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Enhancing green innovation and financial performance: the role of stakeholder pressures and green dynamic capabilities

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The present study focuses on stakeholder pressures and the green dynamic capabilities of achieving green innovation and financial performance in various sectors in Indonesia. Data were collected from 120 top management representing their companies involved in this study, and path analysis was applied to test the hypothesis. The study results reveal that stakeholder pressures strengthen organizational green dynamic capabilities and innovation. Moreover, the study finds that stakeholder pressures significantly and positively predict green innovation through green dynamic capabilities and corporate financial performance through sequential mediation involving both green dynamic capabilities and green innovation. This study underscores the significance of green initiatives across various sectors, positioning them as essential components of corporate strategy in the modern business landscape.

KEYWORDS

stakeholder pressure, green dynamic capabilities, green innovation, financial performance, business entities, firm size

1 Introduction

Over the past decade, there has been a notable increase in scholarly and professional attention toward environmental safety, which aligns closely with the Sustainable Development Goals (SDGs) established by the United Nations (Nilsson et al., 2016). This campaign emphasizes organizations' need to adopt sustainable practices that meet regulatory requirements and address broader societal expectations regarding environmental stewardship. The green environment campaign began to be considered important by companies in their operational and management activities as a step to contribute to the campaign to promote environmental quality improvement. Similarly, consumers increasingly value sustainability and green practices such as energy efficiency, waste reduction, and environmental management systems, which can significantly enhance a company's market share and customer loyalty (Alkhodary, 2023). Hence, environmentally oriented in business practices are considered a strategic tool to achieve a higher financial performance and competitive advantage (Al-Qudah et al., 2022; Chen et al., 2006; Qiu et al., 2020; Shuwaikh et al., 2023).

Prior researchers have agreed that green innovation has a primary focus on mitigating environmental pollution and reducing conserving natural resources, which have an impact on environmental damage (Wang, 2011). This action promotes sustainable development by ensuring that economic activities have as little environmental impact as possible. Green innovation can further open up new markets for ecofriendly products (Shuwaikh et al., 2023), while reducing waste and energy consumption costs. Various governments also support campaigns for green innovation implementations by tightening all environmental regulations

and sanctioning companies that violate regulations (Doran et al., 2023). In addition to pressure from the government, companies face pressure from consumers who are increasingly aware and want environmentally friendly products (Melander, 2018). Hence, companies are faced with external (i.e., environmental regulations, market pressures, and societal expectations) and internal (i.e., organizational characteristics, such as a commitment to sustainability, human, financial, and technological capital) pressures to adopt green innovations (Domadenik et al., 2020; Li M. et al., 2022; Thi Ngoc Thuyen and Nhu Bich, 2024).

The present study aims to explain the performance of green innovation through stakeholder pressure and dynamic green capability and how green innovation affects financial performance. First, several studies have been conducted on stakeholder pressures and green innovation relationship (Baah et al., 2021; Li et al., 2017; Ma and Chen, 2025; Sahoo, 2024; Singh et al., 2022; Wang et al., 2022). However, considering the novelty of the green innovation issue, most of the research is still concentrated in specific regions, such as China, India, Malaysia, and Ghana, which may limit the generalizability of findings to other regions (Baah et al., 2021; Ma and Chen, 2025; Sahoo, 2024; Wang et al., 2022). Moreover, most prior studies focus on manufacturing sectors, potentially overlooking insights from other industries (Ma and Chen, 2025; Sahoo, 2024; Singh et al., 2022). In other words, more empirical studies are needed to validate the current findings, particularly in diverse geographical and industrial contexts (Adnan et al., 2025). Thus, this study aims to bridge this literature gap by taking various sectors (i.e., manufacturing, finance and insurance, general trading and maintenance, and health service) in Indonesia to expand cross-sector generalization. Furthermore, the current study extends the research of Wang et al. (2022), who took two sectors (e.g., manufacturing and service) and firm size as control variables. The present study covers more sectors and uses firm size and entity (local and foreign corporates) as control variables to study green innovation and financial performance in the context of stakeholder pressures and green dynamic capabilities. Therefore, it provides a more comprehensive explanation and robust results on the relationship between variables.

