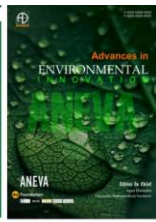




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Investigating Environmental Governance's Impact on Financial Performance; Role of Company Size in Indonesian Palm Oil Firms

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ABSTRACT

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Keywords:

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Objective: This empirical study explores the relationships among environmental governance factors (environmental costs, disclosure, performance), firm size, leverage, and financial performance in Indonesian palm oil firms listed on the Indonesia Stock Exchange (IDX) from 2020 to 2023. It aims to uncover how these variables influence corporate financial outcomes.

Methods: Utilizing secondary data from publicly available sources, the study integrates financial metrics (profitability, return on assets, return on equity) and environmental indicators (costs, disclosure, performance). Regression analysis is employed to statistically analyze these relationships.

Findings: Findings reveal that environmental costs significantly enhance financial performance, emphasizing the strategic advantage of investing in sustainable technologies and processes. Environmental disclosure also positively impacts financial performance by bolstering investor confidence and consumer trust. Surprisingly, environmental performance does not directly influence financial outcomes, indicating the influence of external factors and industry contexts. Firm size mediates the positive effects of environmental disclosure on financial performance, highlighting larger firms' capabilities in implementing sustainable practices. Moreover, leverage plays a significant role in boosting financial flexibility, contributing to growth and profitability.

Novelty: This study contributes to the understanding of the strategic value of environmental governance in the palm oil industry, particularly in the context of emerging markets. It also highlights the unique role of firm size in enhancing the financial benefits of environmental initiatives.

Implications: This study underscores the pivotal role of proactive environmental management in driving competitive advantage and sustainable growth for palm oil companies. It advocates for integrating environmental strategies into business models and governance frameworks to achieve long-term financial success. While offering valuable insights, the study's industry-specific focus suggests potential for broader exploration across various sectors and regions.

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1. Introduction

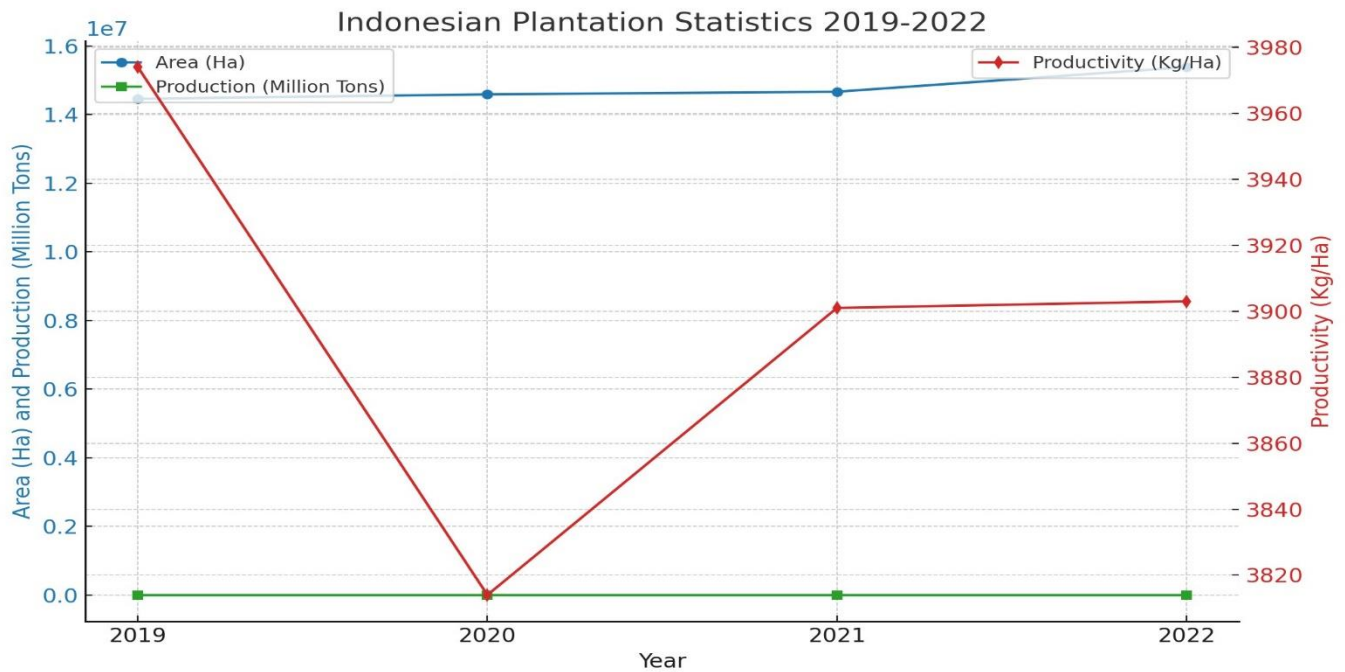
Indonesia, renowned for its fertile land, supports a significant agricultural sector, with palm oil cultivation occupying a prominent role (Wicke et al. 2011). Palm oil, particularly from regions like Aceh, Sumatra, Jambi, Riau, Kalimantan, and Sulawesi, stands as Indonesia's largest agricultural export, contributing substantially to

