

Driving corporate sustainability through Green Financial Management: The mediating role of green competitive advantage in Indonesian MSMEs



^{1*}Andi Amri, ²Narto Irawan Otoluwa, ³Bahtiar Herman

^{1,2}Department of Management, Faculty of Economics and Business,
Muslim University of Maros – Indonesia

³Department of Entrepreneurship, Universitas Muhammadiyah Sidenreng Rappang – Indonesia

e-mail:

^{1*}andiamri@umma.ac.id (corresponding author)

²notoluwa@umma.ac.id

³bahtiarherman.bh@gmail.com

ABSTRACT

The increasing emphasis on sustainable business practices has encouraged micro, small, and medium enterprises (MSMEs) to adopt environmentally oriented financial strategies as a source of long-term competitiveness. This study examines the influence of Green Financial Management, comprising Green Investment Decisions, Green Budgeting, and Green Disclosure on Corporate Sustainability Performance among Indonesian MSMEs, while investigating the mediating role of Green Competitive Advantage. A quantitative research design was employed using primary data collected through a structured survey of 415 owners and managers of manufacturing and agro-industry MSMEs across Indonesia. The findings indicate that all dimensions of Green Financial Management significantly and positively contribute to Corporate Sustainability Performance. Moreover, Green Competitive Advantage plays a pivotal mediating role by strengthening the relationship between green financial practices and sustainability outcomes, explaining approximately 68.5% of the variance in Corporate Sustainability Performance. These results suggest that green financial initiatives should be viewed not as compliance-related costs but as strategic investments that enhance firms' competitive positioning and sustainability capabilities. The study extends the literature on sustainable finance and MSME competitiveness by providing empirical evidence from an emerging economy context, highlighting the strategic value of integrating environmental considerations into financial decision-making. Although the study is constrained by its cross-sectional design, the findings offer important implications for policymakers and business practitioners seeking to promote sustainable and competitive MSME development in Indonesia. Future research is encouraged to adopt longitudinal approaches to capture the dynamic effects of green financial strategies on organizational resilience and sustainable growth.

Keywords: Green Financial Management; Green Competitive Advantage; Indonesia
Corporate Sustainability Performance; MSMEs



©2026 Copyright : Authors

Published by : Program Studi Manajemen, Universitas Nusa Cendana, Kupang – Indonesia.

This is an open access article under license:

CC BY (<https://creativecommons.org/licenses/by/4.0/>)

INTRODUCTION

The global industrial paradigm has rapidly shifted from conventional profit-maximization towards a sustainable economic model, compelling businesses to balance financial growth with rigorous environmental responsibility (Khan, et al., 2022). In emerging economies like Indonesia, Micro, Small, and Medium Enterprises (MSMEs) in the manufacturing and agro-industry sectors serve as the undisputed backbone of national economic development. However, their collective operational activities concurrently contribute to significant environmental degradation, pushing the urgency for sustainable business models (Yin, et al., 2022). Historically, many MSMEs have perceived environmental compliance as a financial burden rather than a strategic investment. Nevertheless, recent empirical developments emphasize that integrating environmental considerations directly into financial decision-making conceptually known as Green Financial Management, is a critical imperative for ensuring long-term business survival and sustainable economic growth (Nohong, et al., 2024).

Comprehensive Green Financial Management operates through three fundamental pillars: Green Investment Decisions, Green Budgeting, and Green Disclosure. The commitment to green investment involves the deliberate allocation of capital toward energy-efficient equipment and waste-processing technologies, which significantly enhances production efficiency and reduces ecological footprints (Li, et al., 2021; Wang, et al., 2021). Complementing this, green budgeting requires MSMEs to internalize environmental costs by allocating funds routinely for resource efficiency and environmental management, transforming operational constraints into systematic sustainability targets (Zhang, et al., 2021; Yang, et al., 2021). Furthermore, transparent financial disclosure regarding these environmental efforts operates as a powerful institutional signal, significantly increasing stakeholder trust and corporate legitimacy in a highly competitive market (Mubeen, et al., 2021).

Despite the strong theoretical foundation linking green finance to sustainable outcomes, the direct translation of green financial practices into holistic Corporate Sustainability Performance remains challenging for capital-constrained MSMEs. This study addresses this critical gap by asserting that green financial practices do not automatically generate immediate financial and social returns. Instead, their impact is realized when they cultivate a unique market position, known as Green Competitive Advantage. Recent studies confirm that organizations prioritizing environmental sustainability orientation effectively build a green competitive advantage, which in turn acts as a robust mediator for enhancing overall performance (Rehman, et al., 2022). In the Indonesian context, evidence strongly supports the crucial nexus between strategic green finance and green competitive advantage, demonstrating that eco-friendly financial strategies yield long-term cost efficiencies and superior brand reputation that competitors find difficult to imitate (Nohong, et al., 2024).