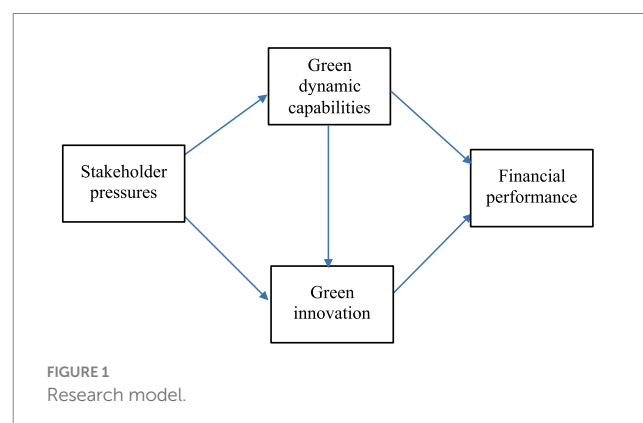
Second, the present study addresses a literature gap regarding the ambiguous relationship between stakeholder pressures, green innovation, and financial performance. For instance, several studies indicate that green innovation can improve firm performance by enhancing reputation and environmental performance, ultimately leading to financial benefits (Baah et al., 2021; Ha and Nguyen, 2022; Liu L. et al., 2024; Liu M. et al., 2024; Singh et al., 2022). In contrast, other studies have revealed a negative relationship between green innovation and financial performance, where implementing green innovation requires significant technological investments, which can strain financial resources, increase operational risk, and negatively impact short-term financial performance (Ai et al., 2024; Casciello et al., 2024; Khan et al., 2021; Xie et al., 2022). Another study categorized two types of green innovations that improve environmental performance, but their impact on financial performance varies. Substantive green innovation significantly improves financial performance, while strategic green innovation has the opposite effect (Liu L. et al., 2024; Liu M. et al., 2024). Moreover, a meta-analysis reveals that the link between green innovation and financial performance is more dominant in fast-paced, close-to-consumer industries and countries with low corruption (Yi et al.,

2023). Hence, the current study contributes to resolving inconsistencies in the existing literature and provides valuable insights for practitioners to navigate the multifaceted challenges of financial performance in their green strategies.

In short, this study seeks to investigate (1) the direct relationship between stakeholder pressures and both green dynamic capabilities and green innovation, (2) the indirect relationship between stakeholder pressures and green innovation mediated by green dynamic capabilities, and (3) the indirect relationship between stakeholder pressures and financial performance through a sequential mediation model that includes green dynamic capabilities and green innovation. In general, the results of this study provide a more comprehensive explanation of how stakeholder pressure can influence green dynamic capability and green innovation in organizations, as well as its impact on financial performance, especially in Indonesia.

2 Literature review and hypothesis development

This study uses two theories to explain the proposed model (Figure 1). First, institutional theory (Meyer and Rowan, 1977) elucidates how external pressures drive corporate sustainability practices. Formal institutions, through green financial policies and regulatory frameworks, create normative and coercive pressures that incentivize firms to improve their financial performance (Lei and Yu, 2024; Wang and Xu, 2025). This institutional perspective highlights how macro-level actors and policies shape organizational behavior toward sustainability. Complementing institutional theory, the Resource Based View (RBV) (Barney, 1991) emphasizes internal firm-specific factors that enable green implementation. Firms that strategically allocate resources toward ESG practices mitigate financing constraints and build unique capabilities in green technologies (Li and Li, 2025; Mohy-ud-Din, 2024). From clean production processes to sustainable supply chain management, these capabilities become valuable, rare, and imperfectly imitable resources that confer long-term competitive advantage (Barney, 1991). RBV thus explains heterogeneity in green innovation adoption, as firms with superior resource management can transform sustainability investments into market differentiation. These theories provide a multi-level framework: Institutional Theory explains why firms pursue green implementation (external legitimacy, stakeholder pressure). In contrast, RBV explains how they successfully implement it (internal



capabilities: green dynamic capability and green innovation). This synergy is critical for understanding how policy interventions (e.g., green subsidies) and firm-level resource mobilization jointly advance corporate sustainability transitions.

2.1 Stakeholder pressure

Stakeholder pressure encompasses the multifaceted influences exerted by diverse internal and external groups with vested interests in organizational conduct and outcomes, including employees, management, customers, suppliers, regulators, and communities (Mungai et al., 2023; Wang et al., 2020). These pressures manifest through four primary channels: (1) *internal pressure* from organizational members, particularly leadership and staff, which drives environmental strategy formulation and implementation; (2) *coercive pressure* imposed by regulatory bodies through legislation, penalties, and compliance mandates (Wang et al., 2020); (3) *market pressure* from competitive forces, supply chain partners, and consumer demands that shape strategic positioning (Mousavi and Mousavi, 2023); and (4) *social pressure* from civil society, media, and public sentiment, which increasingly influences corporate reputation and legitimacy (Wang et al., 2020). Collectively, these pressures create an institutional ecosystem that compels organizations to adopt sustainable practices while balancing competing stakeholder expectations.

