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LEVERAGE AND ENVIRONMENTAL COST DISCLOSURE: EVIDENCE FROM INDONESIAN PUBLIC COMPANIES WITH FIRM SIZE AS MODERATOR

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ABSTRACT

Objective: This study examines the effect of leverage on environmental cost disclosure and investigates the moderating role of firm size among Indonesian public companies.

Research Design & Methods: This study uses a quantitative approach with panel data collected from 2020 to 2025 on companies that were included in the Kompas100 Index. Purposive sampling was applied, resulting in 130 non-financial companies after excluding financial sector, suspended, and delisted firms. Data were analyzed using panel logit regression.

Findings: The results indicate that leverage negatively affects environmental cost disclosure, suggesting that companies with higher debt levels tend to be less likely to disclose environmental costs. Firm size positively affects environmental cost disclosure and weakens the negative effect of leverage on disclosure. This finding indicates that larger firms are more likely to maintain environmental transparency despite higher financial pressure.

Implications: The findings imply that financial conditions influence corporate environmental transparency decisions. Companies are encouraged to maintain environmental cost disclosure practices to strengthen legitimacy and stakeholder trust. Regulators are also expected to enhance sustainability reporting standards related to environmental costs.

Contribution & Value Added: This study contributes to environmental accounting literature by analyzing environmental cost disclosure using a panel logit regression approach. The study also offers novelty by positioning firm size as a moderating variable in the relationship between leverage and environmental cost disclosure.

Keywords: Environmental Cost Disclosure, Firm Size, Indonesia Companies, Kompas100, Leverage.

JEL codes: M41, Q56
Article type: research paper

INTRODUCTION

Since sustainability reporting has evolved from a niche initiative to a global legal obligation, the disclosure of environmental responsibilities has become an integral part of companies' core strategies (Cormier and Magnan, 1999; Nguyen et al., 2026; Wang et al., 2023). Increased environmental awareness has also driven companies to expand their sustainability disclosure practices, particularly public companies that require stakeholder legitimacy (Kuo and Chen, 2013). This underscores the importance of environmental disclosure as a means to bridge the information gap between companies and stakeholders (Nguyen et al., 2026). Disclosures framed in positive tones signal a company's accountability in maintaining ecological sustenance (Arena et al., 2015). One element of standardized environmental responsibility disclosures under GRI-300 is environmental management costs. These costs represent the total of a company's expenditures on environmental management activities, including waste management, energy efficiency, conservation, and other environmental sustainability initiatives. The disclosure of these environmental costs reflects a company's commitment to managing the operational impacts of its activities on the environment (Shi et al., 2021), although they often place a financial burden on the company (Ren et al., 2020).

In the Indonesian context, practices regarding the disclosure of environmental costs still vary among companies. Some companies have disclosed environmental costs in detail in their integrated annual reports, while others are still limited to general narrative disclosures without including the environmental costs incurred. This

situation raises questions regarding the factors influencing companies' decisions to disclose environmental costs. One factor frequently examined in relation to environmental disclosure in general is leverage (e.g. Adnan et al., 2023; Akhter et al., 2023; Alsayegh et al., 2020; Desai, 2022; Yohana and Suhendah, 2023; Yulianti and Waworuntu, 2025). In theory, companies with high leverage tend to face pressure from creditors, leading management to be more cautious in allocating resources to non-financial activities, including the disclosure of environmental costs. This occurs because companies with high debt levels generally focus more on financial stability, cost control, and meeting obligations to creditors (Chen et al., 2021). Conversely, companies with higher ESG scores tend to have higher debt ratios. Under these conditions, companies tend to increase environmental and ESG disclosures as an effort to reduce information asymmetry, maintain legitimacy, and enhance the trust of external stakeholders (N. Malik and Kashiramka, 2025). These differing arguments mean that the relationship between leverage and environmental disclosure remains a subject of empirical debate.

Previous research has yielded inconsistent results regarding the effect of leverage on environmental disclosure. Studies by Desai (2022); Yulianti and Waworuntu (2025) found that leverage has a negative effect on environmental disclosure. Conversely, other studies suggest that leverage has a positive impact (Akhter et al., 2023; Alsayegh et al., 2020; Yohana and Suhendah, 2023) or has no significant effect on environmental disclosure (Adnan et al., 2023). This inconsistency in results indicates that there remains a gap requiring further testing, particularly in the context of Indonesian public companies, which have distinct governance characteristics and market pressures. Furthermore, most previous studies have focused more on environmental disclosure in general, CSR disclosure, or ESG disclosure, whereas research specifically examining the disclosure of environmental costs remains relatively limited.

