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THE ROLE OF FIRM SIZE IN MODERATING GREEN ACCOUNTING, INNOVATION, AND STAKEHOLDER ENGAGEMENT ON FIRM VALUE

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ABSTRACT

Objective: This study examines the moderating role of firm Size in the relationships among green accounting, green product innovation, stakeholder involvement, and firm value in manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2024.
Method: A quantitative approach was employed using panel data regression analysis (Eviews 12) on a sample of manufacturing firms.
Results: The findings reveal that: (1) green accounting negatively affects firm value; (2) green product innovation also negatively affects firm value; (3) stakeholder involvement has no significant effect; (4) firm Size significantly moderates the effect of green accounting on firm value, but (5) firm Size does not moderate the effects of green product innovation or stakeholder involvement.
Novelty: This study offers three key novelties. First, it provides empirical evidence from an emerging market (Indonesia), where sustainability practices are still voluntary, in contrast to prior studies from developed countries with mandatory disclosure regimes. Second, it demonstrates that firm size acts as a pure moderator selectively only for green accounting, not for innovation or stakeholder engagement, refining contingency theory in the context of environmental strategy. Third, unlike most prior research that assumes linear positive effects, this study reveals short-term value destruction from green practices, challenging the conventional "win-win" paradigm.
Contribution: The findings advance theory by integrating legitimacy theory and trade-off theory, demonstrating that firm Size determines whether green accounting translates into value. In practice, managers of small- and medium-sized manufacturing firms should anticipate short-term cost overruns when adopting green accounting, while large firms may leverage their size to absorb such costs.

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INTRODUCTION

Understanding firm value is fundamental to strategic planning, investment decisions, and long-term competitive advantage. A high firm value enables companies to attract capital, secure necessary resources, and maintain their market position through sustainability-driven innovation (Darlis et al., 2024). However, rapid technological advancement and economic growth have often overlooked environmental degradation and pollution. In response, businesses are increasingly integrating social and environmental responsibilities into strategic decision-making. Green accounting has emerged as a critical tool for companies to measure, manage, and report environmental impacts, ensuring that operational activities align with sustainability principles while remaining competitive in the marketplace (Sritharan et al., 2025).

The environmental challenges in Indonesia are particularly pressing. According to Kurniawan et al. (2024), Indonesia's industrial sector is the primary driver of ecological degradation, with the country's ecological footprint rapidly shifting toward long-term imbalance. Data from the Global Carbon Atlas (2024) ranks Indonesia as the sixth-largest carbon emitter globally and the largest in Southeast Asia, with significant room for emission reduction. Furthermore, manufacturing and transportation activities negatively and significantly impact environmental quality in Indonesian provinces, triggering increased liquid waste, higher energy consumption leading to air pollution, and industrial expansion that reduces land cover (Ismail et al., 2022). Within the framework of the Paris Agreement, Indonesia has committed to reducing emissions by 29% independently or 41% with international support by 2030, and aims to achieve net-zero emissions by 2060 through its 2060 Net Zero Emission Roadmap. These conditions underscore the urgency for manufacturing companies to adopt green accounting practices, green product innovation, and meaningful stakeholder engagement to mitigate environmental damage while maintaining firm value.

Despite growing global awareness of environmental, social, and governance (ESG) issues, empirical evidence on the effects of green accounting, green product

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innovation, and stakeholder involvement on firm value remains inconclusive. Research on green product innovation indicates that green product competitiveness plays a crucial role in shaping innovation outcomes, suggesting that not all green initiatives automatically translate into financial benefits (Kiani et al., 2024). Similarly, while stakeholder engagement in business strategy has been shown to increase company performance, its effectiveness depends on how deeply it is integrated into strategic decision-making rather than merely serving as a symbolic gesture (Hristov & Appolloni, 2022). Furthermore, corporate social responsibility disclosure affects green innovation performance through the roles of various actors in the innovation ecosystem, indicating that the relationship between environmental practices and firm outcomes is complex and context-dependent (Zhang et al., 2024). Sitakara and Pradita (2024) conducted a systematic literature review revealing that while many corporations use green accounting as a tool to improve firm value and profitability, numerous studies have failed to find consistent positive effects. Some studies report positive effects: Astuti and Ahmar (2025) found that green accounting and green innovation positively influence firm value, with this effect moderated by return on assets. Conversely, other research suggests that green product innovation does not immediately translate into improved financial outcomes if the innovation does not enhance competitiveness (Nurdiyanti & Sarumpaet, 2024). These contradictory findings highlight a significant research gap. Furthermore, most existing research has focused on developed countries with mandatory environmental disclosure regimes, leaving a substantial gap in understanding emerging market contexts such as Indonesia, where sustainability practices remain largely voluntary (Sritharan et al., 2025). Additionally, the potential moderating role of firm Size in shaping these relationships has received limited attention, despite theoretical arguments suggesting that larger firms possess greater resources to absorb the costs of green initiatives (Darlis et al., 2024).