2.2 Green dynamic capabilities

Green dynamic capabilities represent an organization's strategic capacity to systematically integrate, reconfigure, and upgrade internal and external resources to address environmental sustainability challenges (Teece, 2007, 2014). These meta-capabilities serve as critical drivers for green innovation and sustainable performance enhancement across industries, manifesting through three interdependent dimensions: (1) resource integration - the strategic combination and deployment of green assets and stakeholder knowledge (Abbas, 2024; Li, 2022); (2) environmental insight - the ability to anticipate and adapt to ecological trends, regulatory changes, and sustainability market signals (Abbas, 2024; Li, 2022); and (3) organizational learning - the mechanisms for absorbing, recombining, and applying green knowledge to foster continuous eco-innovation (Amaranti et al., 2019). These components enable firms to transform environmental constraints into sustainable competitive advantages while maintaining dynamic alignment with evolving ecological demands.

2.3 Green innovation

The foundations of green innovation emerged alongside the late 20th-century concept of sustainable development, initially focusing on technologies to reduce environmental impact and improve resource efficiency (Tambovceva et al., 2019; Xu et al., 2019). Early terminology, such as “eco-innovation” and “environmental innovation,” highlighted different aspects of this movement. However, these terms gradually converged under the broader umbrella of green

innovation, encompassing products, processes, and societal awareness (Liu and Ho, 2018; Martínez-Falcó et al., 2024). Green Innovation encompasses developing and implementing environmentally sustainable solutions across products, processes, services, and systems. Synthesizing existing definitions, green innovation is a strategic organizational effort to harmonize economic objectives with ecological and social sustainability (Marco-Lajara et al., 2023; Martínez-Falcó et al., 2024).

The literature converges on three core dimensions of green innovation: (1) product-oriented innovation, which focuses on designing goods with reduced environmental footprints (Thomas et al., 2022); (2) process-oriented innovation, involving cleaner production methods that enhance resource efficiency and minimize pollution (Xu et al., 2019); and (3) systemic innovation, which integrates ecological principles into broader business models and value chains to drive sustainable development (Xu et al., 2019). Collectively, these dimensions aim to address pressing environmental challenges while maintaining competitiveness. A unifying theme across studies is the emphasis on intergenerational equity—green innovation seeks to mitigate immediate environmental harm and ensure long-term wellbeing by preserving natural resources for future societies (Gugissa et al., 2021). Hence, green innovation is viewed as a multidimensional construct that bridges technical advancements, organizational strategies, and societal benefits.

Despite its transformative potential, the innovation adoption process has historically been protracted, marked by multi-stage development and gradual market penetration. For example, technological milestones—from Edison's light bulb to digital cameras—illustrate that innovations universally progress through iterative phases (e.g., conceptualization, gestation, and incubation) before achieving commercial viability (Graßhoff, 2021; Namatame et al., 2009). Furthermore, the impact of innovation sometimes takes time to manifest. It may have undesirable effects, especially in the context of technological innovation (Warburton, 2021). Copying and disseminating existing technologies proved more viable than creating new ones, making diffusion the cornerstone of successful technical advances (Warburton, 2021). Moreover, successful innovation requires striking a balance between technical advancement and market acceptance, necessitating iterative design adjustments (Graßhoff, 2021). In the same vein, market validation is highly time-sensitive, as seen in the volatile financial performance of green technologies (Desalegn and Tangl, 2022). For example, a study reports that the impact of green innovation on financial performance can vary over time; a positive and significant impact was only found in the short run, but an insignificant effect was observed in the long run (Desalegn and Tangl, 2022). Similarly, proactive green product innovation improves long-term financial performance but does not improve short-term performance (Qing et al., 2022). Another study employing a longitudinal design found that an excessive focus on green innovation hurts accounting and stock market performance (Przychodzen et al., 2020).

Furthermore, a critical barrier is the resource and capability gap—transitioning to sustainable practices often demands new competencies, technologies, and infrastructure that diverge from existing organizational capabilities (Calza et al., 2017). This challenge is exacerbated in developing countries, where supplier firms struggle with inadequate technological, financial, and institutional support, alongside pressure from buyer firms to adopt green strategy (Khattak,

2019). Financial and economic constraints further hinder green strategy adoption. High upfront costs and unpredictable returns discourage organizations, tiny and medium-sized enterprises (SMEs) with limited financial resources (Grant and Marshburn, 2014; Khan et al., 2023; Wang et al., 2023). The issue is intensified by insufficient dedication from management, as limited support from senior leaders obstructs strategic alignment and employee involvement, both essential for successful green implementation (Jóhannsdóttir et al., 2015; Khan et al., 2023). Finally, technological inadequacies pose a persistent obstacle. Many firms lack the infrastructure or expertise to develop or integrate green solutions, creating a reliance on external knowledge partners—a dependency that may not be feasible for all organizations (Calza et al., 2017; Khan et al., 2023).

