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# Scaling up sustainable innovation: Stakeholder ties, eco-product innovation, and new product performance

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## Abstract

Deriving insights from the stakeholder theory, this article investigates the impact of industry stakeholders on product innovation through eco-innovation. It further examines the moderating role of environmental R&D expenditure on this relationship. Using data from 212 firms, the results from this article reveal that (1) both intra and extra-stakeholder ties predict eco-innovation, (2) eco-innovation mediates the relationship between industry stakeholder ties and new product performance, and (3) environmental R&D expenditure has a positive moderating effect on the linkage between intra and extra-industry stakeholder ties and new product performance through eco-innovation. These findings contribute to our understanding of the role of industry stakeholders in the context of emerging markets by being a driver of new product outcomes. Implications for theory and practice are discussed.

**KEYWORDS**
eco-innovation, environmental R&D expenditure, new product performance, sustainable innovation

## 1 | INTRODUCTION

The growing public awareness of environmental concerns has prompted organizations to recognize the importance and benefits of embracing eco-innovation. This shift is driven by the increasing stakeholder pressure on organizations to implement sustainability measures in their activities (Gabriel & Mina, 2015; Salas-Zapata & Ortiz-Muñoz, 2019; Tsai & Liao, 2017). Environmental concerns for innovation are motivated by external pressures, such as stringent government regulations and stakeholder expectations. Additionally, organizations recognize that embracing environmental innovation can result in a competitive advantage and enhanced performance through cost reduction and improved reputation (Forsman, 2013). Thus, organizations now understand that environmental issues significantly impact customer decisions and can affect their competitive standing. Moreover, they realize that regulatory bodies are formulating policies to restrict harmful practices. By engaging in eco-innovation, organizations can leverage unique resources and position themselves to achieve positive returns (Adomako et al., 2023; Rizzi et al., 2013) and effectively allocate resources to gain a competitive advantage.

Eco-innovation signifies the pursuit of innovation in various environmental areas, such as emission reduction, recycling, and material substitution (Adomako et al., 2023; Hellström, 2007). It goes beyond the mere adoption of eco-innovation and focuses on the extent to which firms' activities benefit the environment (Hart, 1995; Liao & Tsai, 2019).

Eco-innovation can positively impact society by addressing social challenges, such as access to clean water, sanitation, and affordable clean energy. It can also promote inclusive growth and enhance the quality of life by providing sustainable solutions to societal needs. Research indicates that increased engagement in eco-innovation positively impacts firm performance (Adomako et al., 2023; Cainelli et al., 2011; Russo & Fouts, 1997). Thus, eco-innovation holds increasing significance for research and policymaking, aiming to optimize natural resource utilization and reduce the ecological footprint. Accordingly, numerous studies have been conducted to analyze the drivers, characteristics, and impacts of eco-innovation to improve our understanding of the predictors, and outcomes of eco-innovation.

Despite these efforts, research in this field is still in its early stages and is considered relatively young (Díaz-García et al., 2015; Klewitz & Hansen, 2014). For example, despite previous research efforts to highlight the determinants of eco-innovation in organizations (de Jesus Pacheco et al., 2017; Hojnik & Ruzzier, 2016; Horbach, 2016), we still do not know enough about the impact of industry stakeholder ties. Thus, there remains a lack of specific research on the effect of stakeholder ties on eco-innovation, particularly in terms of empirical data from surveys. Thus, we aim to address the existing gaps by exploring (1) the role of industry stakeholder ties on eco-innovation, (2) investigating the mediating mechanism between eco-innovation and new product performance, and (3) examining the moderating role of environmental R&D spending. Specifically, we focus on how organizations pursue environmental benefits while considering the moderating influences of R&D spending.