This study also suggests that firm size may influence the relationship between leverage and the disclosure of environmental costs. Large firms generally have more adequate resources, higher levels of public visibility, and face stronger legitimacy pressures compared to small firms. Therefore, large firms tend to be more motivated to maintain environmental transparency to safeguard their reputation and the trust of investors and other stakeholders (Khlif et al., 2025). Furthermore, large firms generally have a greater capacity to maintain environmental disclosure practices even when facing financial pressures due to high leverage (Yulianti and Waworuntu, 2025). Conversely, small firms tend to focus more on financial efficiency when facing debt pressures, so environmental disclosure is given lower priority. Although firm size has been widely used as an independent variable in environmental disclosure research, studies that treat firm size as a moderating variable in the relationship between leverage and environmental cost disclosure remain relatively limited, particularly among Indonesian public companies.

Based on those explanations, this study aims to analyze the effect of leverage on environmental cost disclosure in Indonesian public companies and to examine the role of firm size as a moderating variable in that relationship. This study is expected to provide a theoretical contribution to the development of environmental accounting literature and legitimacy theory, particularly regarding the factors that influence a company's environmental cost disclosure. From a practical perspective, the research findings are expected to serve as a basis for consideration by investors, regulators, and company management in understanding the importance of environmental cost transparency as part of sustainable business practices in the Indonesian capital market.

LITERATURE REVIEW

Environmental Cost Disclosure

The disclosure of environmental costs is part of environmental reporting, which includes information on the costs incurred by a company in its environmental management activities. These costs may include waste management, pollution control, energy conservation, environmental rehabilitation, and investments in environmentally friendly technologies (GRI, 2020). Environmental cost disclosure is important because it reflects a company's transparency in managing the environmental impacts resulting from its operational activities (Ren et al., 2020; Shi et al., 2021). The more comprehensive a company's disclosure of environmental costs, the more information is available to stakeholders to assess the company's commitment to sustainability (Kong and Fang, 2024; Nguyen et al., 2026). In practice, the disclosure of environmental costs is often carried out through integrated annual or sustainability reports.

Environmental cost disclosure serves as a means for companies to communicate with stakeholders regarding their commitment to environmental management (Arena et al., 2015). Through such disclosure, companies seek to build a positive reputation, maintain their standing, and gain the trust of investors, creditors, regulators, and the public (Akhter et al., 2023; Kuo and Chen, 2013). From a legitimation theory perspective, a company's decision to disclose environmental costs is influenced by both external pressures and internal characteristics, such as leverage and firm size.

Leverage and Environmental Cost Disclosure

Leverage indicates the extent to which a company's operations rely on debt-based financing. The higher a company's leverage, the greater the pressure it faces to maintain financial stability and meet its liabilities to

creditors (Zhang, 2022). This situation leads companies to be more cautious in allocating resources and more focused on financial efficiency (Guo et al., 2021).

From the perspective of legitimacy theory, highly leveraged firms actually face greater pressure to maintain corporate transparency. However, the disclosure of environmental costs is often viewed as an activity not directly related to the company's short-term interests in maintaining financial performance (Ren et al., 2020). Consequently, companies with high leverage levels tend to prioritize cost control and operational efficiency over explicitly disclosing environmental costs. Furthermore, companies under high debt pressure generally pay more attention to the quality of information deemed relevant to creditors (Nan and Wen, 2023) than to other non-financial information such as environmental costs. This situation leads to a lower probability of companies disclosing environmental costs as leverage increases.

Several previous studies have also shown that leverage has a negative effect on environmental disclosure (e.g. Desai, 2022; Yulianti and Waworuntu, 2025), as companies facing financial pressure tend to reduce their environmental disclosure activities (Guo et al., 2021). Thus, leverage is expected to reduce the probability that a company will disclose environmental costs. Based on the above discussion, the first hypothesis in this study is:

H1: Leverage has a negative effect on the disclosure of environmental costs.