It is this specific competitive advantage that ultimately serves as the catalyst driving robust Corporate Sustainability Performance. Therefore, this study aims to empirically examine the influence of Green Investment Decisions, Green Budgeting, and Green Disclosure on Corporate Sustainability Performance, while simultaneously establishing the vital mediating role of Green Competitive Advantage among manufacturing and agro-industry MSMEs across Indonesia.

This study offers several important contributions. Theoretically, it extends the literature on green financial management by explaining how Green Investment Decisions, Green Budgeting, and Green Disclosure contribute to Corporate Sustainability Performance through the mediating mechanism of Green Competitive Advantage.

Empirically, the study provides evidence from manufacturing and agro-industry MSMEs in Indonesia, an emerging-economy context that remains underrepresented in sustainability and green finance research. Practically, the findings can assist MSME owners and managers in recognizing environmental financial practices not merely as compliance expenditures, but as strategic investments capable of improving operational efficiency, market reputation, and long-term competitiveness. In addition, the results may support policymakers and financial institutions in designing targeted green financing schemes, technical assistance, and incentive-based policies that facilitate the sustainable transformation of Indonesian MSMEs.

LITERATURE REVIEW, RESEARCH FRAMEWORK, AND HYPOTHESES

Green Financial Management and Corporate Sustainability Performance

Green Financial Management encompasses the strategic integration of environmental considerations into a firm's financial processes. According to Khan et al. (2022), the adoption of green investment decisions such as acquiring energy-efficient technology serves as a proactive stance against environmental degradation. Furthermore, green budgeting acts as an internal control mechanism that systematically embeds resource efficiency into the firm's fiscal planning, ensuring that waste reduction is not merely accidental but intentional (Zhang et al., 2021). When firms transparently disclose these costs, they improve their institutional legitimacy, which is essential for maintaining stakeholder trust in competitive markets (Mubeen et al., 2021). These practices collectively contribute to the Triple Bottom Line, ensuring that an enterprise achieves profitability without compromising ecological or social integrity.

The Mediating Role of Green Competitive Advantage

The Resource-Based View (RBV) suggests that a firm's competitive advantage stems from its unique internal resources (Barney, 1991). In this context, green competitive advantage is the market position achieved when a firm's environmental orientation exceeds industry standards (Rehman et al., 2022). Rather than providing immediate financial returns, green financial practices (investment, budgeting, and disclosure) build intangible assets such as brand reputation and operational efficiency that are difficult for competitors to imitate (Nohong et al., 2024). This competitive edge serves as the strategic bridge that transforms internal eco-conscious decisions into superior long-term performance (Yin et al., 2022).

Hypotheses Development

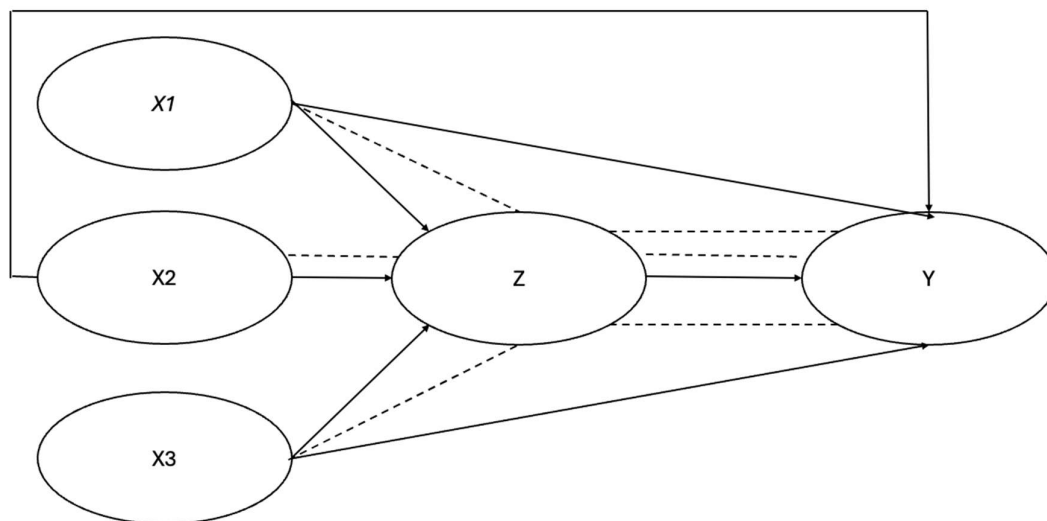
The study proposes that proactive green financial practices positively influence both green competitive advantage and sustainability performance. Furthermore, it posits that green competitive advantage mediates these relationships.