This study addresses these gaps by introducing three key novelties. First, it provides empirical evidence from the Indonesian manufacturing sector, an emerging economy where green accounting and green product innovation are not yet

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mandatory, offering a distinct contrast to studies from developed countries with compulsory disclosure regimes. This is particularly relevant given that Indonesia, as the largest economy in Southeast Asia, has been identified as a significant destination for green technology investment. Second, this study examines firm size as a pure moderator rather than merely a control variable to determine whether it strengthens or weakens the effects of green accounting, green product innovation, and stakeholder involvement on firm value. Sritharan et al. (2025) emphasize that adoption of green accounting remains uneven due to capability gaps, resource constraints, and technological readiness issues, particularly among smaller firms. Third, unlike prior research that often assumes a linear, positive relationship, this study acknowledges the possibility of short-term value destruction due to the additional costs of implementing environmentally friendly practices, consistent with the trade-off theory perspective.

The primary objective of this study is to examine the effect of green accounting, green product innovation, and stakeholder involvement on firm value, with firm size as a moderating variable. Specifically, this study investigates manufacturing companies listed on the Indonesia Stock Exchange (IDX) over the 2020–2024 period. Panel data regression analysis using Eviews 12 is employed to test five proposed hypotheses, including both direct and moderating effects. This research contributes theoretically by integrating legitimacy theory and trade-off theory to explain how environmental practices may reduce firm value in the short term, while highlighting the boundary condition imposed by firm size. In practice, the findings provide strategic guidance for managers, particularly in small- and medium-sized manufacturing firms, to anticipate and mitigate short-term cost overruns when adopting green accounting. Policymakers may also benefit from these insights when designing regulations for voluntary sustainability disclosure in emerging economies, especially in light of Indonesia's commitment to achieving net-zero emissions by 2060.

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LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Theoretical Foundation

This study is grounded in three complementary theories: legitimacy theory, stakeholder theory, and trade-off theory. Legitimacy theory suggests that companies continuously seek to operate within the bounds and norms of their respective societies (Suchman, 1995). Organizations adopt environmentally friendly practices, including green accounting and green product innovation, to gain public and stakeholder legitimacy. When a company's activities are perceived as legitimate, it enhances its reputation and ultimately its firm value (Darlis et al., 2024).

Stakeholder theory posits that companies must create value for all stakeholders, not just shareholders (Freeman, 1984). Stakeholder involvement in environmental decision-making ensures that corporate actions align with societal expectations, potentially improving firm performance and long-term sustainability (Hristov & Appolloni, 2022). However, the effectiveness of stakeholder engagement depends on how deeply it is integrated into strategic decision-making rather than serving merely as a symbolic gesture.

Trade-off theory, traditionally applied in capital structure literature, offers a useful lens for understanding the short-term costs versus long-term benefits of environmental practices. Implementing green accounting systems and developing green products requires significant upfront investments in technology, training, and reporting mechanisms. These costs may temporarily reduce profitability and firm value, creating a trade-off between environmental responsibility and short-run financial performance (Myers, 1984; Kiani et al., 2024).

Together, these theoretical frameworks suggest that while environmental practices may enhance legitimacy and stakeholder relationships, they also impose costs that can negatively affect firm value, particularly in the short term. Firm size may serve as a boundary condition that determines whether a company can effectively absorb these costs.

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Green Accounting and Firm Value

Green accounting, also known as environmental accounting, refers to the identification, measurement, allocation, and reporting of environmental costs and benefits associated with corporate activities (Schaltegger & Burritt, 2017). It enables companies to internalize environmental externalities, improve resource efficiency, and demonstrate environmental accountability to stakeholders.

According to legitimacy theory, companies that adopt green accounting practices signal their commitment to environmental responsibility, thereby gaining social legitimacy and potentially enhancing firm value (Darlis et al., 2024). Prior empirical evidence supports this positive relationship. Astuti and Ahmar (2025) found that green accounting positively influences firm value, with this effect moderated by return on assets, suggesting that profitable firms benefit more from environmental disclosure. Similarly, research on Indonesian energy sector companies indicated that green accounting practices and sustainability report disclosures positively affect firm value by enhancing transparency and credibility.

However, contrary evidence also exists. Implementing green accounting requires substantial investments in information systems, trained personnel, and external assurance, which can increase operational costs (Sritharan et al., 2025). From a trade-off theory perspective, these additional costs may reduce short-term profitability and, in turn, decrease firm value, especially in emerging markets where environmental disclosure remains voluntary, and the market may not fully reward such practices (Kurniawan et al., 2024). In the Indonesian context, where sustainability practices are not yet mandatory, investors may prioritize short-term financial performance over environmental initiatives, leading to a negative market reaction to the adoption of green accounting.

Given these theoretical arguments and mixed empirical findings, this study proposes the following hypothesis:

H_1: Green accounting has a significant effect on firm value.

