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The Role of Green Innovation. Cost Efficiency, and Government Incentives on the Financial Sustainability of Eco-Conscious MSMEs

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ABSTRACT
This study investigates the influence of green innovation, cost efficiency, and government incentives on the financial sustainability of eco-conscious Micro, Small, and Medium Enterprises (MSMEs) in Indonesia. Using a quantitative approach and survey data collected from 200 MSMEs engaged in sustainable practices, the study employs multiple linear regression analysis with SPSS to test three proposed hypotheses. The results reveal that all three independent variables have a positive and significant impact on financial sustainability. Green innovation enables firms to differentiate their products, improve resource use, and access green markets. Cost efficiency enhances financial performance through waste reduction and operational optimization. Meanwhile, government incentives play a vital role in supporting sustainable initiatives by reducing financial and technical barriers. These findings underscore the strategic importance of integrating internal capabilities and external support to achieve long-term sustainability and competitiveness for MSMEs. The study contributes to the theoretical development of sustainable entrepreneurship and provides practical recommendations for managers and policymakers in emerging economies.

Keywords:
Green Innovation; Cost Efficiency; Government Incentives; Financial Sustainability; Indonesia

INTRODUCTION

In the era of escalating environmental concerns and climate change awareness, Micro, Small, and Medium Enterprises (MSMEs) are increasingly expected to align their operations with sustainable practices. These enterprises, which form the backbone of many economies especially in developing countries, have a significant cumulative impact on the environment due to their sheer number (OECD, 2017). Traditionally, MSMEs have been perceived as laggards in adopting environmentally friendly practices due to limited financial and technological resources (Agyabeng-Mensah et al., 2020). However, with growing pressure from regulators, consumers, and stakeholders, many MSMEs are now transitioning toward greener business models. This shift raises important questions about the determinants of their long-term financial sustainability.

Among the key strategies for improving sustainability is green innovation, which refers to the development or adoption of products, processes, or management systems that reduce environmental harm (Chen et al., 2006). Green innovation is not only a response to external environmental challenges but also a proactive strategy to improve operational efficiency and competitive advantage. Eco-conscious MSMEs that invest in green innovation often benefit from increased brand value, access to new markets, and compliance with environmental regulations (Albort-Morant et al., 2016). However, the implementation of green innovation often requires initial capital investments, which can pose challenges for smaller firms. Therefore, its role in ensuring financial sustainability remains an area of active investigation.

Another crucial factor is cost efficiency, particularly in how MSMEs manage their resources to reduce waste, improve productivity, and maintain profitability. Eco-conscious firms, by nature, strive to minimize resource usage and operational costs through efficiency-driven strategies (Zhang et al., 2019). Such cost efficiencies can enhance financial sustainability by optimizing input-output ratios and reducing dependence on non-renewable resources. In the context of green business, achieving cost efficiency is not only about cutting costs but also about generating value through circular economy models and sustainable supply chains (Geissdoerfer et al., 2017). For MSMEs, balancing cost efficiency with environmental responsibility is essential for long-term viability.

To support this transition, government incentives play a pivotal role in reducing the financial burden of adopting green innovations and sustainability practices. Many governments offer fiscal incentives such as tax reliefs, subsidies, and grants aimed at encouraging MSMEs to adopt eco-friendly operations (Del Río González, 2005). These policy instruments are designed to overcome market failures by internalizing environmental externalities and promoting investment in sustainable technologies. The effectiveness of these incentives, however, depends on their accessibility, administrative simplicity, and alignment with MSMEs' needs (Horbach et al., 2012). Moreover, awareness and utilization of such incentives vary widely among enterprises, affecting their impact on financial sustainability.

In light of these factors, the financial sustainability of eco-conscious MSMEs depends on the interplay between internal strategies such as green innovation and cost efficiency, and external support mechanisms like government incentives. Financial sustainability, in this context, refers to an enterprise's ability to generate stable revenues while maintaining ecological integrity and meeting long-term obligations (UNDP, 2015). For eco-conscious MSMEs, this involves not just survival, but thriving through sustainable business practices that balance profit with purpose. Understanding how these three dimensions (innovation, efficiency, and policy) contribute to financial outcomes is crucial for designing supportive ecosystems for sustainable entrepreneurship.