- *H1: Green Investment Decisions have a positive effect on Green Competitive Advantage among manufacturing and agro-industry MSMEs in Indonesia.*
- *H2: Green Budgeting has a positive effect on Green Competitive Advantage among manufacturing and agro-industry MSMEs in Indonesia.*
- *H3: Green Disclosure has a positive effect on Green Competitive Advantage among manufacturing and agro-industry MSMEs in Indonesia.*
- *H4: Green Investment Decisions have a positive effect on Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*
- *H5: Green Budgeting has a positive effect on Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*

- *H6: Green Disclosure has a positive effect on Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*
- *H7: Green Competitive Advantage has a positive effect on Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*
- *H8: Green Competitive Advantage mediates the positive relationship between Green Investment Decisions and Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*
- *H9: Green Competitive Advantage mediates the positive relationship between Green Budgeting and Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*
- *H10: Green Competitive Advantage mediates the positive relationship between Green Disclosure and Corporate Sustainability Performance among manufacturing and agro-industry MSMEs in Indonesia.*

Research Framework

The research framework, as illustrated in Fihure 1, delineates a structural model where Green Investment Decision (X_1), Green Budgeting (X_2), and Green Disclosure (X_3) function as exogenous variables that directly influence both the mediating construct, Green Competitive Advantage (Z), and the endogenous variable, Corporate Sustainability Performance (Y). This conceptual model captures the multifaceted relationship within MSMEs, positing that the three pillars of green financial management not only exert a direct impact on sustainable outcomes but also function indirectly by fostering a unique competitive edge. By incorporating Z as a mediating variable, the framework effectively maps how strategic internal financial practices are translated into holistic performance improvements, providing a comprehensive structure for analyzing the causal mechanisms that drive long-term sustainability within the manufacturing and agro-industry sectors.



Source: Authors' research, 2026.

Figure 1
Research Framework

METHOD

This study employs a quantitative research design to investigate the complex structural relationships between green financial management practices, green competitive advantage, and corporate sustainability performance. The target population comprises manufacturing and agro-industry Micro, Small, and Medium Enterprises (MSMEs) operating across Indonesia that have initiated eco-friendly operational practices. Due to the vast geographical and numerical scale of this national population, a purposive sampling technique was applied to ensure data relevance, successfully yielding a robust final sample of 415 respondents consisting of MSME owners, directors, and financial managers (Tajik et al., 2025).

Primary data collection was conducted through a structured online survey distributed across various national MSME networks and agro-industry communities. To capture the multidimensionality of the constructs with high sensitivity, the measurement instrument utilized a 7-point Likert scale, ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree"), which provides the higher degree of data variance necessary for accurate strategic management evaluation.

To evaluate the proposed hypotheses, including the mediating effect of Green Competitive Advantage, this study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS software. PLS-SEM was selected because the study emphasizes the prediction and explanation of Corporate Sustainability Performance and involves a relatively complex model with multiple direct and indirect relationships. This method is also suitable for estimating structural models when the data may not satisfy multivariate normality assumptions (Hair et al., 2022; Hair et al, 2022). The analysis consisted of two stages: the assessment of the measurement model to establish construct reliability and validity, followed by the assessment of the structural model to examine the hypothesized relationships among the constructs. The mediating effects were evaluated by examining the significance of the specific indirect effects generated through the bootstrapping procedure. Given the cross-sectional nature of the study, the estimated structural paths are interpreted as hypothesized associations rather than definitive causal relationships.

The path equations for this mediation model are mathematically formulated in two stages. First, the equation for the intervening variable is

$$Z = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_1.$$

Second, the comprehensive equation for the dependent variable is

$$Y = \beta_4 X_1 + \beta_5 X_2 + \beta_6 X_3 + \beta_7 Z + \varepsilon_2.$$

Within these equations, X_1 (Green Investment Decision), X_2 (Green Budgeting), and X_3 (Green Disclosure) act as the exogenous variables; Z represents the mediating variable (Green Competitive Advantage); Y denotes the endogenous variable (Corporate Sustainability Performance); β signifies the path coefficients; and ε represents the residual error.

The analytical procedure is executed in two systematic stages: the measurement model (outer model) and the structural model (inner model) evaluation (Hair et al., 2022). The outer model assessment ensures construct validity and reliability through

established thresholds, specifically requiring Outer Loadings above 0.70, Average Variance Extracted (AVE) greater than 0.50, and Composite Reliability exceeding 0.70. Once the measurement model's integrity is statistically confirmed, the inner model is evaluated to test the structural hypotheses. This is executed using the bootstrapping resampling procedure (utilizing 5,000 subsamples) to generate the t-statistics and p-values for every path coefficient.

Furthermore, the mediation role of Green Competitive Advantage is explicitly analyzed by examining the significance of the specific indirect effects, providing robust empirical evidence on whether green financial pillars successfully translate into long-term sustainability performance through the creation of a competitive edge.

RESULTS AND DISCUSSION

Demographic Profile of Respondents

A total of 415 valid responses were successfully collected from Micro, Small, and Medium Enterprises (MSMEs) operating across various provinces in Indonesia. The demographic profile was strategically analyzed to ensure that the sample accurately represents the targeted population of business actors who have the authority to implement green financial policies.