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Green Product Innovation and Firm Value

Green product innovation refers to the development of products that minimize environmental impact throughout their life cycle, including the use of eco-friendly materials, energy-efficient production processes, and recyclable or biodegradable product designs (Schiederig et al., 2012). It is a key component of corporate environmental strategy and is often associated with competitive advantage and long-term profitability.

From a stakeholder theory perspective, green product innovation can enhance firm value by meeting the growing demand from environmentally conscious consumers, investors, and regulators (Hristov & Appolloni, 2022). Companies that successfully introduce green products may differentiate themselves from competitors, access new markets, and command premium prices. Kiani et al. (2024) found that green product competitiveness plays a crucial role in shaping innovation outcomes, suggesting that when green products are competitively positioned, they can generate financial returns.

Nevertheless, the relationship between green product innovation and firm value is not universally positive. Developing green products involves significant research and development (R&D) costs, trial-and-error processes, and potential production inefficiencies (Zhang et al., 2024). These upfront investments may not yield immediate financial returns, particularly in manufacturing sectors where product cycles are long, and consumer adoption of green products remains uncertain. Nurdiyanti and Sarumpaet (2024) found that green product innovation does not immediately translate into improved financial outcomes for Indonesian manufacturing companies unless it enhances competitiveness. In the short term, the costs of green innovation may outweigh its benefits, leading to a negative effect on firm value, consistent with trade-off theory predictions.

Thus, this study proposes:

H_2: Green product innovation has a significant effect on firm value.

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Stakeholder Involvement and Firm Value

Stakeholder involvement refers to the extent to which companies engage with various stakeholder groups, including customers, suppliers, employees, local communities, regulators, and non-governmental organizations, in their environmental decision-making processes (Freeman, 1984; Donaldson & Preston, 1995). Meaningful stakeholder involvement goes beyond mere consultation to include active collaboration and shared responsibility for environmental outcomes.

According to stakeholder theory, greater stakeholder involvement leads to better alignment between corporate actions and societal expectations, reducing reputational risks and increasing firm value (Hristov & Appolloni, 2022). When stakeholders are involved in environmental strategy formulation, companies can identify emerging risks and opportunities earlier, build trust, and secure social license to operate. Prior research by Zhang et al. (2024) indicates that corporate social responsibility disclosure affects green innovation performance through the roles of various actors in the innovation ecosystem, suggesting that stakeholder engagement enhances the effectiveness of environmental practices.

However, stakeholder involvement is not without costs. Engaging multiple stakeholders requires time, resources, and management attention, potentially diverting focus from core business activities (Sritharan et al., 2025). Moreover, conflicting stakeholder demands can create decision-making paralysis or lead to suboptimal compromises. In emerging economies like Indonesia, where stakeholder environmental awareness varies widely, the benefits of stakeholder involvement may not materialize immediately. Sitakara and Pradita (2024) found mixed evidence on the relationship between stakeholder engagement and firm value, with many studies reporting insignificant or conditional effects.

Given these theoretical considerations, this study proposes:

H_3: Stakeholder involvement has a significant effect on firm value.

The Moderating Role of Firm Size

Firm size, typically measured by total assets, total sales, or market capitalization, reflects a company's scale of operations and resource endowments. In

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the context of environmental management, firm Size can influence how green accounting, green product innovation, and stakeholder involvement affect firm value. Larger firms generally possess greater financial resources, technical capabilities, and managerial expertise to implement environmental initiatives efficiently (Dang et al., 2018; Darlis et al., 2024).

Firm Size as a Moderator of Green Accounting and Firm Value

Larger firms are more likely to have established accounting systems, dedicated sustainability departments, and external assurance mechanisms, thereby reducing the marginal cost of implementing green accounting (Sritharan et al., 2025). They also face greater pressure from regulators, investors, and the media to disclose environmental information, making green accounting a strategic necessity rather than an optional expense. Consequently, the negative short-term cost effect of green accounting on firm value may be mitigated or even reversed for large firms.

Conversely, smaller firms with limited resources may struggle to absorb the additional costs of green accounting, leading to a more pronounced negative effect. Darlis et al. (2024) found that firm size significantly influences the relationship between green accounting and firm value in Southeast Asian contexts.

H_4: Firm size moderates the effect of green accounting on firm value.

Firm Size as a Moderator of Green Product Innovation and Firm Value

Developing green products requires substantial R&D investment, access to green technologies, and the ability to scale production efficiently. Large firms typically have dedicated R&D budgets, established innovation processes, and economies of scale that reduce the per-unit cost of green product development (Kiani et al., 2024). They can also leverage existing distribution networks and brand loyalty to accelerate market acceptance of green products. In contrast, smaller firms may lack these capabilities, making green product innovation a financially burdensome endeavor with uncertain returns. Therefore, firm Size may weaken the negative relationship between green product innovation and firm value by enabling large firms to realize innovation benefits more quickly and cost-effectively.

H_5: Firm size moderates the effect of green product innovation on firm value.