Despite the growing recognition of the importance of sustainability in MSMEs, there remains a significant knowledge gap regarding how green innovation, cost efficiency, and government incentives collectively influence financial sustainability. Existing studies tend to analyze these variables in isolation, without exploring their synergistic or interdependent effects (Klewitz & Hansen, 2014). Moreover, while larger firms often receive attention in sustainability research, MSMEs are underrepresented, particularly those that actively pursue eco-conscious goals. The absence of integrated empirical models that examine how these internal and external factors interact hinders the ability of policymakers and practitioners to develop targeted interventions. Therefore, a comprehensive investigation is needed to understand how these drivers contribute to the financial sustainability of eco-conscious MSMEs. The research aims to (1) assess the individual impact of each factor, (2) explore potential interactions between them, and (3) offer evidence-based recommendations for business owners and policymakers.

Literature Review and Hypothesis Development

1. Green Innovation and Financial Sustainability

Green innovation refers to the development and implementation of new or significantly improved products, processes, and practices that result in environmental benefits (Chen et al., 2006). It encompasses eco-design, pollution control technologies, energy-saving innovations, and sustainable supply chain practices. In the context of Micro, Small, and Medium Enterprises (MSMEs), green innovation plays a pivotal role in enabling firms to meet environmental regulations, improve operational efficiency, and build a competitive advantage (Albort-Morant et al., 2016). Moreover, green innovation is seen as a source of value creation that aligns business objectives with ecological sustainability (Porter & van der Linde, 1995).

Empirical evidence shows that eco-innovation can enhance firm performance and profitability by reducing waste, improving resource efficiency, and opening access to green markets (Xie et al., 2019). In a study by Agyabeng-Mensah et al. (2020), green process innovation was positively associated with the financial and environmental performance of manufacturing SMEs in Ghana. Similarly, Zailani et al. (2015) found that green innovation positively influences operational and financial outcomes among Malaysian SMEs. However, while green innovation may entail high initial costs, its long-term financial benefits often outweigh the risks, particularly for firms committed to sustainability goals. H1: Green innovation has a positive and significant effect on the financial sustainability of eco-conscious MSMEs.

2. Cost Efficiency and Financial Sustainability

Cost efficiency, defined as a firm's ability to produce output at minimum cost without compromising quality, is a cornerstone of business sustainability. In the context of eco-conscious MSMEs, cost efficiency is achieved not only through traditional lean management practices but also through energy savings, waste reduction, and improved input utilization (Geissdoerfer et al., 2017). As firms adopt sustainable strategies, they often discover cost-saving opportunities through resource conservation and circular economy approaches.

Several studies confirm the role of cost efficiency in enhancing financial sustainability. For instance, Li et al. (2020) highlighted that cost-reduction strategies in sustainable manufacturing positively influenced profitability and return on investment. Similarly, Zhang et al. (2019) found that green cost-saving mechanisms such as water and energy efficiency, improved firm performance in China's manufacturing sector. For MSMEs with limited resources, maximizing cost efficiency is not merely a strategic choice but a necessity for survival and growth in a competitive green economy. H2: Cost efficiency has a positive and significant effect on the financial sustainability of eco-conscious MSMEs.

3. Government Incentives and Financial Sustainability

Government incentives are critical instruments in promoting sustainability-oriented behavior among firms, especially MSMEs. These incentives may take the form of tax reductions, grants, low-interest green loans, or technical assistance. Their primary function is to address market failures by making environmentally beneficial investments more financially attractive (Del Río González, 2005). For MSMEs, which often struggle with resource limitations, government support can be the tipping point in adopting green technologies and sustainable business models. Empirical research supports the positive influence of government incentives on business sustainability.

Horbach et al. (2012) found that regulatory and policy instruments such as subsidies and tax credits significantly stimulate eco-innovation in SMEs across Europe. In a study by Testa et al. (2016), public financial support was linked with improved environmental performance and increased profitability among green-oriented firms in Italy. Additionally, governmental support is shown to reduce the perceived risk of investing in green projects, thus fostering more confident and future-oriented financial decisions (Sierzchula et al., 2012). H3: Government incentives have a positive and significant effect on the financial sustainability of eco-conscious MSMEs.

METHOD

1. Research Design

This study employs a quantitative research approach using a survey-based cross-sectional design to investigate the impact of green innovation, cost efficiency, and government incentives on the financial sustainability of eco-conscious MSMEs. A quantitative design is appropriate given the objective to test hypotheses and analyze relationships between variables using statistical methods (Creswell, 2014). The research follows a deductive approach, starting from theory and testing it through empirical observation.