2.4 The relationship between stakeholder pressure and green dynamic capabilities

Green dynamic capability refers to a firm's ability to integrate, build, and reconfigure internal and external resources to address environmental sustainability challenges. This capability enables firms to adapt their business processes and innovate in response to environmental issues, thereby contributing to sustainable development and competitive advantage (Borah et al., 2025; Li, 2022; Singh et al., 2022). On the other hand, stakeholder pressures, including those from customers, competitors, regulations from the government, and the general public, can play an important role in forming a company's dynamic capabilities as an adaptive response from a company. The impact of stakeholder pressures on green dynamic capabilities can be explained based on several reasons: First, stakeholder pressures can directly influence the development of green dynamic capabilities by compelling firms to integrate environmental considerations into their strategies and operations (Huang et al., 2024; Sahoo, 2024; Singh et al., 2022; Yu and Ramanathan, 2015). Second, government regulations can enforce stricter environmental standards, prompting firms to enhance their green dynamic capabilities (Ma and Chen, 2025; Zhang and Zhu, 2019). Third, stakeholder pressures in the context of consumer demand for sustainable products drive firms to innovate and improve their green practices (Cheng et al., 2025; Huang et al., 2024). Hence, stakeholder pressure is a key factor in forming green dynamic capability. The hypothesis proposed is:

H1: Stakeholder pressures positively related to green dynamic capabilities

2.5 The relationship between stakeholder pressure and green innovation

The following hypothesis proposed is that stakeholder pressure significantly influences green innovation. Firms adopt green technologies primarily for cost savings, competitive advantage (eco-efficiency/effectiveness), and environmental responsibility. Early adopters often achieve favourable outcomes, creating peer pressure for industry-wide adoption (Ashton et al., 2017; Molla and Abareshi, 2012). At the same time, pollution prevention investments can enhance both ecological and financial performance (Molla and Abareshi, 2012). Governments play a dual role: enforcing regulations (e.g., carbon

emission limits) and incentivising adoption through subsidies, particularly for small and medium-sized enterprises (SMEs), as part of national green growth strategies (Lee et al., 2015; Priyan, 2023). Simultaneously, consumer demand for sustainable products, including a willingness to pay premiums for green buildings, pushes firms toward eco-innovation (Chatterjee and Sur, 2025; Li T. et al., 2022). In sum, these drivers, including economic, regulatory, and market-based, create a synergistic ecosystem to align preferences and encourage firms to enhance the adoption of green technologies. Additionally, it is anticipated that in contexts such as China, green competition will emerge as the most influential factor driving green innovation practices, outpacing formal institutions, informal institutions, and customer green demands as motivating forces for firms to engage in sustainable practices (Adomako et al., 2023; Chen and Liang, 2023; Kawai et al., 2018; Sahoo, 2024; Zewen et al., 2017). The hypothesis proposed is:

H2: Stakeholder pressures positively related to green innovation

2.6 The relationship between green dynamic capabilities and green innovation

Green innovation involves creating and applying products, processes, and practices designed to reduce environmental harm and foster sustainability substantially. This strategy can manifest as developing new or enhanced eco-friendly products to decrease plastic consumption (Borah et al., 2025; Qiu et al., 2020) and developing new methods or improving existing processes to minimize environmental harm (Martínez-Falcó et al., 2024; Yuan and Cao, 2022). Green innovation can also use advancing technologies that align with ecological principles (e.g., using non-fossil fuels) and sustainable development (Wang, 2011; Xu et al., 2019). According to the dynamic capabilities theory (Teece, 2014), businesses need to cultivate their abilities to identify potential opportunities and threats, capitalize on these opportunities, and sustain their competitive edge by reorganizing their resources effectively (Fan et al., 2024; Guo, 2023; Li, 2022). Empirical studies indicate that firms with strong green dynamic capabilities—skills that enable them to detect and capitalize on environmental opportunities—are more effective in pursuing green innovation in process and product. These capabilities allow organizations to adapt to various external demands that are increasingly aware of environmental conditions and then integrate sustainability into their strategies to continue to innovate. Hence, leveraging green dynamic capabilities is key to fostering successful green innovation initiatives (Borah et al., 2025; Yu et al., 2022; Yuan and Cao, 2022). In other words, firms with strong green dynamic capabilities are more likely to successfully develop environmentally friendly products and optimize their processes for sustainability; thus, the hypothesis proposed is:

H3: Green dynamic capabilities are positively associated with green innovation.

2.7 The role of green dynamic capabilities as mediator

Green dynamic capabilities are the firm's abilities to absorb, adapt, integrate, build, and reconfigure internal and external

competencies to address rapidly changing environments, particularly in the context of environmental sustainability (Arshad et al., 2023; Huang et al., 2024; Lin and Su, 2024; Singh et al., 2022). These capabilities enable firms to innovate in environmentally friendly ways, such as developing green products or processes (Huang et al., 2024; Singh et al., 2022). The direct relationship between stakeholder pressures and green dynamic capabilities (Huang et al., 2024; Lin and Su, 2024; Singh et al., 2022) is also confirmed indirectly through green dynamic capabilities. Thus, the pressures from stakeholders lead to the development of green dynamic capabilities, which then facilitate green innovation (Huang et al., 2024; Lin and Su, 2024; Singh et al., 2022; Yuan and Cao, 2022).