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the nation's economy (Herdiansyah et al. 2020). The vast plantations in Riau, Sumatra, and Kalimantan collectively account for 90% of Indonesia's palm oil cultivation, generating 95% of the nation's crude palm oil (CPO) production (Gellert 2015). According to the Directorate General of Plantation, Ministry of Agriculture, Republic of Indonesia (2021), Riau Province leads in palm oil production with 2.86 million hectares and a yield of 8.86 million tons in the 2020-2022 national plantation statistics:



Source: (Directorate General of Plantation, Ministry of Agriculture, Republic of Indonesia, 2023)

Figure 1. Indonesian Plantation Statistics 2020-2022

The chart lists the Indonesian plantation data, including 3 indicators in hectares: i.e. area under cultivation (AUC) and production volume (PV), productivity (unit/ha). The area under cultivation has gradually increased from 14.46 million hectares in 2019 to 15.38 million hectares for the current cycle of four years. The production volume is expected to show a slight deviation, decreasing in 2020 with 45.74 million tons, before increasing again to 48.24 million tons by the end of the forecast period. The productivity kg/ha slightly decreases from 3,974 kg/ha in 2019 to a new base of around 3814 kg per hectare, and then stabilizes around the long-term stable 3900+ kg per hectare. The patterns reflect a steady increase in planted area and consistent production levels that move to fill the gaps created by minor changes in these trends, evidence of Indonesia's highly mobile agricultural sector. Take these figures as an example: in 2018, palm oil accounted for a staggering 94.7 percent of the value (Rp393 trillion) of Indonesia's agricultural exports, with minimal surrounding yields reducing the percentage to only about less than half. The sector not only enhances foreign exchange, but also internalizes smallholder farmers into the global supply chain for their socio-economic betterment. Throughout the COVID-19 pandemic, palm oil has proven to be resilient to approximately \$13 billion in exports by August 2020, Coordinating Ministry for Economic Affairs of The Republic of Indonesia, 2021).

Oil palm is in the spotlight primarily because, while it offers cost benefits, there are environmental challenges associated with this crop (Ordway et al. 2017). Expansions often cause deforestation, habitat destruction, greenhouse gas emissions, and water/soil pollution, which have raised environmental concerns as well as social conflicts with local communities (Kolawole and Iyiola 2023; Singh and Singh 2017). This has indeed attracted the international attention of developed countries, which in turn have put pressure on

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Indonesia due to environmental sustainability issues such as deforestation correlated with palm oil expansion (Varkkey, Tyson, and Choiruzzad 2018). In order to face the international pressure and to be more competitive in the market, Indonesia established a certification system called Indonesian Sustainable Palm Oil (Choiruzzad, Tyson, and Varkkey 2021; Varkkey et al. 2018). ISPO is the Indonesian national standard that palm oil companies must adhere to in order to comply with sustainable practices and environmental protection (Astari and Lovett 2019). This certification also ensures the protection of Indonesia's palm oil market share and is in line with international sustainability development, promoting economic growth as well as environmental preservation (Hidayat, Offermans, and Glasbergen 2018).