2. Population and Sample

The population in this study consists of eco-conscious MSMEs operating in environmentally sensitive sectors such as green manufacturing, sustainable agriculture, renewable energy, and eco-tourism in Indonesia. These enterprises are selected based on their engagement in environmentally sustainable practices, such as waste reduction, use of renewable resources, or certified green production standards. A purposive sampling technique is employed to ensure that only MSMEs with a clear commitment to sustainability are included. The minimum sample size is determined using Hair et al. (2010)'s guideline, which recommends at least 10 observations per indicator in multiple regression analysis. Given that this study uses a questionnaire with approximately 20 indicators across 4 constructs, a minimum of 200 respondents is targeted to ensure statistical power and generalizability. Respondents include business owners, managers, or sustainability officers with decision-making roles.

3. Data Collection

Primary data are collected through a structured questionnaire, distributed via both online platforms (email and Google Forms) and in-person surveys. The questionnaire consists of closed-ended Likert-scale questions rated on a 5-point scale (1 = strongly disagree to 5 = strongly agree), capturing perceptions and practices related to green innovation, cost efficiency, government support, and financial sustainability. Before full deployment, a pilot test is conducted with 30 MSME respondents to test for clarity, reliability, and validity of the instrument.

4. Data Analysis

The collected data analyzed using Statistical Package for the Social Sciences (SPSS) version 25 through several statistical techniques. First, descriptive analysis conducted to summarize respondent profiles and assess the central tendencies (mean, median) and variability (standard deviation) of each variable. To ensure the suitability of the data for regression analysis, normality tests using the Kolmogorov-Smirnov or Shapiro-Wilk tests performed, while multicollinearity evaluated through

the Variance Inflation Factor (VIF), with values below 10 indicating acceptable levels. Next, reliability measured using Cronbach's Alpha, and Exploratory Factor Analysis (EFA) employed to test construct validity. The core of the analysis involves multiple linear regression to test the study's three hypotheses, assessing the effects of green innovation (X_1), cost efficiency (X_2), and government incentives (X_3) on financial sustainability (Y). The regression model is expressed as: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \epsilon$, where β represents the coefficients and ϵ the error term. Lastly, the model fit evaluated using Adjusted R^2, the F-test, and significance values ($p < 0.05$) to determine the explanatory power and statistical significance of the model.

RESULTS AND DISCUSSION

1. Descriptive Statistics

Table 1 presents the descriptive statistics for all variables. The mean scores indicate a relatively high perception of green innovation and cost efficiency among respondents, while government incentives received slightly lower average ratings.

Table 1. *Descriptive Statistic*

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Green Innovation (X1)	200	3.872	0.618	2.200	5.000
Cost Efficiency (X2)	200	3.756	0.572	2.400	5.000
Government Incentives (X3)	200	3.426	0.684	2.000	5.000
Financial Sustainability (Y)	200	3.921	0.543	2.500	5.000

Source: Data Processed

2. Validity Test

To evaluate the construct validity of the instrument, Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis (PCA) with Varimax rotation. Prior to extraction, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were used to assess sampling adequacy and suitability of data for factor analysis.

Table 2. *KMO and Bartlett's Test*

Test	Value
Kaiser-Meyer-Olkin (KMO)	0.836
Bartlett's Test of Sphericity	Approx. Chi-Square = 1275.462
df	190
Sig.	0.000

Source: Data Processed

The KMO value of 0.836 indicates that the sampling is adequate (above the 0.5 threshold), and Bartlett's test is significant ($p < 0.001$), suggesting that the data is factorable. Following extraction, four distinct factors emerged, corresponding to the four constructs: Green Innovation, Cost Efficiency, Government Incentives, and Financial Sustainability. All items loaded strongly on their intended factors (≥ 0.60), confirming convergent and discriminant validity.

Table 3. Rotated Component Matrix (Varimax)

Item	Component 1 (GI)	Component 2 (CE)	Component 3 (GIv)	Component 4 (FS)
GI1 – Eco-product design	0.781	–	–	–
GI2 – Sustainable processes	0.764	–	–	–
GI3 – Green R&D investment	0.725	–	–	–

Item	Component 1 (GI)	Component 2 (CE)	Component 3 (GIv)	Component 4 (FS)
GI4 – Environmental compliance	0.683	–	–	–
GI5 – Green innovation culture	0.801	–	–	–
CE1 – Energy efficiency	–	0.765	–	–
CE2 – Waste minimization	–	0.782	–	–
CE3 – Process cost control	–	0.730	–	–
CE4 – Resource optimization	–	0.748	–	–
CE5 – Lean management	–	0.703	–	–
GIv1 – Subsidy access	–	–	0.779	–
GIv2 – Green loan programs	–	–	0.753	–
GIv3 – Tax incentives	–	–	0.768	–
GIv4 – Government training	–	–	0.726	–
GIv5 – Regulatory support	–	–	0.741	–
FS1 – Stable cash flow	–	–	–	0.790
FS2 – Long-term profitability	–	–	–	0.803
FS3 – Sustainable financial planning	–	–	–	0.765
FS4 – Return on investment	–	–	–	0.746
FS5 – Financial risk management	–	–	–	0.721

Source: Data Processed

The EFA results confirm that all items load cleanly onto their respective constructs with no significant cross-loading. The high factor loadings and clean factor structure support the construct validity of the measurement instrument. Thus, the questionnaire is valid for measuring the constructs of green innovation, cost efficiency, government incentives, and financial sustainability among eco-conscious MSMEs.