Firm Size as a Moderator

Firm size indicates the scale of a company, which is generally measured by its total assets. Large companies tend to have a higher level of public visibility than small companies (Jonkman et al., 2020) and thus face greater pressure from stakeholders to demonstrate legitimacy. In addition, large companies also have more adequate resources and funding capacity to carry out voluntary activities (D'Amato and Falivena, 2020) and disclose their information (Acabado et al., 2020). In the context of environmental cost disclosure, large companies generally have a higher probability of disclosing such costs (Adnan et al., 2023) because they need to maintain their reputation, image, and public trust. Large companies also tend to be the primary focus of capital market investors, leading to higher demands for environmental transparency.

Conversely, high leverage may reduce the probability that a firm will disclose environmental costs. However, this negative effect of leverage is not expected to apply equally to all firms. Large firms are better able to maintain environmental transparency despite facing high debt pressures because they possess more adequate resources and face greater legitimacy pressures than small firms. Thus, firm size is expected to mitigate the negative effect of leverage on the probability of a firm disclosing environmental costs. This means that the larger the firm, the smaller the negative impact of leverage on the firm's decision to disclose environmental costs. Based on this discussion, the second hypothesis of this study is:

H2: Firm size mitigates the negative effect of leverage on the disclosure of environmental costs.

METHODS

This study employs a quantitative approach with the aim of analyzing the effect of leverage on companies' decisions to disclose environmental costs and testing the role of firm size as a moderating variable. The research framework is presented in Figure 1. The research focuses on public companies that have been included in the Kompas100 index over the past five years. The selection of Kompas100 companies is based on the consideration that these companies have high levels of liquidity and market capitalization and are the focus of investor attention, thus facing greater demands for transparency, including in the aspect of environmental disclosure.

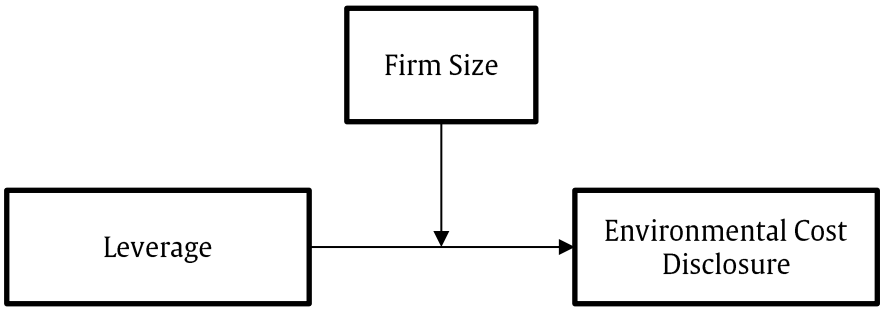

Figure 1. Conceptual Framework

Source: Created by Author

The sampling technique employed purposive sampling based on specific criteria to ensure the sample aligns with the research objectives. In the initial stage, 160 companies that had been included in the Kompas100 index over the past five years were identified. However, 26 companies from the financial sector were excluded from the sample because they exhibited distinct financial reporting characteristics, regulatory structures, and leverage

metrics compared to the non-financial sector. Additionally, two companies were excluded due to a suspension of stock trading, and two others were excluded due to delisting from the Indonesia Stock Exchange during the study period. The final sample used in this study consists of 130 companies for the observation period from 2020 to 2025. Consequently, a total of 780 company-years were analyzed in this study.

The data used in this study consists of secondary data obtained from companies' integrated annual or sustainability reports published on the official website of the Indonesia Stock Exchange or on the companies' respective websites. Data collection was conducted using a documentary method, involving the identification of information related to leverage, firm size, and disclosures of environmental costs.

The dependent variable in this study is the disclosure of environmental costs, measured using a dummy variable (F. Malik et al., 2023; Pisano et al., 2022). Companies that disclose environmental cost information in their intergated annual or sustainability reports are assigned a value of 1, while those that do not disclose such costs are assigned a value of 0. The independent variable in this study is leverage, measured using the total liabilities-to-total-assets ratio (Adnan et al., 2023; Chen et al., 2021; N. Malik and Kashiramka, 2025). Meanwhile, the moderating variable—firm size—is measured using the natural logarithm of total firm assets (Adnan et al., 2023; Chen et al., 2021; Yulianti and Waworuntu, 2025).

The data analysis technique used in this study is panel logit regression because the dependent variable is a binary variable and the research data exhibit panel data characteristics (Baltagi, 2021). The panel logit regression model is used to analyze the probability of a company's decision to disclose environmental costs based on the effects of leverage and the interaction between leverage and firm size. The regression results are interpreted using logit coefficients, odds ratios, and pseudo R^2 to explain the direction and strength of the influence of each research variable. The research model is estimated as follows.