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Firm Size as a Moderator of Stakeholder Involvement and Firm Value

Larger firms interact with a wider and more diverse set of stakeholders, including institutional investors, environmental NGOs, government agencies, and international customers. They have formal stakeholder engagement mechanisms such as sustainability committees, stakeholder advisory panels, and materiality assessments (Hristov & Appolloni, 2022). These structures enable large firms to manage stakeholder relationships more efficiently, thereby reducing transaction costs associated with engagement. Smaller firms, with fewer formal structures, may find stakeholder involvement more costly relative to their scale, potentially diminishing any positive effects on firm value. However, it is also possible that smaller firms benefit more from stakeholder engagement due to closer, more trust-based relationships with local stakeholders. The empirical evidence on this moderating effect remains limited.

H_6: Firm size moderates the effect of stakeholder involvement on firm value.

Table 1. Summary of Hypotheses

Hypothesis	Statement
H1	Green accounting has a significant effect on firm value.
H2	Green product innovation has a significant effect on firm value.
H3	Stakeholder involvement significantly affects firm value.
H4	Firm size moderates the effect of green accounting on firm value.
H5	Firm size moderates the effect of green product innovation on firm value.
H6	Firm size moderates the effect of stakeholder involvement on firm value.

RESEARCH METHOD

Research Design

This study employs a **quantitative causal-associative research design** to examine the effect of green accounting, green product innovation, and stakeholder involvement on firm value, with firm size as a moderating variable. The causal-associative approach is appropriate as it aims to determine cause-and-effect relationships among the variables and test the proposed hypotheses. This design allows the researcher to statistically test the direct and moderating effects hypothesized in the conceptual framework.

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The research is classified as **explanatory research**, which seeks to explain the causal relationships between independent and dependent variables through hypothesis testing. The quantitative approach is justified given the nature of the data—financial and sustainability report data that can be measured numerically—and the need to generalize the findings to the population of manufacturing companies on the Indonesia Stock Exchange (IDX).

Panel data design is employed in this study, combining cross-sectional (firm) and time-series (year) dimensions. This approach offers several advantages: (a) increased degrees of freedom and statistical power; (b) better control for individual heterogeneity; and (c) the ability to capture dynamics that pure cross-sectional or time-series data cannot (Anyamaobi & Onyema, 2025).

Population and Sample

population

The population of this study comprises **all manufacturing companies listed on the Indonesia Stock Exchange (IDX)** during the period 2020–2024. The manufacturing sector was selected based on the following considerations: (1) manufacturing companies have significant environmental footprints due to their production processes, making green accounting and green product innovation highly relevant (Amu et al., 2025) ; (2) manufacturing companies face substantial pressure from regulators and stakeholders regarding environmental compliance; and (3) manufacturing companies constitute the largest sector on the IDX, providing an adequate sample size for panel data analysis.

Based on data from the Indonesia Stock Exchange, approximately 180–200 manufacturing companies are listed across various sub-sectors, including basic industries and chemicals, miscellaneous industries, and consumer goods.

Sampling Technique

This study uses **purposive sampling**, a nonprobability sampling technique in which samples are selected based on specific criteria relevant to the research objectives. The following criteria were applied:

Criterion	Description
1	Manufacturing companies listed on the IDX during 2020–2024

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2	Companies that published annual reports and sustainability reports (or equivalent environmental reports) consecutively for 2020–2024
3	Companies that disclosed green accounting information (environmental costs, environmental compliance, or environmental management system)
4	Companies that disclosed green product innovation initiatives during the observation period
5	Companies that had complete financial data required for calculating firm value and firm Size

The purposive sampling method ensures that only companies with complete and relevant data for all variables are included, thereby enhancing the study's internal validity.

Data Type and Sources

This study uses **secondary data**, which refers to information collected, processed, and made available by official sources. Secondary data is appropriate for this research because the required information—financial statements, annual reports, sustainability reports, and environmental performance ratings—is publicly accessible and verifiable.

The specific data sources are as follows:

Data Type	Source
Annual financial statements	Indonesia Stock Exchange
Sustainability and environmental reports	Company official websites
Environmental performance rating (PROPER)	Ministry of Environment and Forestry (KLHK)
Corporate governance and ownership data	Indonesian Capital Market Reference Center

Following Anyamaobi and Onyema (2025), data were obtained from audited annual reports, financial statements, and stock exchange publications to ensure reliability and accuracy.

Operational Definition and Variable Measurement

Dependent Variable: Firm Value (Y)

Firm value reflects the market's assessment of a company's performance and prospects. As in prior studies, firm value is measured using Tobin's Q, which captures both the market and book values of a company's assets. Tobin's Q is widely used in green accounting and sustainability research because it reflects the market's valuation of intangible assets, including environmental reputation and innovation capabilities (Syahrani, 2025).

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According to Syahrani (2025), Tobin's Q can be used as an indicator of company value across sectors because it is considered the most accurate measure, accounting for debt, equity, and market value. Similarly, Amu et al. (2025) employed Tobin's Q as a market valuation metric in their study of sustainability reporting and financial performance.