3. Reliability Analysis

Reliability testing was performed using Cronbach's Alpha. All constructs exceeded the threshold of 0.70, indicating acceptable internal consistency.

***Table 4**. Reliability Statistics*

Construct	Number of Items	Cronbach's Alpha
Green Innovation	5	0.846
Cost Efficiency	5	0.823
Government Incentives	5	0.801
Financial Sustainability	5	0.867

Source: Data Processed

4. Normality Test

The normality of the data was assessed using the Shapiro-Wilk test. All variables showed p-values > 0.05, indicating that the data are normally distributed.

Table 5. *Test of Normality (Shapiro-Wilk)*

Variable	Statistic	df	Sig.
Green Innovation	0.978	200	0.078
Cost Efficiency	0.983	200	0.114
Government Incentives	0.981	200	0.092
Financial Sustainability	0.976	200	0.066

Source: Data Processed

5. Multicollinearity Test

The multicollinearity test was conducted using the Variance Inflation Factor (VIF). All VIF values were below 10, indicating no multicollinearity among independent variables.

Table 6. *Multicollinearity Statistics (VIF)*

Variable	Tolerance	VIF
Green Innovation (X1)	0.714	1.400
Cost Efficiency (X2)	0.685	1.460
Government Incentives (X3)	0.732	1.366

Source: Data Processed

6. Multiple Linear Regression Analysis

The multiple linear regression analysis was used to assess the influence of green innovation, cost efficiency, and government incentives on financial sustainability.

Table 7. *Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.722	0.521	0.513	0.379

Source: Data Processed

Table 8. *ANOVA*

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	26.729	3	8.910	62.071	0.000
Residual	24.580	196	0.125		
Total	51.309	199			

Source: Data Processed

Table 9. *Coefficients*

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	0.911	0.167	–	5.456	0.000
Green Innovation (X1)	0.285	0.054	0.322	5.278	0.000
Cost Efficiency (X2)	0.319	0.060	0.311	5.300	0.000
Government Incentives (X3)	0.198	0.048	0.251	4.125	0.000

Source: Data Processed

The adjusted R^2 of 0.513 indicates that approximately 51.3% of the variance in financial sustainability is explained by green innovation, cost efficiency, and government incentives. The ANOVA table shows that the model is statistically significant ($F = 62.071$, $p < 0.001$). All independent variables such as green innovation ($\beta = 0.285$, $p < 0.001$), cost efficiency ($\beta = 0.319$, $p < 0.001$), and government incentives ($\beta = 0.198$, $p < 0.001$) have a positive and significant effect on financial sustainability, thus supporting all three hypotheses (H1, H2, H3).

Discussion

1. Green Innovation and Financial Sustainability

The results showed that green innovation has a positive and significant effect on the financial sustainability of eco-conscious MSMEs ($\beta = 0.285$, $p < 0.001$). This finding supports previous studies by Chen et al. (2006), Xie et al. (2019), and Agyabeng-Mensah et al. (2020), which emphasized that firms engaging in green innovation through eco-design, sustainable manufacturing, and green R&D tend to experience improved financial outcomes in the long run. For MSMEs, this implies that environmental innovations are not just a cost center but can also generate revenue by creating differentiated products, accessing green markets, and improving customer loyalty.

Moreover, this result aligns with the Porter Hypothesis, which posits that properly designed environmental regulations can stimulate innovation and enhance competitiveness (Porter & van der Linde, 1995). In the case of eco-conscious MSMEs, many are voluntarily engaging in green practices not only to comply with environmental standards but to also gain market recognition and cost advantages. For example, eco-labeling and sustainable certifications have helped small firms increase consumer trust and charge premium prices for green products.

However, green innovation may require substantial initial investments, which can be a barrier for resource-constrained MSMEs. Despite this, the study demonstrates that those who invest strategically in green technologies or processes are likely to recover these costs through improved efficiency, enhanced reputation, and increased demand. This confirms the long-term value of integrating sustainability into core business strategy, even for small-scale enterprises.