Previous studies on the effect of environmental governance to financial performance in Indonesian palm oil companies revealed various findings, which indicated positive and mixed impact. These findings complement those of Gomez-Bezares, Przychodzen, and Przychodzen (2017), who underscore the business benefits of high-quality environmental practices, positing that investment in sustainability strategies may improve financial performance market standing with time. However, there is a range of results presented in, with even negative effects observed due to upfront and regulatory costs along market acceptance factors related to investor confidence, as well as consumer demand (Polzin et al. 2019). However, there is a major gap in this literature which has yet to assess in depth how Indonesian palm oil firms experience these relationships and if it differs by level of company size (Ogahara et al. 2022). Organizational characteristics as determinants of environmental governance and financial performance are well acknowledged in academia but we still lack detailed research on this issue (Clarkson et al. 2008). Larger companies, which have more economic power/resources in the first place, can score here for an extensive environmental management and take advantage compared to medium-sized enterprises that cannot afford such luxuries (Clibborn and Hanna-Osborne 2023). This gap underscores the importance of firm-level analysis to examine how operational scale, resource deployments and strategic emphasis interact with environmental strategies to affect financial performance (Maletič, Maletič, and Gomišček 2018).

Previous studies on environmental governance's impact on financial performance of Indonesian palm oil companies have shown mixed results, suggesting positive effects (Abdullah et al. 2020). These findings underscore the business benefits of high-quality environmental practices and suggest that investments in sustainability strategies may improve financial performance and market position over time (Smith, Hillon, and Liang 2019). Hooftman et al. (2018) presents mixed results, with even negative effects observed due to preproduction and regulatory costs along with market acceptance factors related to investor confidence and consumer demand. However, how Indonesian palm oil companies experience these relationships and whether they differ by firm size is a major gap in this literature (Ogahara et al. 2022). Organizational characteristics as determinants of environmental governance and financial performance are well recognized in the academic literature, but we still lack detailed research on this issue (Baah et al. 2021). Larger firms, which have more economic power/resources to begin with, can score here with comprehensive environmental management and gain advantages over midsize firms, which cannot afford such luxuries (Bermúdez-Figueroa and Roca 2022). This gap underscores the importance of firm-level analysis to examine how operational scale, resource deployment, and strategic focus interact with environmental strategies to affect financial performance.

This study aims to fill the knowledge gap in the relationship between environmental governance and financial performance in the palm oil industry. The focus is on how environmental costs, disclosure practices, and environmental performance collectively affect firm financial performance, taking into account the moderating role of firm size. It is expected that the results of this study not only provide practical insights for decision-makers and investors in the industry, but also contribute to the development of theories on environmental governance and financial performance, exploring how environmental strategies can strengthen long-term business resilience and provide broader social value-added.

2. Method Innovation

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This study adopts an empirical research strategy based on a quantitative approach, focusing on the analysis of numerical data. The secondary data for this study was obtained from publicly available records of palm oil companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2023. The environmental costs, investment climate relationships, performance (environmental disclosure, eco-efficiency returns), and other quantifiable financial and environmental metrics are also proxied by these datasets (Broadstock et al. 2019). These indicators include independent variables such as return on assets (ROA), return on equity (ROE) and return on investment (ROI) (Bunea, Corbos, and Popescu 2019). This dataset includes all palm oil companies listed on the Indonesia Stock Exchange from 2007 to 2015, providing a comprehensive perspective on the sector. Specifically, the study examines whether firm size influences the relationship between environmental governance factors such as environmental expenditures, transparency, and performance and financial performance as the outcome variable (Haque and Ntim 2018). Statistical studies using descriptive statistics, correlation analysis, and multi-linear regression were used to test the hypotheses and evaluate the impact of each component on financial performance, with a moderating role for firm size. In order to further ensure the validity of the results, they also conducted sensitivity analysis and sub-sample analysis as part of their robustness checks (Busch and Friede 2018). To support academic knowledge creation and facilitate stakeholder action, this study provides a theoretical framework for generating robust empirical data on the relationship between responsible environmental management and financial success in the palm oil business.