Model 1, $DENV_{it} = \beta_0 + \beta_1 LEVE_{it} + \varepsilon_{it}$

Model 2, $DENV_{it} = \beta_0 + \beta_1 LEVE_{it} + \beta_2 SIZE_{it} + \varepsilon_{it}$

Model 3, $DENV_{it} = \beta_0 + \beta_1 LEVE_{it} + \beta_2 SIZE_{it} + \gamma_1 LEVE * SIZE_{it} + \varepsilon_{it}$

Note, $DENV_{it}$ is dummy of environmental cost disclosure for company i year t; β_0 is intercept; $\beta_{1,2}$ is slope for independent variable; γ_1 is coefficient for moderation; $LEVE_{it}$ is leverage for company i year t; $SIZE_{it}$ is firm size for company i year t; $LEVE * SIZE_{it}$ is interaction between leverage and firm size; ε_{it} is estimation error.

RESULT

The research analysis begins by describing the characteristics of the research data, which include leverage, firm size, total assets, environmental costs, and environmental cost disclosure. This analysis is useful for understanding the data distribution, mean, minimum and maximum values, and the degree of variation for each research variable before hypothesis testing is conducted. Table 1 presents an overview of the research sample. On average, companies in this research sample have a liability-to-asset ratio of 0.467. This figure indicates that, on average, 46.7 percent of the sample companies' operational financing relies on liabilities. The standard deviation of 0.239 indicates the level of variation in leverage among companies in the sample. This suggests that companies have diverse financing structures, ranging from those with low liability dependence (0.028) to those with relatively high leverage.

The firm size variable, proxied by the natural logarithm of total assets, has a mean of 30,383, with a minimum value of 21,902 and a maximum value of 33,860. These values indicate variation in firm size within the sample, even though the firms are included in the Kompas100 index, which comprises companies with high market capitalization and liquidity.

Table 1. Descriptive Statistics of Research Variables

	Leverage	Firm Size	Environmental Costs (IDR)	Total Asset (IDR)
Mean	0.466613	30.38322	89,807,059,762	36,662,571,574,995
St. Deviation	0.239037	1.46105	3.76531E+11	5.62303E+13
Minimum	0.027556	21.90182	5,930,000	3,249,678,024
Maximum	2.283086	33.86025	7,244,458,454,192	507,366,000,000,000

Source: Data processed by Author

This study also recorded the phenomenon of environmental cost disclosure practices, which have shown a positive trend from 2020 to 2025. This positive trend is illustrated in Figure 2. This increase is reflected in the rising number of companies that explicitly disclose environmental costs in their annual and sustainability reports. This positive trend also indicates that corporate awareness of environmental transparency is increasing, particularly among companies with high exposure.

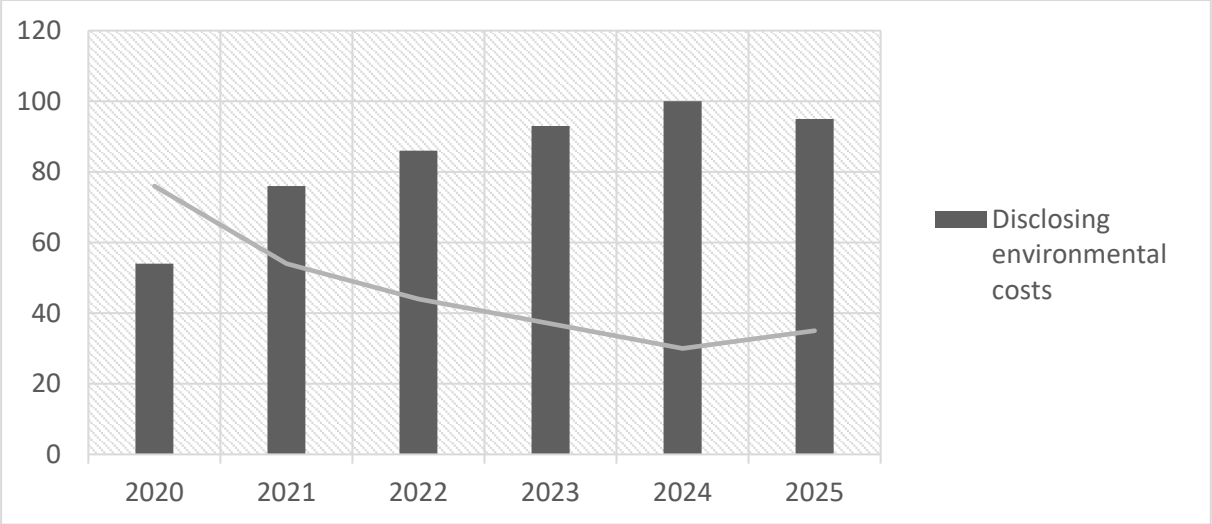

Figure 2. Trends in environmental cost disclosure during 2020—2025
Source: Data processed by Author