H4: Green dynamic capabilities mediates the link between stakeholder pressures and green innovation.

2.8 Stakeholder pressures on financial performance

The study posits that green dynamic capability and innovation sequentially mediate the relationship between stakeholder pressures and firm performance, suggesting that stakeholder pressures lead to enhancements in green dynamic capabilities, which in turn foster green innovation, ultimately resulting in improved firm performance overall (Huang et al., 2024; Singh et al., 2022). First, stakeholder pressures enhance green dynamic capabilities (Huang et al., 2024; Sahoo, 2024; Singh et al., 2022). Moreover, dynamic capabilities facilitate green innovation (Ma and Chen, 2025; Sahoo, 2024; Singh et al., 2022). Green innovation offers numerous benefits, such as cost savings from more efficient resource utilization, improved operational efficiency that minimizes waste, and increased competitiveness by addressing consumer demand for sustainable practices. These advantages can significantly enhance a firm's overall performance and profitability (Huang et al., 2024; Ma and Chen, 2025; Singh et al., 2022). Hence, stakeholder pressures indirectly affect financial performance by enhancing green dynamic capabilities and innovation, which improves financial performance (see Figure 1).

H5: Stakeholder pressures indirectly influence financial performance through the sequential mechanisms of green dynamic capabilities and green innovation.

3 Materials and methods

3.1 Sample and data collection procedure

The target sample in this study was top management from various companies in Indonesia, which was determined based on a purposive approach. The doctoral program of Bina Nusantara University supervised this study, and the internal ethics committee approved the research. First, more than 300 companies were contacted by the researcher to be involved voluntarily as respondents. After receiving a positive response, 120 questionnaires were sent via email. All respondents were involved voluntarily and were not compensated. Data was collected for 3 months, from June 2023 to August 2023.

After checking the completeness of the data, all data were used for further analysis. Of the 120 top management people representing their companies, 78.3 percent were male, and the majority of respondents (53.3%) had more than 10 years of service. Based on company type, 72.5% were private, and 27.5% were public. The sectoral distribution highlights the dominance of the manufacturing sector (25.44%), followed by finance and insurance (12.28%), general trading and maintenance (12.28%), health service (8.77%), Freight and Forwarding (7.89%), information and communication (7.89%), and Mining and Quarrying (7.02%). The remaining real estate, professional service, education, power and energy, and construction companies comprise 2.6–5.26% of the total sample. More than half (57.5%) of the companies were local, and 57.5% were foreign-owned. Finally, the size of the companies in the large category was 82.2, and 17.5% of the companies were in the medium category (see Table 1).

3.2 Measurement

This research employs a modified scale from previous studies with several adjustments based on content validity and assessment from panel experts, including three professors and four doctors in the finance and strategic management field. First, stakeholder pressures consist of six items to measure the pressures faced by companies from government, competitors, and customers (Helmig et al., 2016; Pratama et al., 2023; Sun et al., 2025). Cronbach's alpha of 0.88 indicates that this scale has met the cut-off value 0.70 (Nunnally and Bernstein, 1994).

Second, green dynamic capability is measured based on three items, including acquired new technologies, upgraded current technologies that are environmentally friendly, the ability to understand and foresee environmental trends and challenges, and the ability to absorb and integrate green knowledge (Borah et al., 2025; Li, 2022). The Cronbach's alpha of 0.756 indicates that this scale has met adequate internal consistency.

Third, green innovation is measured using four items that lead to technological innovation activity that adheres to the eco-economic development requirements, including acquiring more efficient materials, reducing waste generation, energy-efficient products, and implementing a waste recycling program. Cronbach alpha for green innovation is 0.775. Finally, financial performance is assessed using return on assets (ROA) (Zheng et al., 2022). Except for ROA, all items were measured with 5-point Likert-type items, where respondents were asked to provide a rating: 1 = very low/strongly disagree to 5 = very high/strongly agree.

Control variables: this study uses three control variables: firm size, entities, and type. Firm size is coded as medium (1) and large (2) based on total assets, where companies stated as medium have assets of 10 billion IDR or less and large assets category have assets of more than 10 billion IDR. Next, business entities are categorized into 1 = local and 2 = foreign. Firm type is categorized into two: 1 = private, 2 = public.

3.3 Data analysis

This study employed process procedures using Smart PLS software to assess the direct and indirect relationships among variables. Data analysis includes control variables to adjust for confounding effects

TABLE 1 Characteristics of respondent and company data.