3. Result and Discussion

The results of the normality test indicate that the multiple regression model is normally distributed. This is evidenced by the significance value obtained from the test, which is greater than 0.05 ($0.05 < 0.364432$). Therefore, it can be concluded that the regression model used for the research hypothesis meets the normality assumption.

Table 1. Data Normality Test

Normality	N	Unstandardized Residual	Decision
Asymp. Sig. (2-tailed)	68	0.364432	Accepted

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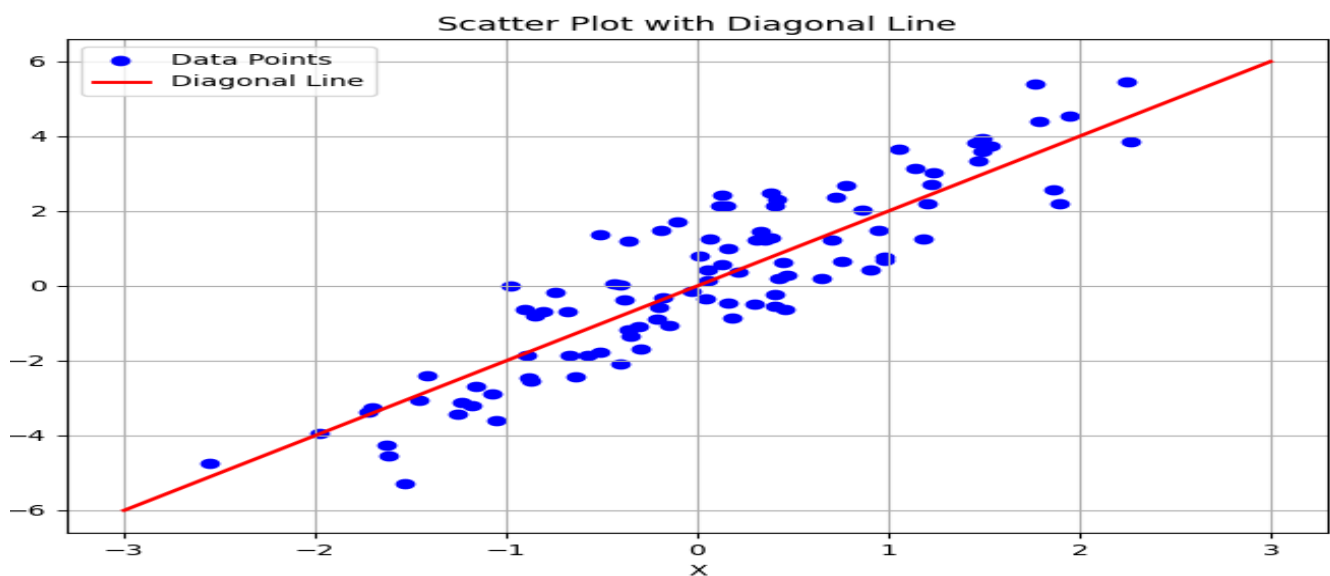


Figure 2. Scatter Plot of Data Points with Diagonal Line

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Table 2. Multicollinearity Test displays the coefficient and variance inflation factor (VIF) for each variable. Variable C shows the coefficient with a non-centered VIF. Environmental Cost (Envi_cost) shows the coefficient and VIF value. Environmental Disclosure ED shows the coefficient and VIF value. Environmental Performance EP shows a coefficient and VIF value. Company size has a coefficient and VIF value. Leverage shows a coefficient with a VIF value.

Table 2. Multicollinearity Test

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.00004	213.5744	
Envi_cost	0.00000	1.12858	1.04765
Envi_disclosure	0.00002	32.43256	1.13436
Envi_performance	0.00003	62.323478	1.26543
Company size	0.00000	239.13220	1.22976
Leverage	0.01469	1.69809	1.11333

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Table 3. Based on the table, at a significance level of 5%, with a sample size and 5 independent variables and moderator variables (k=5), the Durbin-Watson statistic (DU) is 1.7562. Since the DU value of 1.7562 exceeds the lower limit (1.7452) and is less than 4 minus DU (2.2438), it can be concluded that there is no autocorrelation.