One factor driving the massive growth in environmental cost disclosure practices is the implementation of regulations by the Financial Services Authority regarding sustainability reporting obligations for financial institutions, issuers, and public companies. These regulations promote corporate accountability and transparency regarding sustainability issues, including social, environmental, and governance matters. As stakeholder pressure on sensitive environmental issues increases, companies are driven to communicate environmental information in a more systematic and standardized manner. GRI standards provide more detailed guidelines on the disclosure of environmental aspects, including resource use, waste management, emissions, and costs related to a company's environmental activities. The increasing trend of environmental cost disclosure in this study indicates that companies are beginning to align their reporting practices with regulatory requirements and global sustainability standards.

Although logit regression does not require the full set of classical assumptions like OLS, tests for multicollinearity and heteroscedasticity were conducted to ensure the stability of residual variance and that the independent variables are not correlated with one another. Table 2 provides a summary of the results of the multicollinearity and heteroscedasticity tests. The table shows that the VIF values are below 10 and the probability of the Breusch-Pagan test is above 0.05. These figures confirm that the model is free from multicollinearity issues and that the residual variance in the model is relatively stable.

Table 2. Multicollinearity and Heteroscedasticity Results

Variable	VIF	1/VIF	Breusch-Pagan Test (prob > chi2)
Leverage	1.015	0.985	0.5172
Firm size	1.015	0.985	

Source: Data processed by Author

A procedure to select the best estimation model was conducted for each model. The test results indicate that the fixed-effects model is the best fit for this study. This is supported by a chi-square probability of less than 0.05, as presented in Table 3. Table 3 also indicates that all research hypotheses were accepted. First, leverage was found to have a negative effect on environmental cost disclosure. Second, firm size was found to have a positive effect on environmental cost disclosure. Finally, the interaction variable between leverage and firm size has a positive and significant coefficient. These results indicate that firm size can mitigate the negative effect of leverage on environmental cost disclosure.

Table 3. Fixed Effext Panel Logit Regression Results

Variable	Model 1	Model 2	Model 3
LEVE	-3.804	-1.978	-87.733
	(-2.43)**	(-1.95)*	(-1.85)*
SIZE		.777	1.938
		(3.11)***	(2.11)**
LEVE*SIZE			2.855
			(1.83)*
Number of obs	780	780	780
Chi-square	6.517	27.820	31.585
Prob > chi2	0.013	0.000	0.000

Variable	Model 1	Model 2	Model 3
Pseudo r-squared	0.025	0.115	0.131

Source: Data processed by Author

The results of the panel logit regression provide the Pseudo R^2 value as the coefficient of determination for the research variables. The Pseudo R^2 value ranges from 0 to 1. Its value is relatively smaller than the OLS coefficient of determination because it is based on maximum likelihood estimation. As shown in Table 3, the Pseudo R^2 value is 0.131. This value indicates that a company's decision to disclose environmental costs may be influenced by factors other than leverage and firm size. Nevertheless, a relatively low Pseudo R^2 value remains acceptable as long as the model demonstrates statistical significance and adequate predictive power.

Table 4. Odds Ratio of the Relationship between Exogenous and Dependent Variable

	Leverage	Firm Size	Interaction Variable
Odds ratio	7.91e-39	6.943916	17.38032

Source: Data processed by Author

In logit regression, the odds ratio indicates the change in the odds of an event occurring due to a one-unit change in an independent variable, assuming all other variables remain constant. Table 4 presents the odds ratios for the relationship between the exogenous and dependent variables. The results show that the probability of a company deciding to disclose environmental costs is very low (7.91e-39), even though the logit regression results indicate a significant effect. However, this probability increases (17.38) after the interaction of firm size is included in the estimation. The study confirms that larger firms are approximately 6.9 times more likely to disclose environmental costs than smaller firms. Furthermore, firm size effectively mitigates the negative impact of leverage on environmental cost disclosure.