This article contributes significantly to the existing environmental management and innovation literature (Adomako et al., 2023; Bossle et al., 2016; Hojnik & Ruzzier, 2016), by developing and testing a model that draws on the stakeholder theory. First, this article sheds light on the importance of both intra-and extra-industry stakeholder ties in a firm's eco-innovation strategy. While previous research primarily views stakeholders are pressure generators (Adomako & Nguyen, 2023; Nguyen & Adomako, 2022), this article focuses on how ties with industry stakeholders foster eco-innovation adoption for environmental practices. Our study enhances the understanding of the impact of industry stakeholder ties on eco-innovation. Second, this article fills the gap in understanding the mechanism through which industry stakeholder ties predict new product performance. The successful integration of stakeholders into a firm's strategy could potentially stronger performance through eco-innovation activities. By exploring this relationship, we expand the current knowledge base on the role of stakeholders in new product performance (Adomako et al., 2023; Jakhar, 2017; Singh et al., 2022). Third, this study examines how environmental R&D spending moderates the relationship between industry stakeholders and eco-innovation. By doing so, it uncovers a crucial boundary condition that determines the extent to which firms can maximize the benefits of industry stakeholders.

## 2 | THEORY AND HYPOTHESES DEVELOPMENT

### 2.1 | Stakeholder theory

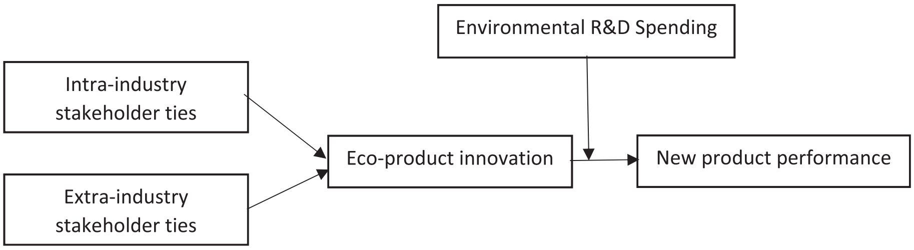
Stakeholder theory delves into the significance of meeting the diverse needs of stakeholders to accomplish an organization's goals (Freeman, 1984; Laplume et al., 2008). It offers a framework for effectively managing relationships with various actors in the surrounding environment, emphasizing the consideration of the legitimate interests of all relevant stakeholders simultaneously (Freeman, 1984). Stakeholder management literature defines stakeholders as groups or individuals who can influence or are affected by the objectives of the organization (Freeman, 1984; Freeman, 2010; Freeman et al., 2012). This definition extends beyond the market and encompasses shareholders, employees, consumer associations, and environmental pressure groups. Stakeholders are invested in the success or failure of a business as it directly impacts their gains and losses. According to stakeholder theory, firms should manage their relationship with society by considering the specific actors who can influence or are influenced by their objectives (Clarkson, 1995).

Stakeholder goodwill is maximized when managers can match organizational resources with often-diverging goals resulting from multiple stakeholder views (Hill & Jones, 1992). Therefore, as stakeholder ties grow, the importance of addressing such pressures increases. Accordingly, organizations must develop appropriate capabilities to manage expectations and to identify and engage priority stakeholders in a variety of manners appropriate to different issues (Freeman & McVea, 2001; Lee, 2011). Managers will allocate more resources to develop stakeholder ties to better know, relate and adapt to the environmental claims of their stakeholders (Delgado-Ceballos et al., 2012). The increase in stakeholder ties will result in more efforts to integrate stakeholders and collaborate with them to jointly address their concerns. Moreover, responding to stakeholder views with stakeholder ties is a survival strategy for firms in developing countries that operate in distinctively hostile institutional environments (Abubakar et al., 2019), and rely on stakeholder relationships to navigate institutional voids and cyclical crises (Soundararajan et al., 2018). As noted by Pajunen (2006) frequent communication and personal relationships with stakeholders enhance continuous support from such stakeholders in a crisis.

Stakeholders vary in their characteristics, and the ties they form within and outside the industry can have distinct effects on eco-innovation activities due to the different resources they bring (Yi et al., 2022; Yoo et al., 2009). Intra-industry stakeholders consist of entities within the same industry as the focal firm, such as customers, suppliers, and competitors. They provide essential resources like materials, human resources, and valuable but undisclosed information and knowledge about existing markets and technologies, which are crucial for the focal firm's eco-innovation activities. On the other hand, extra-industry stakeholders are entities outside the focal firm's industry, such as firms from other industries, universities, and the media. In addition to capital, materials, and human resources, extra-industry stakeholders offer diverse information and knowledge regarding new markets and technologies. Intra-industry/extra-industry stakeholder ties refer to the degree to which a firm's managers have established strong connections with members of the business ecosystem within or outside their industry (Atuahene-Gima et al., 2006).