Table 3. Autocorrelation Test

Statistic	DL. Durbin-Watson	DU
1.4200	1.7452	1.7562

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The heteroscedasticity test examines whether the residuals in the regression model exhibit varying levels of dispersion heteroscedasticity rather than consistent variance homoscedasticity (Huang, Wiedermann, and Zhang 2022). Heteroscedasticity can affect the accuracy of regression predictions due to irregularities in residual patterns (Dutcă et al. 2022). In this study, the significance of each variable's coefficient and t-statistic is assessed to determine if any independent variable significantly influences the dependent variable at a confidence level above 5%. Based on the results, none of the variables show statistically significant influence on the dependent variable (noted as "Prob." values above 0.05), suggesting that the regression model is not affected by heteroscedasticity.

Table 4. Heteroscedasticity Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Envi_cost	0.000	0.000	-0.977	0.300
Envi_disclosure	0.000	0.000	-0.311	0.665
Envi_performance	0.000	0.000	4.754	0.534
Company size	0.000	0.000	-111.213	0.300
Leverage	28.92	0.011	381.810	0.227

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The Adjusted R-squared value of 0.6231 indicates that approximately 62.31% of the variation in the dependent variable is explained by the independent variables included in the regression model. The Root

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Mean Square Error (RMSE) of 0.001937 suggests the average deviation of the predicted values from the observed values. The F-statistic of 14.300 and its associated probability (0.0001) indicate that the regression model is statistically significant at a confidence level of 95%. The Durbin-Watson statistic of 1.7422 suggests mild positive autocorrelation in the residuals.

Table 5. Coefficient of Determination Test (R2)

Model Fit Test			
Root MSE	0.0019	R-squared	0.8452
Mean dependent var	0.0212	Adjusted R-squared	0.6231
S.D. Dependent	0.0596	S.E. of reg	0.0020
Sum squared resid	0.0001	F-statistic	14.300
Durbin-Watson stat	1.7422	Prob(F-statistic)	0.0001

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The R-squared value of 0.8745 indicates that approximately 87.45% of the variation in the dependent variable is explained by the independent variables in the regression model. The Adjusted R-squared value of 0.7862 is a corrected version of R-squared that accounts for the number of predictors in the model. The Standard Error of regression (S.E.) of 0.0011 represents the average deviation of the observed values from the predicted values by the model. The F-statistic of 14.361 is a measure of how well the overall regression model fits the data, with a very low probability (0.0000), suggesting that the regression model is statistically significant.

Table 6. F Statistical Test

Data	Score Data
R-squared	0.8745
Adjusted R-squared	0.7862
S.E. of regression	0.0011
F-statistic	14.361
Prob(F-statistic)	0.0000

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In this study, the analysis results indicate that Environmental Cost has a significant positive influence on financial performance ($\beta = 0.0002, p < 0.05$). Furthermore, Environmental Disclosure also shows a significant positive impact on Financial Performance ($\beta = 0.0024, p < 0.01$). Transparent disclosure practices can increase trust and reputation, directly supporting revenue growth and profitability. However, Environmental Performance does not exhibit a significant influence on financial performance in this study ($\beta = -0.0004, p > 0.05$). This highlights that external factors such as market fluctuations or industry regulations may play a more dominant role in financial performance outcomes. Regarding the mediation by firm size, it was found that firm size does not mediate the effect of Environmental Cost on Financial Performance ($p > 0.05$). However, firm size positively mediates both Environmental Disclosure ($\beta = 0.0024, p < 0.001$) and Environmental Performance ($\beta = 0.0001, p < 0.01$) on Financial Performance. This suggests that larger companies tend to derive greater benefits from sustainable practices, whether through disclosure or good environmental performance. Lastly, Leverage (VK) also shows a significant positive influence on Financial Performance ($\beta = 29.64, p < 0.001$). The use of leverage can strengthen equity returns and support overall profitability.