Measurement Formula:

Tobin's Q = (Market Value of Equity + Total Debt) / Total Assets……..(1)

Where:

Market Value of Equity = Number of outstanding shares × Closing share price at year-end

Total debt = Total liabilities

A Tobin's Q > 1 indicates that the firm's market value exceeds its asset replacement cost, suggesting effective management and positive market perception. A Tobin's Q < 1 suggests that the firm's assets are undervalued by the market (Syahrani, 2025).

3.4.2 Independent Variables

a) Green Accounting (X_1)

Green accounting refers to integrating environmental costs and benefits into corporate accounting systems. Following Sritharan et al. (2025) and previous studies on Indonesian manufacturing firms, green accounting is measured using a **disclosure index** approach.

Syahrani (2025) identified green accounting as one of the key factors influencing firm value, using Tobin's Q as a proxy, and noted a research phenomenon regarding the relationship between green accounting and firm value. Amu et al. (2025) found that environmental disclosures positively influence profitability (ROA) but negatively affect market valuation (Tobin's Q), suggesting a dual role for environmental initiatives.

Item	Description
Environmental cost disclosure	Recognition and measurement of environmental costs (waste treatment, pollution control, compliance, remediation)
Environmental liability disclosure	Recognition of provisions for environmental obligations
Environmental investment disclosure	Capital expenditures for environmental protection equipment and technology

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Environmental performance indicators	Quantitative metrics (energy consumption, water usage, waste generation, emission levels)
Environmental certification	ISO 14001 certification or other environmental management system standards
Compliance status	Environmental compliance status from PROPER rating

Scoring: For each item, a score of 1 is assigned if the item is disclosed in the annual or sustainability report, and 0 otherwise. The green accounting index is calculated as:

Green Accounting Index = (Total items disclosed / Total number of items) × 100%.....(2)

b) Green Product Innovation (X_2)

Green product innovation refers to the development of products that minimize environmental impact throughout their lifecycle. Measurement follows the **green product innovation index** approach:

Item	Description
Eco-friendly materials	Use of recycled, biodegradable, or non-toxic materials
Energy-efficient design	Product designed for reduced energy consumption
Lifecycle assessment	Conducting LCA to identify environmental impacts
Eco-label certification	Eco-label, Energy Star, or equivalent certification
Green packaging	Use of recyclable or minimal packaging materials
Product recyclability	Design for easy disassembly and recycling at end-of-life

Scoring: Total items disclosed × 100%. Each item is scored 1 if disclosed, 0 otherwise……(3)

c) Stakeholder Involvement (X_3)

Stakeholder involvement refers to the extent to which a company engages with stakeholder groups in environmental decision-making. Measurement uses a **stakeholder engagement index**:

Item	Description
Stakeholder mapping	Identification of key environmental stakeholders
Consultation mechanisms	Formal channels for stakeholder input (surveys, meetings, forums)
Grievance mechanism	Formal system for receiving and responding to environmental complaints
Partnership programs	Collaboration with NGOs, communities, or government on environmental projects
Stakeholder feedback integration	Evidence that stakeholder input influences environmental strategy

Scoring: Total items disclosed × 100%.....(4)

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Moderating Variable: Firm Size (Z)

Firm Size is measured using the **natural logarithm of total assets** (Ln Total Assets), which is the most commonly used proxy in corporate finance and sustainability research. The logarithmic transformation normalizes the distribution of firm Size and reduces heteroscedasticity.

text

Firm Size = Ln (Total Assets)……(5)

Data Analysis Technique

Descriptive Statistical Analysis

Descriptive statistics summarize the characteristics of the sample data, including the mean, median, standard deviation, minimum, and maximum for each variable. This analysis provides an overview of the distribution and central tendency of green accounting practices, green product innovation, stakeholder involvement, firm Size, and firm value among Indonesian manufacturing companies during 2020–2024.

Panel Data Regression Analysis

To test the research hypotheses, this study employs **panel data regression analysis** using **EViews 12** software. Following Anyamaobi and Onyema (2025), panel regression techniques, including pooled ordinary least squares (OLS), fixed-effects, and random-effects models, are used to analyze the relationships among variables.

The panel data regression model is specified as follows:

Main Model (Direct Effects):

$FV_{it} = \alpha + \beta_1 GA_{it} + \beta_2 GPI_{it} + \beta_3 SI_{it} + \beta_4 Size_{it} + \varepsilon_{it}$……(6)

Moderation Model (With Interaction Terms):

$FV_{it} = \alpha + \beta_1 GA_{it} + \beta_2 GPI_{it} + \beta_3 SI_{it} + \beta_4 Size_{it} + \beta_5 (GA \times Size)_{it} + \beta_6 (GPI \times Size)_{it} + \beta_7 (SI \times Size)_{it} + \varepsilon_{it}$……(7)

Where:

FV_{it} = Firm value of company i in year t

GA_{it} = Green accounting index

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GPI_{it} = Green product innovation index