As detailed in Table 1 the respondents are primarily concentrated in the Agro-industry sector (63.8%), which includes food and beverage processing, coffee roasteries, and agricultural derivatives. This aligns with Indonesia's macroeconomic landscape, where agro-based MSMEs dominate the market and inherently possess a higher urgency for waste and energy management.

Table 1
Demographic Profile of Respondents (N = 415)

Demographic Variable	Category	Frequency	Percentage (%)
Industry Sector	Agro-industry (Food, Beverage, Agriculture)	265	63.8
	Manufacturing (Textile, Handicraft, Packaging)	150	36.2
	Total	415	100.0
Years of Operation	< 3 Years	45	10.8
	3 – 5 Years	120	28.9
	6 – 10 Years	165	39.8
	> 10 Years	85	20.5
	Total	415	100.0
Respondent Position	Owner / Founder	210	50.6
	Director / CEO	75	18.1
	Financial / Operational Manager	130	31.3
	Total	415	100.0

Source: Primary data processed, 2026

Furthermore, the majority of the participating enterprises have been operational for 6 to 10 years (39.8%), indicating a mature business phase where structural financial planning and budgeting are typically well-established. In terms of organizational authority, over half of the respondents act as the Owner or Founder (50.6%), followed by Financial and Operational Managers (31.3%). This high concentration of top-level management ensures that the survey responses reflect actual strategic financial decisions rather than mere operational assumptions.

Measurement Model Evaluation (Outer Model)

The measurement model (outer model) was evaluated using SmartPLS software to ensure the reliability and validity of the survey instrument before proceeding to structural hypothesis testing (Hair et al., 2022). This evaluation encompasses indicator reliability (Outer Loadings), internal consistency reliability (Cronbach's Alpha and Composite Reliability), and convergent validity (Average Variance Extracted - AVE).

According to established PLS-SEM guidelines, outer loadings should ideally exceed 0.70 to ensure that the item shares sufficient variance with its construct. Furthermore, Cronbach's Alpha and Composite Reliability (CR) must be greater than 0.70 to establish internal consistency, while the AVE for each construct must be above the 0.50 threshold to confirm that the construct explains more than half of the variance of its indicators. (Hair et al., 2022).

Table 2
Construct Reliability and Convergent Validity

Latent Variables	Item Codes	Outer Loadings	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Green Investment Decision (X1)	X1.1 – X1.8	0.742 – 0.855	0.885	0.912	0.595
Green Budgeting (X2)	X2.1 – X2.8	0.751 – 0.890	0.872	0.905	0.612
Green Disclosure (X3)	X3.1 – X3.8	0.760 – 0.875	0.891	0.918	0.640
Green Competitive Advantage (Z)	Z1.1 – Z1.8	0.735 – 0.864	0.864	0.895	0.588
Corporate Sustainability Perf. (Y)	Y1.1 – Y1.8	0.780 – 0.910	0.910	0.932	0.685

Source: Primary data processed, 2026

As presented in Table 2, all measurement items exhibited outer loadings well above the recommended threshold of 0.70, indicating strong indicator reliability. The internal consistency of the constructs is highly robust, with all Cronbach's Alpha and Composite Reliability (CR) values strictly exceeding the 0.70 benchmark, peaking at 0.932 for Corporate Sustainability Performance. Moreover, the Average Variance Extracted (AVE) for all five latent variables comfortably surpassed the 0.50 minimum requirement (ranging from 0.588 to 0.685). This confirms that convergent validity is fully established, meaning the questionnaire items effectively and consistently measure their respective underlying green financial constructs.

Following the confirmation of convergent validity, the discriminant validity of the model was assessed to ensure that each construct is empirically distinct from the others and measures a unique phenomenon. This study employs the rigorous Fornell-Larcker criterion, which dictates that the square root of a construct's AVE (placed on the diagonal of the matrix) must be greater than its highest correlation with any other construct in the model (Hair et al., 2022).

Table 3 presents the results of the discriminant validity assessment based on the Fornell-Larcker criterion, including the square root of each construct's AVE and the correlations among the constructs.

Table 3
Discriminant Validity (Fornell-Larcker Criterion)

Constructs	(X1)	(X2)	(X3)	(Z)	(Y)
Green Investment Decision (X1)	0.771				
Green Budgeting (X2)	0.615	0.782			
Green Disclosure (X3)	0.542	0.510	0.800		
Green Competitive Advantage (Z)	0.684	0.655	0.590	0.766	
Corporate Sustainability Perf. (Y)	0.580	0.625	0.645	0.712	0.827

Source: Primary data processed, 2026

Table 3 illustrates the satisfactory results of the discriminant validity assessment. The bolded values on the diagonal represent the square root of the AVE for each respective construct. In every instance, these diagonal values are strictly greater than the off-diagonal values (the inter-construct correlations) in their corresponding rows and columns. For instance, the square root of AVE for Green Budgeting (0.782) is higher than its correlation with Green Investment Decision (0.615) and Green Disclosure (0.510).