Category	Counts	% of total
Gender		
Female	26	21.7%
Male	94	78.3%
Tenure		
< 5 Years	20	16.7%
5–10 Years	36	30.0%
> 10 Years	64	53.3%
Sector		
Manufacturing	31	25.44
Finance and insurance	14	12.28
General trading and maintenance	15	12.28
Health service	11	8.77
Freight and forwarding	9	7.89
Information and communication	9	7.89
Mining and quarrying	8	7.02
Real estate	6	5.26
Professional service	5	4.39
Education	4	3.51
Power and energy	4	3.51
Construction	3	2.63
Type		
Private	87	72.5%
Public	33	27.5%
Business entities		
Foreign-owned company	51	42.5%
Local company	69	57.5%
Size		
Micro and medium	21	17.5%
Big	99	82.5%

and ensure the independent variable's estimated effect is unbiased (Mehta, 2015; Wysocki et al., 2022). Additionally, the data from this study was analyzed with and without control variables to identify possible concerns such as p-hacking and the robustness of the findings (Sturman et al., 2022). Next, bootstrapping analysis was applied to verify the confidence interval and the accuracy of the path estimates.

4 Results

4.1 Descriptive statistics and correlation

Table 2 presents the descriptive statistics and correlations between variables. The mean of stakeholder pressures is 4.02 (SD = 0.664), green dynamic capability has a mean of 3.77 (SD = 0.661), green innovation (mean = 3.89, SD = 0.731), and ROA has a mean of 1.39 (SD = 0.132). Next, Table 2 also shows a significant positive correlation between stakeholder pressures and green dynamic capability of

$r = 0.415$ ($p < 0.001$), green innovation ($r = 0.406$, $p < 0.05$), and ROA ($r = 0.535$, $p < 0.001$). Return on assets also exhibits strong positive correlations with stakeholder pressures ($r = 0.535$, $p < 0.001$), green dynamic capability ($r = 0.660$, $p < 0.05$), and green innovation at $r = 0.655$ ($p < 0.001$). These findings demonstrate a significant relationship between stakeholder pressures, green dynamic capabilities, green innovation, and financial performance, as assessed by ROA.

4.2 Hypothesis testing

The path analysis (Table 3) explains all the hypotheses in this study. Four hypotheses examined the direct effect, and two examined the indirect effect. Firstly, the findings demonstrated a significant, direct, and positive influence of stakeholder pressures on green dynamic capabilities ($\beta = 0.415$, $p < 0.01$), supporting H1. The stakeholder pressures had a significant, direct, positive influence on green innovation ($\beta = 0.172$, $p < 0.05$), and green dynamic capabilities also confirmed a significant positive effect on green innovation ($\beta = 0.564$, $p < 0.05$), supporting H2 and H3. Hypothesis 4 tested the role of green dynamic capability as a mediator of the relationship between stakeholder pressures and green innovation based on this result was confirmed ($\beta = 0.234$, $p < 0.01$). Sequential mediation stakeholder pressures on financial performance via dynamic capabilities and green innovation have been confirmed ($\beta = 0.093$, $p < 0.05$). Hence, H5 is supported.

4.3 Robustness analysis

Table 4 indicates that the conclusion of the results is no difference between Model 1 (without control variables) and Model 2 (with control variables). For example, both models' path coefficients and p -values lead to the same conclusions. Additionally, the bootstrapping resampling process results show that all path coefficients do not include zero values, indicating that the path coefficients are significant at a 5% confidence interval for both models. Finally, the R square value evaluation shows relatively equal results. For example, the R square for GDC is 0.173 (model 1) and 0.214 for model 2. Furthermore, for GI, the R square is 0.428 (model 1) and 0.438 (model 2), indicating that the inclusion of three control variables in model 2 does not significantly change the general conclusion of the results.

5 Discussion

The positive relationship in hypothesis 1 suggests that stakeholder pressures influence the development of green dynamic capabilities within firms. This result aligns with existing literature that recognizes the importance of external pressures from stakeholders, such as customers, regulators, and investors, in motivating organizations to enhance their capability to innovate in environmentally friendly ways (e.g., Huang et al., 2024; Sahoo, 2024; Singh et al., 2022; Yu and Ramanathan, 2015). In this research, the level of stakeholder pressure measures based on government, competitors, and customers shows that combining the three as external pressures compels firms to develop capabilities by using new technology or upgrading existing

TABLE 2 Descriptive statistics and correlation.

No.	Variable	Mean	SD	1	2	3	4
1	SHP	4.02	0.664	–			
2	GDC	3.77	0.661	0.415***	–		
3	GI	3.89	0.731	0.406***	0.635***	–	
4	Ln_ROA	1.39	0.132	0.535***	0.660**	0.655***	–

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, SHP, Stakeholder pressures; GDC, Green dynamic capability; GI, Green innovation; ROA, return on asset.