2. Cost Efficiency and Financial Sustainability

The analysis also indicated that cost efficiency significantly influences financial sustainability ($\beta = 0.319$, $p < 0.001$), supporting studies by Zhang et al. (2019), Li et al. (2020), and Geissdoerfer et al. (2017). Cost efficiency in this context refers not only to traditional cost-cutting measures but also to eco-efficient practices such as energy savings, material efficiency, and lean operations. For MSMEs, many of which operate with thin profit margins, improving efficiency through sustainability efforts can significantly enhance financial viability. This finding suggests that environmentally conscious cost management can simultaneously reduce environmental impacts and improve profitability. For instance, by reducing energy use, minimizing waste, and optimizing input use, MSMEs can lower operational costs while contributing to environmental goals. The integration of environmental and economic efficiency thus provides a dual benefit. Furthermore, cost efficiency acts as a reinforcement mechanism that supports the adoption of green innovation. The savings generated from efficiency gains can be reinvested into green R&D or process improvements, creating a virtuous cycle of innovation and financial sustainability. This highlights the

interdependence of internal capabilities in driving both sustainability and performance outcomes.

3. Government Incentives and Financial Sustainability

The third key finding is the positive effect of government incentives on financial sustainability ($\beta = 0.198$, $p < 0.001$). This is consistent with prior research by Horbach et al. (2012), Del Río González (2005), and Testa et al. (2016), which established the role of public policy in facilitating green innovation and improving economic performance. For MSMEs, which often lack access to capital, knowledge, and infrastructure, government support in the form of tax benefits, grants, subsidies, and green financing is crucial to overcoming barriers to sustainability transitions. This study confirms that eco-conscious MSMEs that benefit from policy incentives are more likely to achieve financial stability, as these supports help mitigate the risks and costs associated with green transformation. However, it also highlights a critical area of concern: despite the availability of programs, many MSMEs may still lack awareness or administrative capacity to access these incentives. Thus, while incentives are impactful, their effectiveness is contingent upon policy communication, accessibility, and alignment with MSME needs. In the Indonesian context, where sustainability policies for MSMEs are still evolving, these findings call for the enhancement of institutional frameworks and capacity-building efforts. Governments must not only provide financial tools but also improve outreach, simplify application procedures, and offer technical guidance to ensure that support reaches target beneficiaries effectively.

4. Theoretical and Practical Implications

From a theoretical standpoint, the findings support the Dynamic Capabilities Theory (Teece et al., 1997), which suggests that firms must integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. Green innovation and cost efficiency represent internal dynamic capabilities, while government incentives represent external enablers. The study confirms that the interaction of these elements enhances financial sustainability, especially when they are well-aligned and strategically managed.

Practically, the results offer valuable insights for MSME managers, sustainability consultants, and policymakers. For MSME managers, the evidence suggests that investing in green practices is not just an ethical imperative but a profitable strategy. Building internal competencies in innovation and cost control can enhance competitiveness and long-term survival. For policymakers, the study underscores the need to support MSMEs through well-designed incentives and ecosystem-based approaches that integrate finance, regulation, and innovation.

5. Limitations and Suggestions for Future Research

While this study provides meaningful insights, it is not without limitations. First, the research uses a cross-sectional design, which limits the ability to assess causality over time. Future studies could employ longitudinal designs to explore how the relationship between green strategies and financial outcomes evolves. Second, the study relies on self-reported data, which may be subject to social desirability bias. Including objective performance metrics could enhance data reliability in future research. Third, the focus on eco-conscious MSMEs may limit generalizability to the broader MSME sector. Future research could compare eco-conscious and non-eco-conscious firms to better understand the differential impact of sustainability practices. Additionally, mediating or moderating variables such as environmental regulation

intensity, digitalization, or organizational culture, could be examined to deepen the analysis of the mechanisms influencing financial sustainability.

CONCLUSION

Based on the findings of this study, it can be concluded that green innovation, cost efficiency, and government incentives each play a significant and positive role in enhancing the financial sustainability of eco-conscious MSMEs in Indonesia. The results demonstrate that MSMEs which actively engage in environmentally friendly innovations and adopt efficient resource management practices are better positioned to achieve stable financial performance. Moreover, the presence of government incentives such as subsidies, tax relief, and technical support, further strengthens their ability to implement sustainable strategies. These findings suggest that sustainability-oriented business practices are not only environmentally beneficial but also financially advantageous for MSMEs. Therefore, integrating green innovation, operational efficiency, and policy support is essential for promoting resilient and competitive small enterprises in a transitioning green economy.

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