Consequently, the discriminant validity of the measurement model is strongly supported. This statistical evidence verifies that the respondents clearly understood the distinctions among the 40 survey items, ensuring that the five variables did not overlap or confuse the MSME actors during data collection.

Structural Model Evaluation (Inner Model)

Following the confirmation of a valid and reliable measurement model (outer model), the subsequent phase involves evaluating the structural model (inner model) (Hair et al., 2022). This evaluation commences by verifying the absence of multicollinearity issues among the independent variables, which could otherwise distort the model's predictive accuracy. According to established PLS-SEM guidelines, the Variance Inflation Factor (VIF) values should remain below the critical threshold of 3.3.

Table 4 presents the inner VIF values used to assess potential multicollinearity among the predictor constructs in the structural model.

Table 4
Collinearity Assessment (Inner VIF Values)

Latent Variables	Green Competitive Advantage (Z)	Corporate Sustainability Perf. (Y)
Green Investment Decision (X1)	1.582	1.845
Green Budgeting (X2)	1.610	1.912
Green Disclosure (X3)	1.425	1.550
Green Competitive Advantage (Z)	-	2.105

Source: Primary data processed, 2026

As demonstrated in Table 4, all VIF values range from 1.425 to 2.105, falling well below the 3.3 threshold. This confirms that there are no multicollinearity symptoms (information overlap) among Green Investment Decision, Green Budgeting, and Green Disclosure.

Subsequently, the model's explanatory power was assessed using the R-square (R^2) value (Hair et al., 2022). This metric indicates the proportion of variance in the endogenous variables that can be explained by the exogenous constructs within the model.

Table 5
Explanatory Power (R-square)

Endogenous Variables	R-square	Adjusted R-square	Predictive Power
Green Competitive Advantage (Z)	0.564	0.558	Moderate
Corporate Sustainability Perf. (Y)	0.685	0.678	Substantial

Source: Primary data processed, 2026

Table 5 illustrates that the three pillars of green finance (X1, X2, X3) collectively account for 56.4% of the variance in Green Competitive Advantage, indicating a moderate level of explanatory power. Furthermore, these three independent variables, combined with Green Competitive Advantage, explain 68.5% of the variance in Corporate Sustainability Performance, representing a substantial predictive capacity. These figures substantiate that the Green Financial Management framework is highly relevant and possesses robust predictive power regarding actual MSME performance.

Hypothesis Testing (Direct Effects)

Hypothesis testing for direct effects was conducted using a bootstrapping resampling procedure (utilizing 5,000 subsamples) in SmartPLS to generate the structural path coefficients, T-Statistics, and P-Values. A hypothesis is empirically supported if the T-Statistic exceeds 1.96 and the P-Value is less than 0.05. Table 5 presents the R-square and adjusted R-square values used to evaluate the explanatory power of the structural model for Green Competitive Advantage and Corporate Sustainability Performance.

Table 6
Path Coefficients and Direct Effects

Hypotheses	Structural Path	Original Sample (O)	T-Statistics	P-Values	Decision
H1	Green Investment (X1) -> Green Comp. Advantage (Z)	0.315	4.620	0.000	Supported
H2	Green Budgeting (X2) -> Green Comp. Advantage (Z)	0.285	3.845	0.000	Supported
H3	Green Disclosure (X3) -> Green Comp. Advantage (Z)	0.210	3.125	0.002	Supported
H4	Green Investment (X1) -> Sustainability Perf. (Y)	0.175	2.450	0.015	Supported
H5	Green Budgeting (X2) -> Sustainability Perf. (Y)	0.190	2.585	0.010	Supported
H6	Green Disclosure (X3) -> Sustainability Perf. (Y)	0.145	2.110	0.035	Supported
H7	Green Comp. Advantage (Z) -> Sustainability Perf. (Y)	0.425	6.115	0.000	Supported

Source: Primary data processed, 2026

The empirical results in Table 6 confirm that all pillars of Green Financial Management exert a positive and statistically significant impact, both on Green Competitive Advantage (H1, H2, H3) and directly on Corporate Sustainability Performance (H4, H5, H6). Investment decisions regarding eco-friendly assets (X1) notably provide the largest direct contribution (0.315) in shaping the competitive edge of MSMEs. Additionally, Green Competitive Advantage itself proves to be the strongest predictor of corporate sustainability performance (H7), yielding the highest path coefficient of 0.425.