TABLE 3 Hypothesis testing results.

Relationship	Coeff	SE	t	p -values	R square
Direct effect					
SHP → GDC	0.415	0.075	5.575	0.00	0.173
SHP → GI	0.172	0.068	2.533	0.01	0.428
GDC → GI	0.564	0.067	8.477	0.00	
Indirect effect					
SHP → GDC → GI	0.234	0.056	4.198	0.00	
SHP → GDC → GI → ROA	0.093	0.028	3.349	0.00	

SHP, Stakeholder pressures; GDC, Green dynamic capability; GI, Green innovation; ROA, return on asset.

technology to operate more environmentally friendly. In other words, governments in the form of regulatory bodies impose strict environmental regulations that compel firms to develop green capabilities to comply with legal requirements (Ma and Chen, 2025; Zhang and Zhu, 2019). On the other hand, pressure from consumers who prefer environmentally friendly products pushes firms to enhance their capabilities to meet these expectations (Zhang and Zhu, 2019).

The confirmation of the second hypothesis (H2) indicates that stakeholder pressures positively affect green innovation. This finding aligns with previous studies that emphasize the role of stakeholder engagement in driving firms to pursue innovative and environmentally friendly solutions (Baah et al., 2021; Chen and Liang, 2023; Li et al., 2017; Ma and Chen, 2025; Sahoo, 2024; Singh et al., 2022; Wang et al., 2022). In other words, green innovation in adopting environmentally friendly practices can be increased through stakeholder pressure, where companies will try to meet these expectations (Adomako et al., 2023; Kawai et al., 2018; Sahoo, 2024). The higher the public pressure, the higher the green practices in process and product innovation. More specifically, this study is not solely about how stakeholder pressures affect green innovation but also about expanding previous studies focusing only on specific sectors. Hence, we confirm how implementing green innovation based on stakeholder pressure can apply to various sectors, especially in Indonesia.

The third hypothesis (H3), green dynamic capability, has been confirmed to affect green management, supported by previous studies (Borah et al., 2025; Yu et al., 2022; Yuan and Cao, 2022). In other words, firms with strong green dynamic capabilities—such as using new technology and reconfiguring and upgrading their resources in response to environmental challenges—are better equipped to implement and manage green innovation. The interplay between

TABLE 4 Robustness check.

Relationship	Model 1		Model 2	
	Coeff.	p -value	Coeff.	p -value
SHP → GDC	0.415	0.00	0.424	0.00
SHP → GI	0.172	0.01	0.177	0.01
GDC → GI	0.564	0.00	0.554	0.00
SHP → GDC → GI	0.234	0.00	0.235	0.00
SHP → GDC → GI → ROA	0.093	0.00	0.094	0.00

Bootstrapping	Model 1		Model 2	
	2.50%	97.50%	2.50%	97.50%
SHP → GDC	0.038	0.304	0.265	0.549
SHP → GI	0.256	0.547	0.037	0.316
GDC → GI	0.423	0.681	0.402	0.682
SHP → GDC → GI	0.132	0.350	0.131	0.348
SHP → GDC → GI → ROA	0.048	0.160	0.047	0.157

R square	Model 1	Model 2
GDC	0.173	0.214
GI	0.428	0.438
ROA	0.529	0.531

Model 1 without control variables, model 2 with control variables, SHP, Stakeholder pressures; GDC, Green dynamic capability; GI, Green innovation; ROA, return on asset.

dynamic capability and green management indicates that organizations must prioritize developing these capabilities to foster robust environmental strategies. Moreover, the results of this study also found the role of intermediates green dynamic capability in the relationship between stakeholder pressures and green innovation (H4), indicating that stakeholder pressures stimulate green capability, which fosters green innovation in the next stage (Huang et al., 2024; Lin and Su, 2024; Singh et al., 2022; Yu et al., 2022; Yu and Ramanathan, 2015; Yuan and Cao, 2022).

Finally, this study shows how stakeholder pressures can influence financial performance through green dynamic capabilities and innovation (H5). The present study reveals that when organizations face increased stakeholder demands (government, customer, and competitor) to embrace sustainable practices, their first step is to boost their green dynamic capabilities. The improvements in green capabilities make green innovation easier to develop and implement, ultimately contributing to more substantial financial results. The sequential process in this hypothesis also emphasizes the need to see stakeholder pressures as challenges to meet and valuable opportunities to enhance strategic capabilities and drive innovation. Therefore, organizations that actively work to fulfill stakeholder expectations will have a more significant advantage in enhancing their value, providing them with a competitive benefit, and making their financial performance increase as the ultimate objective.