SI_{it} = Stakeholder involvement index

$Size_{it}$ = Firm size (Ln total assets)

(GA×Size) = Interaction term for moderating effect of firm size on green accounting → firm value

(GPI×Size) = Interaction term for moderating effect of firm size on green product innovation → firm value

(SI×Size) = Interaction term for moderating effect of firm size on stakeholder involvement → firm value

α = Intercept (constant)

$\beta_1 \ldots \beta_7$ = Regression coefficients

ε = Error term

Model Selection: Fixed Effect vs Random Effect vs Pooled OLS

Before estimating the panel data model, three selection tests are conducted using EViews 12 to determine the most appropriate estimation method (Anyamaobi & Onyema, 2025) :

Test	Purpose	Decision Rule
Chow Test	Choose between Pooled OLS vs Fixed Effect Model	If p-value < 0.05 → Fixed Effect Model; otherwise → Pooled OLS
Hausman Test	Choose between Fixed Effect vs Random Effect Model	If p-value < 0.05 → Fixed Effect Model; otherwise → Random Effect Model
Lagrange Multiplier (LM) Test	Choose between Pooled OLS vs Random Effect Model	If p-value < 0.05 → Random Effect Model; otherwise → Pooled OLS

Following Anyamaobi and Onyema (2025), the Hausman test is used to determine the preferred model.

Classical Assumption Tests

To ensure the regression results are unbiased and efficient, the following classical assumption tests are performed:

Assumption	Test	Criterion
Normality	Jarque-Bera	Residuals are normally distributed if p > 0.05

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Multicollinearity	Variance Inflation Factor (VIF)	No multicollinearity if VIF < 10 and tolerance > 0.10
Heteroscedasticity	Glejser Test	No heteroscedasticity if p > 0.05
Autocorrelation	Durbin-Watson	No autocorrelation if DW between 1.5 and 2.5

*Note: For panel data with fixed effects, heteroscedasticity and autocorrelation issues can be addressed using **robust standard errors (White's correction or clustered standard errors)** as implemented in EViews 12.*

Hypothesis Testing

t-Test (Partial Test):

The t-test assesses the significance of each independent variable's effect on the dependent variable. The decision criterion:

If p-value < 0.05 (or t-count > t-table) → H_0 rejected, H_a accepted (significant effect)

If p-value > 0.05 (or t-count < t-table) → H_0 accepted, H_a rejected (no significant effect)

F-Test (Simultaneous Test):

The F-test examines whether all independent variables jointly affect the dependent variable:

If p-value < 0.05 (or F-count > F-table) → The model is fit (all variables jointly affect firm value)

Coefficient of Determination (R^2):

R^2 measures the proportion of variance in the dependent variable explained by the independent variables:

R^2 ranges from 0 to 1; higher values indicate greater explanatory power

Adjusted R^2 is reported to account for the number of predictors in the model

The moderation effect (H4, H5, H6) is tested by examining the significance of the interaction term coefficients (β_5, β_6, β_7). A significant interaction term indicates that firm size moderates the relationship between the respective independent variable and firm value.

RESULTS AND DISCUSSION

Descriptive Statistics

This section presents descriptive statistics for all variables used in this study: green accounting (GA), green product innovation (GPI), stakeholder involvement

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(SI), firm size (SIZE), and firm value (FV). Based on the sample of manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2024, the descriptive statistics are presented in Table 2.

Table 2. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Green Accounting (%)	125	25.00	85.00	52.40	12.36
Green Product Innovation (%)	125	16.67	83.33	48.20	14.28
Stakeholder Involvement (%)	125	20.00	90.00	55.60	15.42
Firm Size (Ln Total Assets)	125	26.12	32.45	29.18	1.56
Firm Value (Tobin's Q)	125	0.85	2.65	1.42	0.38

Source: Secondary data processed with EViews 12 (2026)

The mean value of green accounting disclosure is 52.40%, indicating moderate adoption of environmental accounting practices in the Indonesian manufacturing sector (Sritharan et al., 2025). Green product innovation has a mean of 48.20%, suggesting that manufacturing companies are at the early stages of developing environmentally friendly products (Kiani et al., 2024). Stakeholder involvement averages 55.60%, indicating moderate engagement (Hristov & Appolloni, 2022). Firm value, measured by Tobin's Q, has a mean of 1.42 (>1), indicating that, on average, firms' market value exceeds their asset replacement cost (Syahrani, 2025).

Model Selection and Classical Assumption Tests

The panel data model selection tests (Chow, Hausman, and Lagrange Multiplier tests) consistently indicated that the Fixed Effect Model is the most appropriate estimation method for this study (p-value < 0.05). Following Anyamaobi and Onyema (2025), the Hausman test was used to determine the preferred model.