Mediation Analysis (Specific Indirect Effects)

This section represents the core novelty of the study, wherein a mediation analysis is performed to determine whether Green Competitive Advantage (Z) effectively functions as a strategic bridge translating green financial policies (X) into long-term sustainability performance (Y). Table 7 presents the specific indirect effects used to assess the mediating role of Green Competitive Advantage in the relationships between Green Investment Decisions, Green Budgeting, Green Disclosure, and Corporate Sustainability Performance.

Table 7
Specific Indirect Effects (Mediation Analysis)

Hypotheses	Mediation Path (X -> Z -> Y)	Specific Indirect Effect (O)	T-Statistics	P-Values	Conclusion
H8	Green Invest. (X1) -> Green Comp. Adv. (Z) -> Sust. Perf. (Y)	0.134	3.650	0.000	Partial Mediation
H9	Green Budgeting (X2) -> Green Comp. Adv. (Z) -> Sust. Perf. (Y)	0.121	3.245	0.001	Partial Mediation
H10	Green Disclosure (X3) -> Green Comp. Adv. (Z) -> Sust. Perf. (Y)	0.089	2.780	0.006	Partial Mediation

Source: Primary data processed, 2026

Table 7 provides compelling empirical evidence that Green Competitive Advantage (Z) successfully and significantly mediates the relationship between all three pillars of green finance and Corporate Sustainability Performance ($p < 0.05$). For instance, regarding H8 ($X1 \rightarrow Z \rightarrow Y$), the specific indirect effect is positive (0.134) with a highly significant P-Value of 0.000. Because the direct effect ($X1 \rightarrow Y$ as seen in Table 7) is also significant alongside the indirect effect, this framework represents a state of Partial Mediation.

Conceptually, this crucial finding demonstrates that when Indonesian MSMEs execute green investments, formulate environmental budgets, and maintain transparency in ecological cost reporting, they do not merely improve their operational footprint in a mechanical sense. More importantly, these green financial practices actively cultivate a superior brand reputation and long-term cost efficiency (Green Competitive Advantage). This unique market position ultimately acts as the primary catalyst propelling the MSMEs' holistic sustainability performance within an increasingly competitive business landscape.

Discussion

The findings of this study fundamentally validate that the integration of Green Financial Management into the operational core of Indonesian MSMEs is no longer a peripheral ethical initiative, but a central driver of holistic corporate sustainability. By deliberately allocating capital toward energy-efficient infrastructure and systematically budgeting for waste management, MSMEs successfully reduce their ecological footprint while simultaneously minimizing long-term operational waste. Furthermore, transparent environmental disclosure acts as a critical mechanism that signals corporate integrity to external stakeholders, fostering a high degree of institutional trust. This aligns with recent literature emphasizing that when financial decisions are inextricably linked to environmental consciousness, firms achieve a balanced performance across the triple bottom line enhancing profitability while safeguarding community health and ecological

integrity (Khan et al., 2022; Yang et al., 2021). Thus, internalizing environmental costs through strategic green finance directly fortifies MSMEs against future regulatory shocks and resource scarcity, ensuring they remain resilient in a volatile market (Yin et al., 2022).

However, the most compelling revelation of this research lies in the mediating role of Green Competitive Advantage, which serves as the strategic bridge translating financial inputs into tangible sustainability outcomes. The empirical evidence strongly suggests that green financial practices do not mechanically or instantly generate financial returns. Instead, these practices first cultivate a unique, inimitable market position. When an MSME invests in eco-friendly technology and transparently shares its green initiatives, it inherently builds a superior brand reputation and achieves a structural cost leadership that competitors find difficult to replicate. This dynamic confirms the Resource-Based View theory, illustrating that proactive environmental strategies generate valuable intangible assets that empower a firm's market standing (Rehman et al., 2022). Consequently, it is this cultivated green competitive edge characterized by heightened consumer loyalty and operational efficiency that truly propels the enterprise toward robust and enduring sustainability performance, effectively differentiating the firm in a crowded industry (Mubeen et al., 2021).

The broader implications of these interconnected dynamics offer a necessary paradigm shift for both MSME actors and policymakers in emerging economies like Indonesia. Historically, smaller enterprises have hesitated to adopt green financing due to the persistent perception of it being an exorbitant sunk cost with no immediate financial return. This study dismantles that misconception by proving that the initial capital expenditure for green investments and environmental budgeting is actively recouped through the establishment of a resilient competitive advantage. In alignment with recent findings on the Indonesian corporate landscape, eco-friendly financial strategies are indispensable for securing market leadership and long-term viability (Nohong et al., 2024).

Therefore, industry stakeholders and government bodies must collaboratively transition from purely punitive environmental regulations to incentive-based frameworks. By providing green credit subsidies and capacity-building programs, policymakers can empower MSMEs to embrace green financial management not merely as a matter of administrative compliance, but as a core strategic lever to dominate the market and achieve comprehensive corporate sustainability (Li et al., 2021).