In sum, this study makes two contributions. First, the present study aims to explain the performance of green innovation through stakeholders and dynamic green capability and how green innovation affects financial performance. Furthermore, this study

expanded previous studies related to the determinant of green innovation and its impact on more financial performance was examined in specific sectors (e.g., mining, manufacturing) (Adnan et al., 2025; Baah et al., 2021; Li et al., 2017; Ma and Chen, 2025; Sahoo, 2024; Singh et al., 2022; Wang et al., 2022). In addition, empirical evidence in this study presents that green innovation has a positive impact on financial performance so that it can be seen as an important strategy to achieve the company's goals in the future (Baah et al., 2021; Ha and Nguyen, 2022; Singh et al., 2022).

5.1 Implications

The research finding highlights significant implications for managers, policymakers, and researchers. From a managerial standpoint, the findings of this study indicate that stakeholder pressures positively influence green dynamic capabilities and innovation, which in turn have an indirect effect on financial performance through the sequential mediation of green dynamic capabilities and green innovation. First, for managers, the empirical evidence from this study shows that it is essential to actively connect with stakeholders such as government officials and customers to improve green innovation capabilities and practices. Proactive actions to obtain information from stakeholders can provide valuable insights into the needs and preferences of their audience. Furthermore, looking into competitors' actions can provide valuable ideas for strengthening their capabilities; this strategy helps organizations become more responsive to external pressures and aligns their efforts with the Sustainable Development Goals (SDGs).

Second, policymakers can use this study's results to create policies encouraging transparency and accountability in sustainability efforts. Specifically, the study's scope, which covered various sectors, shows that stakeholder pressures on how organizations operate to support environmental campaigns have a long-term impact on financial performance. Therefore, policymakers must simultaneously provide general regulations that support sustainability and economic growth for all sectors. Finally, researchers may find the insights derived from this study as initial findings on how financial performance can be achieved through green innovation and green dynamic capabilities for all sectors. Therefore, these findings can be initial ideas to explore industry-specific dynamics, learn more about external stress factors, and how distinct organizational contexts can shape the outcomes of these relationships.

Finally, in Indonesia's context, severe environmental challenges—including deforestation, pollution, and being a top global emitter due to land-use changes—demand urgent and sustainable solutions. While international pressure (the Paris Agreement) and investor priorities drive green policy adoption, these efforts must address the intrinsic link between technological development and socioeconomic inequality as Feinman (2021) concluded that technological change often reinforces existing power structures rather than diminishing inequalities, thus creating a dual challenge for the government to achieve environmental sustainability while ensuring fair access to the benefits of green innovation (Feinman, 2021). Hence, this complexity requires clear commitment and policies to tackle ecological degradation while also promoting inclusive technological advancement.

5.2 Limitations

The study acknowledges several limitations that pave the way for future research opportunities. First, the research in Indonesia may limit the generalizability of the findings to other contexts or countries. Since variations in market dynamics, regulatory frameworks, and stakeholder expectations may differ, future studies should explore the relationships between stakeholder pressures, green capabilities, and innovation across countries to broaden the applicability of the findings. Second, the study measures stakeholder pressures based on government, competitors, and customers but does not consider other potential influences such as NGOs or community groups. Hence, future studies need to expand the measurement of stakeholder pressures by including various other elements, such as environmental NGOs or community groups, to provide a more comprehensive understanding of external pressures.

6 Conclusion

The study comprehensively analyzes how stakeholder pressures influence a firm's strategy and operations, particularly regarding green dynamic capabilities, innovation, and financial performance. Specifically, this study emphasizes the direct effects of stakeholder pressures on developing green dynamic capabilities and innovation. Apart from that, it also examines the indirect effect of stakeholder pressures on green innovation through green dynamic capabilities and financial performance through sequential mediation of green dynamic capabilities and green innovation in the context of companies in Indonesia. This research confirmed that stakeholder pressures enhance green dynamic capabilities and innovation, ultimately impacting financial performance in subsequent phases. Organizations that proactively address stakeholder expectations will likely gain a competitive edge, leveraging sustainability as a driver for long-term strategic success. Moreover, this study contributes to the broader discourse on enhancing financial performance through green innovation; this topic has been widely debated in the existing literature. Specifically, our study underscores the significance of green initiatives across various sectors, positioning them as essential components of corporate strategy in the modern business landscape and highlighting firms' need to integrate sustainability management into their operational frameworks to thrive in an increasingly environmentally conscious market.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by DW (Head of Doctor of Research in Management, BINUS Business School Executive Dean, Bina Nusantara University). The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

TW: Funding acquisition, Investigation, Writing – original draft, Formal analysis, Data curation, Conceptualization. TR: Methodology, Validation, Supervision, Writing – review & editing. DW: Writing – review & editing, Methodology, Supervision, Conceptualization. AF: Supervision, Methodology, Writing – review & editing, Validation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fclim.2025.1599894/full#supplementary-material>

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