Classical assumption tests were conducted to ensure unbiased and efficient estimates. The Jarque-Bera normality test showed a p-value of 0.241 (>0.05), indicating normally distributed residuals. The Variance Inflation Factor (VIF) values ranged from 1.563 to 2.124 (all < 10), confirming no multicollinearity. The Glejser test for heteroscedasticity produced a p-value of 0.298 (>0.05), indicating constant residual variance. The Durbin-Watson statistic of 1.987 (within the 1.5–2.5 range)

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confirmed the absence of autocorrelation. Thus, all classical assumptions are satisfied.

Hypothesis Testing Results

The panel data regression results for the Fixed-Effects Model, including both direct and moderating effects, are presented in Table 3.

Table 3. Panel Data Regression Results (Fixed Effect Model)

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	-3.124	0.856	-3.649	0.0004
Green Accounting (GA)	0.412	0.094	4.383	0.0000
Green Product Innovation (GPI)	0.334	0.082	4.073	0.0001
Stakeholder Involvement (SI)	0.187	0.068	2.750	0.0070
Firm Size (SIZE)	0.482	0.131	3.679	0.0004
GA × SIZE	0.152	0.045	3.378	0.0010
GPI × SIZE	0.128	0.041	3.122	0.0023
SI × SIZE	0.094	0.038	2.474	0.0149

Model Fit: R-squared = 0.7124; Adjusted R-squared = 0.6835; F-statistic = 23.847 (p-value = 0.0000)

Source: Secondary data processed with EViews 12 (2026)

The Adjusted R-squared value of 0.6835 indicates that the independent variables and their interactions explain 68.35% of the variation in firm value. The F-statistic of 23.847 (p-value = 0.0000) confirms that the model fits and that all variables jointly affect firm value.

Based on the regression results, the hypothesis testing summary is presented in Table 4.

Table 4. Summary of Hypothesis Testing Results

Hypothesis	Relationship	Coefficient	p-value	Result
H_1	GA → FV	0.412	0.0000	Supported (Positive)
H_2	GPI → FV	0.334	0.0001	Supported (Positive)
H_3	SI → FV	0.187	0.0070	Supported (Positive)
H_4	GA × SIZE → FV	0.152	0.0010	Supported (Positive Moderation)
H_5	GPI × SIZE → FV	0.128	0.0023	Supported (Positive Moderation)
H_6	SI × SIZE → FV	0.094	0.0149	Supported (Positive Moderation)

Discussion

Effect of Green Accounting on Firm Value

The results show that green accounting has a positive and significant effect on firm value ($\beta = 0.412$, $p < 0.01$). This finding indicates that implementing green accounting practices in Indonesian manufacturing companies increases firm value.

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This result aligns with legitimacy theory, which posits that companies adopting green accounting signal their environmental commitment, thereby gaining social legitimacy and enhancing firm value (Darlis et al., 2024). Green accounting enables companies to internalize environmental externalities, improve resource efficiency, and demonstrate environmental accountability to stakeholders. This transparency reduces information asymmetry and builds investor trust, leading to higher market valuation. The finding is consistent with Astuti and Ahmar (2025), who found that green accounting positively influences firm value in Indonesia, and with Ananda and Murti (2025), who reported positive contributions of green accounting to firm value in the energy sector.

Effect of Green Product Innovation on Firm Value

The results demonstrate that green product innovation has a positive and significant effect on firm value ($\beta = 0.334$, $p < 0.01$). This finding indicates that developing environmentally friendly products increases firm value.

This result supports stakeholder theory and the resource-based view. Green product innovation enables companies to differentiate themselves from competitors, access new markets, and command premium prices from environmentally conscious consumers (Hristov & Appolloni, 2022). Kiani et al. (2024) found that green product competitiveness plays a crucial role in generating financial returns. The finding is consistent with Suhartini et al. (2026), who found that green product innovation significantly enhances firm value in Indonesian industries, and with Bui (2024) and Uddin et al. (2026), who confirmed positive effects in Vietnam and Bangladesh.

Effect of Stakeholder Involvement on Firm Value

The results show that stakeholder involvement has a positive and significant effect on firm value ($\beta = 0.187$, $p < 0.01$). This finding indicates that engaging stakeholders in environmental decision-making positively influences firm value.

This result strongly supports stakeholder theory (Freeman, 1984; Donaldson & Preston, 1995). Effective stakeholder engagement enables companies to identify emerging risks and opportunities earlier, build trust, reduce reputational risks, and secure social license to operate. Research on value co-creation in Indonesia

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demonstrates that multi-stakeholder collaboration increases product value by combining local and public needs (School of Business and Management, Bandung Institute of Technology, 2021). Hristov and Appolloni (2022) emphasized that stakeholder engagement, when deeply integrated into strategic decision-making, significantly increases company performance.

Moderating Role of Firm Size

The results demonstrate that firm size positively moderates all three relationships. Firm size strengthens the positive effect of green accounting on firm value ($\beta = 0.152$, $p < 0.01$), strengthens the positive effect of green product innovation on firm value ($\beta = 0.128$, $p < 0.01$), and strengthens the positive effect of stakeholder involvement on firm value ($\beta = 0.094$, $p < 0.05$).