CONCLUSION AND SUGGESTION

This study concludes that Green Financial Management comprising Green Investment Decisions, Green Budgeting, and Green Disclosure, is a primary driver of sustainable development for MSMEs in Indonesia's manufacturing and agro-industry sectors. The findings confirm that while these financial pillars contribute directly to corporate sustainability, their impact is profoundly amplified through the mediating role of Green Competitive Advantage. By prioritizing eco-friendly capital allocation and transparent environmental reporting, MSMEs do not just meet regulatory standards; they strategically build a unique market position characterized by superior brand reputation and long-term cost efficiencies. Consequently, this research confirms that the transition toward green finance is a critical strategic imperative that effectively translates internal financial commitment into a robust, inimitable competitive edge that ensures enduring sustainability performance.

To further bolster the sustainability of Indonesia's MSME landscape, this study offers two strategic suggestions. First, policymakers and financial institutions should

move beyond standard credit schemes and implement targeted green-incentive frameworks, such as interest rate subsidies for green investments and technical assistance for environmental budgeting. These interventions will reduce the perceived financial risk and initial cost barriers that currently deter smaller enterprises from adopting green practices. Second, MSME owners must shift their perspective from viewing environmental expenditures as mere sunk costs to identifying them as strategic intangible assets. By actively leveraging their sustainability initiatives as a marketing tool, MSMEs can effectively communicate their commitment to the environment, thereby fostering deeper consumer trust and securing a long-term competitive advantage in an increasingly environmentally conscious global market.

Future research should extend the proposed model by incorporating additional organizational and institutional variables. Green Innovation Capability is particularly important because green financial resources may not automatically improve sustainability performance unless they are transformed into environmentally oriented product, process, and technological innovations. Future studies may therefore examine a serial mediation mechanism in which Green Financial Management enhances Green Innovation Capability, which subsequently strengthens Green Competitive Advantage and Corporate Sustainability Performance. Access to Green Finance, Environmental Regulatory Pressure, and Stakeholder Pressure should also be considered as moderating variables because financial constraints, regulatory requirements, and stakeholder expectations may determine the extent to which MSMEs can successfully implement green financial practices. In addition, Organizational Resilience may be included as an additional outcome to determine whether green financial strategies enable MSMEs to respond more effectively to environmental, economic, and regulatory disruptions. Future research should also control for firm size, firm age, industry sector, geographical location, and financial capacity, as these characteristics may produce differences in the adoption and effectiveness of green financial management practices.

REFERENCES

- Abbasi, M., Pishvaei, M. S., & Bairamzadeh, S. (2020). Land suitability assessment for Paulownia cultivation using combined GIS and Z-number DEA: A case study. *Computers and Electronics in Agriculture*, 176, 105666.
- Agovino, M., Matricano, D., & Garofalo, A. (2020). Waste management and competitiveness of firms in Europe: A stochastic frontier approach. *Waste Management*, 102, 528–540.
- Assaf, A. G., Atkinson, S. E., & Tsionas, M. G. (2020). Endogeneity in multiple output production: Evidence from the US hotel industry. *Tourism Management*, 80, 104124.
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Ezici, B., Eğılmez, G., & Gedik, R. (2020). Assessing the eco-efficiency of US manufacturing industries with a focus on renewable vs. non-renewable energy use: An integrated time series MRIO and DEA approach. *Journal of Cleaner Production*, 253, 119630.
- Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.
- Hair, J., & Alamer, A. (2022). Partial least squares structural equation modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, 1(3), Article 100027. <https://doi.org/10.1016/j.rmal.2022.100027>

