own work, 2025

Table 4: Pearson correlation analysis reveals that sustainability reporting, firm size, liquidity, and sales growth are positively correlated with financial performance. The higher the sustainability reporting, firm size, liquidity, and sales growth, the higher the financial performance, and vice versa. Leverage is correlated negatively with financial performance. The higher a company's debt, the lower its financial performance tends to be. Only industry sensitivity has not associated with financial performance. All independent variables show a correlation coefficient of less than 0.8, indicating no multicollinearity among them.

Hypothesis testing uses *Moderated Regression Analysis* (MRA). The MRA results:

Table 5.
Moderated Regression Analysis results

	(1) ROA _{t+1}	(2) ROA _{t+1}
Intercept	0.106*** (4.330)	0.080*** (2.975)
ENV	0.054*** (3.933)	0.124*** (3.248)
LEV	-0.109*** (-6.305)	-0.110*** (-6.336)
	(1)	(2)

	ROA _{t+1}	ROA _{t+1}
LIQ	0.070*** (4.887)	0.071*** (4.913)
SALGRO	0.042***	0.043***
Continue	(4.180)	(4.282)
1.TA	0.033*** (3.968)	0.047*** (3.051)
1. INDUSTRY	0.015** (2.252)	0.039** (2.574)
1.TA#c.ENV		-0.034 (-1.162)
1.INDUSTRY#c.ENV		-0.061* (-1.787)
Year-fixed effect	Include	Include
Adj.R2	0.15	0.15
N	1406	1406
F-stat	10.236	9.400

Note(s). Tabel 5 represents the results of the Moderated Regression Analysis controlled for year-fixed effects. All continuous variables are winsorised at the 1 and 99 percentiles. t-statistic in parentheses. *, **, and *** denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Source: Author's own work, 2025

Column 1 shows that sustainability has a positive effect on financial performance (significant at the 1 percent level), with $\beta = 0.054$ and $t = 3.933$. Companies that prioritize environmental care tend to exhibit higher firm performance. Sustainability disclosure reduces information asymmetry, thereby enhancing future firm performance. Hypothesis 1 is accepted. These results support the studies of (Akyuni & Oktaryani, 2025; Aydo et al., 2022; Chen & Xie, 2022; Imana & Rosiyana, 2025; Mohammad & Wasiuzzaman, 2021), who found that sustainability disclosure enhances a company's positive image and improves firm performance. These findings are also consistent with stakeholder theory, which suggests that sustainability reporting provides information that legitimizes company behavior in accordance with prevailing societal norms, thereby shaping stakeholder perceptions that, in turn, improve firm performance.

Column 1 further shows that firm size has a positive effect on financial performance (significant at the 1 percent level), with $\beta = 0.033$ and $t = 3.968$. Larger firm size is associated with higher firm performance. Column 2 shows the interaction between sustainability and industry sensitivity, with $\beta = -0.061$ and $t = -1.787$ (weakly significant at the 10 percent level), indicating that industry sensitivity negatively affects firm performance. In contrast, firm size serves only as a predictor variable. In other words, firm size does not strengthen the relationship between sustainability and firm performance. Hypothesis 2 not supported. This result contradicts the studies of Zaiane & Ellouze (2023), and Pablo et al. (2020), who found that larger firm size moderates the effect of sustainability practices on firm performance. Larger firms have strengthened their sustainability practices to improve firm performance.

Column 1 shows that industry sensitivity influences financial performance (significant at the 5 percent level), with $\beta = 0.015$ and $t = 2.252$. Environmentally sensitive industries are associated with higher firm performance. Column 2 shows the interaction between sustainability and industry sensitivity with $\beta = -0.034$ and $t = -1.162$ (significant at the 10 percent level). Since both coefficients are significant, industry sensitivity is considered a quasi-moderating variable. Industry sensitivity weakens the relationship between sustainability and firm performance. Hypothesis 3 is accepted. Environmentally sensitive industries disclose more sustainability information but experience lower firm performance. Two factors can explain this finding: (1) Sensitive industries disclose more sustainability information but do not fully implement sustainability-related actions, essentially "window dressing, which reduces firm performance; (2) Sensitive industries are high-risk industries. While they disclose more

sustainability information, the greater the disclosure, the higher the associated costs, which in turn reduce firm performance. These findings support the studies by Ahsan et al. (2022), Ghose et al. (2023), Qureshi et al. (2020), and Gracia & Siregar (2021).

The control variables show that liquidity and sales growth have a significant positive effect on firm performance. The more current assets a company holds, the higher its performance, as these assets are used for operational activities. Similarly, higher sales growth indicates improved firm performance, as year-over-year increases in sales reflect stronger company outcomes. Leverage, on the other hand, has a significantly negative effect on firm performance. The higher the debt, the lower the company's performance. Increased debt raises the interest burden, reducing profits and, consequently, firm performance. These results are consistent with those of (Aydo et al., 2022), who found that leverage negatively impacts firm performance.

CONCLUSION AND SUGGESTIONS

The study results indicate that sustainability disclosure has a significant positive effect on firm performance. Sustainability reporting reduces information asymmetry and increases transparency, and consequently causes an increase in firm performance. Firm size has a significant positive effect on firm performance, but there is no moderate correlation between sustainability and firm performance. Firm size is the only predictor variable or control variable. Industry sensitivity is a factor that determines firm performance. Sensitive industries influence firm performance. Industry sensitivity is a factor that weakens firm performance because it requires the disclosure of environmental activities, which is costly and negatively impacts firm performance.

This study is limited by its reliance on the GRI framework for environmental disclosure. Future research could employ alternative metrics, such as the monetary value of environmental resources or quantitative energy data (e.g., kWh, m³ of water). Future research could be enhanced by considering additional moderating contextual variables, such as corporate governance, to test the impact of sustainability on firm performance or firm value.

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