The study's conceptual framework (Figure 1) encompasses two different stakeholder ties for developing new product success through eco-innovation activities, which is crucial for environmentally-minded

**FIGURE 1** Conceptual model.




firms to adapt to changes brought about by stakeholders. Additionally, we consider the moderating effect of a firm's environmental R&D spending on the relationship between stakeholder ties and new product performance through eco-innovation. In the hypotheses section of this article, we establish the logical connection between these stakeholder ties and new product performance, arguing that when appropriately implemented, they contribute to new product performance. In the subsequent sub-sections, we conceptually refine the constructs of the independent variables used in this study to emphasize their relevance and significance to eco-innovation and new product performance.

## 2.2 | Industry stakeholder ties and eco-innovation

In this study, we distinguish between different types of stakeholders because their resources differ. Intra-industry stakeholders provide industry-specific knowledge and information, while extra-industry stakeholders offer diverse knowledge and innovative ideas (Geletkanycz & Hambrick, 1997). Thus, we argue that firms' intra- and extra-industry stakeholder impact eco-innovation activities. First, intra-industry stakeholder ties can facilitate eco-innovation by providing industry-specific resources, such as tacit knowledge and non-public information. These resources enable firms to uncover opportunities for eco-innovation, which involves a range of innovation types, akin to environmental, sustainable, or green innovations (Díaz-García et al., 2015). The significance of eco-innovation lies in its crucial role in driving sustainability improvements (Adomako et al., 2023). By sharing exclusive industry insights, intra-industry stakeholder ties help firms enhance their understanding of competitors, consumers, and suppliers. This timely awareness of market dynamics and untapped consumer demand empowers firms to develop new value propositions related to eco-innovation practices. Moreover, as intra-industry stakeholder ties strengthen the focal firm stands to gain access to industry-specific knowledge and information (Yi et al., 2022). Through close ties with stakeholders, such as suppliers, customers, and industry experts, firms can gain insights into emerging environmental trends, technological advancements, and best practices. This knowledge exchange will likely enhance the firm's understanding of eco-innovation opportunities and enable them to implement relevant initiatives more effectively. Additionally, intra-industry ties with stakeholders can facilitate resource collaboration and sharing, which are essential for eco-innovation activities (Acebo et al., 2021; Garcés-Ayerbe et al., 2019). For example, firms can tap into additional resources, such as expertise, technologies, and financial support, which may be necessary for implementing eco-friendly practices. Collaborative efforts with stakeholders can lead to shared research and development projects, joint investments in sustainable technologies, and the pooling of resources for eco-innovation initiatives. Finally, a firm with stronger intra-industry ties is likely to be influenced by collective environmental pressures from stakeholders, including customers, investors, and regulatory bodies. As stakeholders become more concerned about environmental issues, they exert pressure on firms to adopt eco-innovation practices as a means of improving sustainability and reducing their environmental footprint (Adomako et al., 2023; Nguyen & Adomako, 2022). Thus, strong stakeholder ties provide firms with a platform to engage in dialogs, understand stakeholders' expectations, and align their eco-innovation strategies with broader sustainability goals. Hence, we argue that:

> **H1a.** The extent to which new ventures use intra-industry stakeholder ties has a positive effect on eco-innovation

We propose that extra-industry stakeholder ties play a crucial role in facilitating firms' eco-innovation activities by offering diverse resources beyond their current value networks. These resources encompass new markets, innovative technologies, unique materials, and diverse human resources (Yi et al., 2022). The heterogeneity of these resources helps overcome the inertia associated with existing resources and business practices, thereby enabling the generation of new value propositions and opportunities related to eco-products.