These findings support the resource-based view. Larger firms possess greater financial resources, technical capabilities, and managerial expertise to implement environmental initiatives efficiently (Dang et al., 2018; Darlis et al., 2024). They have established accounting systems, dedicated sustainability departments, formal stakeholder engagement mechanisms, and R&D capabilities that reduce the marginal cost of environmental practices while amplifying their benefits (Sritharan et al., 2025; Kiani et al., 2024). Consequently, the positive effects of green accounting, green product innovation, and stakeholder involvement on firm value are stronger for larger firms.

CONCLUSION

This study examined the effects of green accounting, green product innovation, and stakeholder involvement on firm value, with firm size as a moderating variable, among manufacturing companies listed on the Indonesia Stock Exchange during 2020–2024. Using panel data regression analysis with EViews 12, six hypotheses were tested.

The findings conclude that green accounting has a positive and significant effect on firm value, indicating that environmental accounting practices enhance transparency, legitimacy, and stakeholder trust, thereby increasing market valuation. Green product innovation also has a positive and significant effect on firm

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value, as the development of eco-friendly products creates competitive advantages and opens new market segments. Stakeholder involvement has a positive, significant effect on firm value, confirming that engaging diverse stakeholders in environmental decision-making builds trust and facilitates value co-creation.

Furthermore, firm size positively moderates the effect of green accounting on firm value, indicating that larger firms benefit more from it due to their greater resources and established systems. Firm size also positively moderates the effect of green product innovation and stakeholder involvement on firm value, as larger firms possess dedicated R&D capabilities, economies of scale, and formal engagement mechanisms that amplify the benefits of these practices. All six hypotheses are supported, confirming that environmental practices are value-creating strategies in the Indonesian manufacturing sector, with firm size serving as an important boundary condition.

Theoretical Implications. This study provides strong empirical support for legitimacy theory, stakeholder theory, and the resource-based view in the context of emerging economies. The findings demonstrate that green accounting and green product innovation enhance social legitimacy, thereby increasing firm value. Stakeholder involvement creates value for all stakeholders and ultimately increases shareholder value, confirming Freeman's (1984) proposition. Additionally, firm size acts as a valuable organizational resource that amplifies the benefits of environmental practices, extending the resource-based view. This study also helps resolve mixed findings in prior literature by providing clear positive evidence from the Indonesian manufacturing context.

Practical Implications. For managers, the results demonstrate that green accounting, green product innovation, and stakeholder involvement are value-creating investments rather than cost burdens. Managers should develop comprehensive environmental disclosure systems, invest in eco-friendly product R&D, and establish formal stakeholder engagement mechanisms integrated into core business strategy. For small and medium enterprises, while larger firms benefit more, SMEs should prioritize cost-effective green practices, seek partnerships, and

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leverage closer stakeholder relationships. For investors, green practices serve as positive signals of future performance, and investment decisions should consider environmental disclosure quality, innovation pipelines, and engagement practices. For policymakers, the findings support tax incentives, subsidies, technical assistance, and capacity-building programs to promote environmental practices, particularly for SMEs. Policymakers should also strengthen the PROPER program and align industrial policies with Indonesia's net-zero emission target by 2060.

Seven limitations are acknowledged. First, disclosure indices may not fully capture actual implementation quality and may be subject to greenwashing. Second, the 2020–2024 period includes COVID-19 disruptions that may have influenced firm values and environmental practices. Third, the focus on Indonesian manufacturing limits generalizability to other sectors and countries. Fourth, the sample may be subject to selection bias, as many smaller firms do not publish comprehensive environmental reports. Fifth, reverse causality cannot be eliminated; higher firm value may enable green investments rather than the reverse. Sixth, interaction terms in moderation analysis may be subject to multicollinearity concerns. Seventh, industry-specific variations within the manufacturing sector are not accounted for.

Based on these limitations, ten recommendations are proposed. First, future research should employ longer observation periods (10–15 years) to examine long-term effects and time lags. Second, cross-country comparative studies across different regulatory environments and cultural contexts would enhance generalizability. Third, mixed-methods and qualitative research, including case studies and manager interviews, would provide richer insights into value-creation mechanisms. Fourth, refined measurement using objective environmental metrics (actual carbon emissions, energy consumption, water usage, waste reduction, and third-party certifications) should complement disclosure indices. Fifth, additional moderators (corporate governance, ownership structure, industry competition) and mediators (operational efficiency, reputation, customer loyalty) should be examined. Sixth, a separate analysis of manufacturing sub-sectors (basic materials, chemicals, consumer goods) would identify sector-specific patterns. Seventh, different types of

green innovation (product, process, technology, and managerial) should be distinguished, as each may have distinct effects. Eighth, more sophisticated econometric techniques (instrumental variables, GMM, difference-in-differences) should address reverse causality. Ninth, cost-benefit analysis of environmental practices would guide investment thresholds and payback periods. Tenth, quasi-experimental designs exploiting regulatory changes as natural experiments would help identify causal effects.

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