DISCUSSION

Based on the results of the panel logit regression analysis, leverage exhibits a negative and significant coefficient regarding the probability of a company disclosing environmental costs. These results suggest that an increase in leverage tends to reduce the likelihood of a company disclosing environmental costs in its integrated annual report or sustainability report. This finding indicates that companies with higher debt levels tend to be more focused on financial efficiency and cost control, resulting in reduced attention to the disclosure of non-financial information, including environmental costs.

In the context of legitimacy theory, highly leveraged firms do face pressure from creditors and investors to maintain corporate transparency (Akhter et al., 2023; Kuo and Chen, 2013). However, firms with high debt burdens generally prioritize disclosing information directly related to their financial condition and ability to meet obligations over non-financial information such as environmental costs. Consequently, the probability of a company disclosing environmental costs decreases as leverage increases.

The results of this study are consistent with previous research finding that leverage has a negative effect on environmental disclosure (Desai, 2022; Yulianti and Waworuntu, 2025). High debt levels cause companies to focus more on maintaining financial stability and operational efficiency, resulting in environmental disclosure activities being deprioritized. Thus, the first hypothesis, which states that leverage has a negative effect on the probability of a company disclosing environmental costs, is accepted. Meanwhile, firm size exhibits a positive correlation with the probability of disclosing environmental costs. These results indicate that large firms tend to have a higher likelihood of disclosing environmental costs compared to small firms. Large firms generally have a higher level of public visibility and thus face greater legitimacy pressures from investors, regulators, the media, and the public. Additionally, large firms also possess more adequate resources to carry out environmental activities and disclose environmental information more transparently.

The results of the moderation variable test indicate that the interaction between leverage and firm size has a positive and significant coefficient. This finding suggests that firm size mitigates the negative effect of leverage on the probability of a firm disclosing environmental costs. In other words, although leverage tends to reduce the likelihood of a firm disclosing environmental costs, this negative effect is less pronounced in larger firms. This situation can be explained by the fact that large companies have greater resource capacity, access to financing, and public attention compared to small companies. Therefore, large companies remain motivated to maintain their legitimacy and reputation through the disclosure of environmental costs, even when facing high debt pressures. In contrast, small companies with high leverage tend to be more focused on operational efficiency, making it less likely that they will disclose environmental costs.

In the logit regression model, the positive interaction coefficient also indicates that an increase in firm size raises the odds that a firm will continue to disclose environmental costs even as leverage increases. This confirms that firm size acts as a variable that mitigates the negative impact of leverage on a firm's decision to disclose environmental costs. Thus, the second hypotheses, which states that firm size weakens the negative influence of leverage on the probability of a firm disclosing environmental costs, is supported.

CONCLUSION

This study found that leverage has a negative effect on the probability of a company disclosing environmental costs. The results indicate that companies with higher debt levels tend to be less likely to disclose environmental costs because they focus more on financial efficiency and controlling operating costs. This study also found that firm size has a positive effect on the probability of environmental cost disclosure. Large firms tend to be more likely to disclose environmental costs because they have greater public visibility, legitimacy pressures, and resources compared to small firms. Additionally, the results of the moderation test indicate that firm size mitigates the negative effect of leverage on the probability of a firm disclosing environmental costs. These findings suggest that large firms remain motivated to maintain environmental transparency and legitimacy even when facing high levels of leverage. Thus, firm size acts as a factor that mitigates the negative impact of leverage on a firm's decision to disclose environmental costs.

In general, this study provides empirical evidence that a company's financial characteristics influence its decisions regarding the disclosure of environmental costs. This study also supports the legitimacy theory, which posits that companies with higher public exposure tend to maintain environmental transparency as a means of gaining and maintaining legitimacy among stakeholders.

Based on the research findings, companies are advised to maintain transparency in the disclosure of environmental costs even when facing financial pressure due to high leverage. The disclosure of environmental costs can enhance the trust of investors, creditors, and the public in the company's commitment to sustainable business practices. Future research is advised to include additional variables that may influence the probability of environmental cost disclosure, such as profitability, corporate governance, institutional ownership, industry sensitivity, and the quality of a company's sustainability governance. Furthermore, subsequent studies could employ more detailed measures of environmental cost disclosure, such as disclosure indices or scores, to provide a more comprehensive picture of a company's environmental transparency.

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