First, extra-industry stakeholder ties provide firms with access to diverse and novel resources that are not readily available within their existing networks (Zhao et al., 2021). These stakeholders, such as research institutions, environmental organizations, and technology providers from different industries, can offer unique perspectives, technologies, expertise, and materials relevant to eco-innovation. The introduction of these external resources stimulates creativity and promotes the exploration of innovative solutions to environmental challenges. Second, firms stand to benefit from the cross-pollination of ideas and knowledge across different sectors and industries. Collaborating with stakeholders outside the firm's traditional domain exposes the firm to new approaches, best practices, and alternative ways of thinking about eco-innovation. This exchange of ideas and knowledge sparks creativity, encourages learning, and inspires the development of novel eco-friendly strategies and solutions that may not have been considered within the firm's existing network. Finally, firms can stay connected to current trends related to eco-innovation practices. This is likely to help the firm stay informed and responsive to emerging environmental trends, regulations, and market opportunities. For example, the firm can gain insights into evolving consumer preferences, regulatory requirements, and emerging sustainability standards. This awareness allows firms to proactively adapt their strategies, develop eco-innovation initiatives aligned with market demands, and seize early-mover advantages in emerging green markets. Thus, we argue that:

> **H1b.** The extent to which new ventures use extra-industry stakeholder ties has a positive effect on eco-innovation

## 2.3 | Mediating effect of eco-innovation

Eco-product innovation focuses on the processes involved in creating and utilizing a novel product that minimizes its environmental impact (Kemp & Pearson, 2007). On the other hand, new product performance measures the degree to which a firm's new products achieve its business objectives (Atuahene-Gima et al., 2005). Eco-innovation encompasses environmentally conscious decision-making within a firm's product development activities, such as the use of sustainable packaging and materials, and assessments aimed at enhancing recyclability, reusability, and decomposability (Chen, 2008). In contrast, new product performance focuses on the business performance of products after their launch, evaluating the extent to which product development objectives are met, as well as revenue, sales, and profitability performance relative to business goals (Atuahene-Gima et al., 2005). Thus, eco-innovation integrates environmentally sustainable practices into a firm's product development process, while new product performance assesses the overall business performance of products post-launch. As such, we contend that eco-innovation serves as a mediating mechanism between industry stakeholder ties and product innovation performance.

First, the utilization of intra-industry ties by firms facilitates knowledge and resource sharing (Yi et al., 2022), which can positively impact eco-product innovation. Intra-industry ties enable firms to access industry-specific knowledge, expertise, and best practices related to eco-product development. Through knowledge and resource sharing as well as collaboration and partnerships, firms can leverage their intra-industry ties to drive eco-product innovation, leading to improved eco-product performance. Thus, we suggest that:

> **H2a.** The extent to which firms use intra-industry ties has an indirect effect on eco-product performance through eco-product innovation

In terms of extra-industry stakeholder ties, we argue that by leveraging external stakeholder ties, firms can access advanced technologies, sustainable materials, and expertise not readily available within their industry (Bell et al., 2016; Garcés-Ayerbe et al., 2019). This access to diverse resources and knowledge facilitates the development of innovative and environmentally conscious products that differentiate new ventures from competitors. As a result, eco-innovation driven by extra-industry stakeholder ties contributes to superior new product performance, including increased market share, customer satisfaction, and financial performance (Adomako et al., 2023). For example, through access to diverse perspectives and resources and the identification of market opportunities, extra-industry stakeholder ties offer firms new knowledge to engage in eco-innovation, ultimately influencing the performance of their new products. Therefore, we argue that:

> **H2b.** The extent to which firms use extra-industry ties has an indirect effect on eco-product performance through eco-product innovation.