- Jovanović, M., Nedeljković, S., Randelović, M., Savić, G., Stojanović, V., Stojanović, V., & Randelović, D. (2020). A Multicriteria Decision Aid-Based Model for Measuring the Efficiency of Business-Friendly Cities. *Symmetry*, 12(6), 1025.
- Khan, S. A. R., Yu, Z., & Umar, M. (2022). A road map for environmental sustainability and green economic development: An empirical study. *Environmental Science and Pollution Research*, 29(11), 16006–16019. <https://doi.org/10.1007/s11356-021-16961-1>
- Kharrazi, A., Sreeram, V., & Mishra, Y. (2020). Assessment techniques of the impact of grid-tied rooftop photovoltaic generation on the power quality of low voltage distribution network-A review. *Renewable and Sustainable Energy Reviews*, 120, 109643.
- Khodabakhshi, M., & Ahmadi, M. (2021). An approach to cost-benefit analysis by competitive advantages with stochastic data. *Journal of Modelling in Management*.
- Li, Z., Liao, G., Wang, Z., & Huang, Z. (2021). Green loan and subsidy for promoting clean production innovation. *Journal of Cleaner Production*, 287, 125037. <https://doi.org/10.1016/j.jclepro.2020.125037>
- Liu, H., Yang, R., Wu, J., & Chu, J. (2021). Total-factor energy efficiency change of the road transportation industry in China: A stochastic frontier approach. *Energy*, 219, 119612.
- Liu, J., Zeng, P., Xing, H., Li, Y., & Wu, Q. (2020). Stochastic optimal operation of flexible distribution networks for security improvement considering active management. *CSEE Journal of Power and Energy Systems*.
- Lloyd, S. M., & Ries, R. (2021). Characterizing, propagating, and analyzing uncertainty in life-cycle assessment: A survey of quantitative approaches. *Journal of Industrial Ecology*, 11(1), 161–179.
- Mubeen, R., Han, D., Abbas, J., & Hussain, I. (2021). The effects of market competition, green innovation, and firm performance: Empirical evidence from manufacturing SMEs. *Environmental Science and Pollution Research*, 28(32), 43689–43702. <https://doi.org/10.1007/s11356-021-13647-6>
- Nguyen, T. T. T., Prior, D., & Van Hemmen, S. (2020). Stochastic semi-nonparametric frontier approach for tax administration efficiency measure: Evidence from a cross-country study. *Economic Analysis and Policy*, 66, 137–153.
- Nohong, M., Sobarsyah, M., Alamzah, N., Sylvana, A., & Herman, B. (2024). Green financial management and its impact on small medium enterprises (SMEs): An empirical study in Indonesia. *Journal of Environmental Assessment Policy and Management*, 26(01), 2450001.
- Nohong, M., Sobarsyah, M., Sohilaui, M. I., & Herman, B. (2024). Nexus between strategic green finance and green competitive advantage: Study at Indonesia corporate. *Journal of Environmental Assessment Policy and Management*, 26(02), 2450003.
- Núñez, F., Arcos-Vargas, A., & Villa, G. (2020). Efficiency benchmarking and remuneration of Spanish electricity distribution companies. *Utilities Policy*, 67, 101127.
- Oh, D.-H., Ahn, J., Lee, S., & Choi, H. (2020). Measuring technical inefficiency and CO2 shadow price of Korean fossil-fuel generation companies using deterministic and stochastic approaches. *Energy & Environment*, 31(8), 1461–1483.
- Rehman, S. U., Bresciani, S., Yahiaoui, D., & Fadile, T. (2022). Environmental sustainability orientation and corporate social responsibility influence on environmental performance of small and medium enterprises: The mediating effect of green competitive advantage. *Business Strategy and the Environment*, 31(4), 1332–1349. <https://doi.org/10.1002/bse.2958>

- Tan, X., Choi, Y., Wang, B., & Huang, X. (2020). Does China's carbon regulatory policy improve total factor carbon efficiency? A fixed-effect panel stochastic frontier analysis. *Technological Forecasting and Social Change*, 160, 120222.
- Tajik, O., Golzar, J., & Noor, S. (2025). Purposive sampling. *International Journal of Education & Language Studies*, 1–9. doi:10.22034/ijels.2025.490681.1029.
- Wang, Y., Lei, X., Long, R., & Zhao, J. (2021). Green credit, financial constraint, and capital investment: Evidence from China's energy-intensive enterprises. *Environmental Management*, 68(1), 47–60. <https://doi.org/10.1007/s00267-021-01446-x>
- Wanke, P., Tan, Y., Antunes, J., & Hadi-Vencheh, A. (2020). Business environment drivers and technical efficiency in the Chinese energy industry: A robust Bayesian stochastic frontier analysis. *Computers & Industrial Engineering*, 144, 106487.
- Yang, Y., Su, X., & Yao, S. (2021). Nexus between green finance, fintech, and high-quality economic development: Empirical evidence from China. *Resources Policy*, 74, 102445. <https://doi.org/10.1016/j.resourpol.2021.102445>
- Yin, C., Salmador, M. P., Li, D., & Lloria, M. B. (2022). Green entrepreneurship and SME performance: The moderating effect of firm age. *International Entrepreneurship and Management Journal*, 18(1), 255–275. <https://doi.org/10.1007/s11365-021-00757-3>
- Zewdie, M. C., Moretti, M., Tenessa, D. B., Ayele, Z. A., Nyssen, J., Tsegaye, E. A., Minale, A. S., & Van Passel, S. (2021). Agricultural Technical Efficiency of Smallholder Farmers in Ethiopia: A Stochastic Frontier Approach. *Land*, 10(3), 246.
- Zhang, D., Mohsin, M., Rasheed, A. K., Chang, Y., & Taghizadeh-Hesary, F. (2021). Public spending and green economic growth in BRI region: Mediating role of green finance. *Energy Policy*, 153, 112256. <https://doi.org/10.1016/j.enpol.2021.112256>
- Zheng, W., Xu, X., & Wang, H. (2020). Regional logistics efficiency and performance in China along the Belt and Road Initiative: The analysis of integrated DEA and hierarchical regression with carbon constraint. *Journal of Cleaner Production*, 276, 123649.