Table 7. Regression Test Results Partial Test

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Variable	Coefficient	Std. Error	t-Statistic	Prob.	Conclusion
C	0.011	0.004	3.8760	0.0003	
Envi_cost	0.000	0.000	2.5268	0.0004	Accepted H1
Envi_disclosure	0.002	0.002	2.6649	0.0005	Accepted H2
Envi_performance	-0.000	0.000	-0.4045	0.6859	Accepted H3
M_Envi_cost	0.000	0.000	2.8850	0.0201	Accepted H4
M_Envi_disclosure	0.000	0.000	3.6776	0.0002	Accepted H5
M_Envi_performance	0.000	0.000	3.2446	0.0004	Accepted H6

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4. Discussion

This study aimed to investigate the relationships between environmental costs, environmental disclosure, environmental performance, firm size, leverage, and financial performance in companies. The regression analysis revealed several significant findings that merit thorough discussion and interpretation. Firstly, the significant positive impact of environmental costs on financial performance underscores the strategic value of investments in environmentally friendly technologies and processes. Consistent with prior research (Nababan & Hasyir, 2019; Sinosi et al., 2022), reducing long-term operational costs and enhancing operational efficiency through environmental investments not only improves profitability but also enhances corporate reputation among stakeholders. This enhancement in reputation can lead to increased revenue streams and long-term profitability.

Secondly, the positive and significant impact of environmental disclosure on financial performance highlights the importance of transparency in disclosing environmental practices and initiatives. This finding aligns with studies emphasizing that clear and detailed environmental disclosures (Holly et al., 2023) foster investor confidence, consumer loyalty, and public trust. Comprehensive disclosures about environmental commitments add substantial value by attracting investment and enhancing consumer trust, thereby positively influencing financial performance.

Contrary to expectations, environmental performance did not demonstrate a significant impact on financial performance in this study. While some studies suggest a positive correlation between environmental and financial performance (Kinasih et al., 2022), the findings here suggest that external factors and industry contexts might exert greater influence on financial outcomes than the measured environmental performance indicators.

The role of firm size as a significant mediator in the relationships between environmental costs, environmental disclosure, and financial performance is notable. Larger firms tend to possess greater resources and capabilities to manage environmental impacts effectively and respond to market demands for sustainability. Moreover, the positive mediation effect of firm size on the relationship between environmental disclosure and financial performance suggests that larger firms are perceived as more credible in executing responsible business practices, thereby enhancing financial performance.

Lastly, the significant positive influence of leverage on financial performance indicates that judicious use of debt can provide additional financial resources for investment and expansion, thereby boosting profitability. However, managing leverage levels is crucial to mitigate risks associated with excessive debt.

In conclusion, the findings of this study offer valuable insights for both practitioners and academics in understanding how environmental factors and control variables such as firm size and leverage influence corporate financial performance. Integrating sustainable strategies into business models appears essential for achieving long-term competitive advantages and supporting sustainable growth. These results underscore the importance of proactive environmental management and transparent communication of environmental efforts to enhance corporate financial outcomes. Despite the contributions, this study has limitations. The research focused on a specific industry or region, limiting generalizability. Future research could explore diverse industry contexts and geographical regions to validate findings across different settings. Additionally,

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incorporating qualitative methods or longitudinal studies could provide deeper insights into the causal mechanisms underlying these relationships over time.

5. Conclusion

In summary, this study contributes to the growing body of literature on environmental management and corporate financial performance by providing empirical evidence on the nuanced relationships between environmental factors, firm characteristics, and financial outcomes. These findings emphasize the imperative for companies to adopt proactive environmental strategies as integral components of their corporate governance and operational frameworks to sustain competitive advantage and financial success in a dynamic global economy.

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This research did not receive any external funding. The study was conducted independently by the authors.

CRedit authorship contribution statement

Safrina Bella: Conceptualization, Methodology, Data Analysis, Writing – Original Draft.
Hendra Setiawan: Data Collection, Analysis, Writing – Review & Editing.

Declaration of competing interest

The authors declare that they have no competing interests related to this research. There are no financial or personal conflicts of interest that could have influenced the outcome of this study.

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Appendix A. Supplementary data

Supplementary data related to this research can be found at <https://doi.org/10.69725/aneva.v1i1.69> or is available upon request from the corresponding author..

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