## 2.4 | Moderating effect of environmental R&D spending

Environmental R&D spending signifies investments made in R&D activities that focused on addressing environmental challenges and developing sustainable solutions (Arimura et al., 2007; Jiang et al., 2022). These investments aim to advance technologies, processes, and practices that minimize environmental impacts, conserve resources, and promote environmental sustainability. In this study, we argue that the effect of eco-innovation on new product performance is amplified when environmental R&D spending is high than when it is low. First, environmental R&D spending could facilitate the transfer of knowledge and technology between researchers, organizations, and industries (Arimura et al., 2007; Wang, 2021). Through R&D investments, new insights, discoveries, and innovative solutions are developed, which can be shared and applied in the development of new products. This transfer of knowledge helps bridge the gap between eco-innovation (development of environmentally friendly technologies or processes) and new product performance. This is likely to help firms tap into the expertise and advancements in sustainable practices, enabling them to incorporate eco-innovations effectively into their product development process. Second, a firm's level of environmental R&D spending can potentially help strengthen its product development capabilities in the context of eco-innovation (Jiang et al., 2022; Komen et al., 1997). By allocating resources to R&D activities, firms can gain a deeper understanding of environmental challenges, identify market opportunities, and refine their eco-innovative product offerings. This process involves conducting research, testing prototypes, and optimizing eco-friendly features. Investments in environmental R&D can also provide the necessary resources and expertise to enhance product development capabilities (Costa-Campi et al., 2017; Green et al., 1994), resulting in improved new product performance. Finally, a firm's degree of environmental R&D spending can help mitigate risks associated with eco-innovation and this is likely to facilitate market adoption of new products. Developing and introducing eco-friendly products often involves uncertainties related to technical feasibility, cost-effectiveness, and consumer acceptance (Adomako et al., 2023). When a firm invests in R&D, it can conduct rigorous testing, address technological hurdles, and refine product designs to meet environmental standards and consumer expectations. This proactive approach helps reduce the risks associated with eco-innovation, leading to higher market acceptance and improved new product performance. Thus, we suggest that:

> **H3.** The effect of eco-product innovation on new product performance moderated by a firm's degree of environmental R&D spending, such that the effect is amplified when a firm's environmental R&D spending is high.

## 3 | METHOD

### 3.1 | Sample and data

To test our hypotheses, a survey was conducted on new ventures located in four government-sponsored technology parks (i.e., Saigon, Da Nang, Ho Chi Minh, and Can Tho) in Vietnam. These regions were selected because new high-technology ventures had formed alliances within their first few years of establishment, providing a rich context to test the proposed hypotheses. A directory of firms in the industrial districts was obtained from its administrative office, and 600 new ventures were sampled from all firms that met the following criteria: (1) inclusion of only independent firms that were not affiliated with any company group or chain; (2) consideration of firms employing a minimum of five and a maximum of 500 full-time staff; (3) focus on technology ventures engaged in productive business activities; and (4) requirement of complete contact information for the chief executive officer (CEO) or a senior management officer.

The survey was originally prepared in English and then back-translated to Vietnamese using the approach suggested by Brislin (1980). The wording of the survey was improved after a pre-test with 11 entrepreneurs, and the final survey was administered in Vietnamese. The collection of data for the independent and control variables was separated from that for the dependent variable with a 5-month time lag to reduce common method bias (Podsakoff et al., 2012).

Survey instruments containing items representing the independent, mediating, and control variables were delivered in separate and sealed envelopes to the CEO or equivalent, of each firm through the administrative office of the industrial districts. Reminder phone calls were made to encourage participation when only one informant from a firm had responded. In total, 229 firms had the CEO complete the surveys. 6 months later, surveys measuring the dependent variable were delivered to the chief technology officer (CTO) of the 229 firms. With the strong involvement and support of the administrative office, paired informants from 212 firms completed surveys and provided complete responses, representing a 35.33% response rate.

To assess potential non-response bias, ANOVA was used to compare the responding and nonresponding firms. No significant differences were found for firm size and age. The sample firms were from a variety of industries electronics, biopharmaceutical, medical equipment, telecommunications, computer software, environmental technologies, and advanced materials. The firms in the final sample had an average of 144 employees and 20 years of operating experience.

### 3.2 | Measures

All multi-item constructs were measured using seven-point rating scales (see Table 1) ranging from 1 = strongly disagree and 7 = strongly agree.

#### 3.2.1 | Environmental R&D spending

We measured environmental R&D spending by calculating R&D expenditure on environmental activities as a percentage of total sales from 2018 to 2022, which is a commonly used method in the field of innovation research (Adomako et al., 2021; Sciascia et al., 2015).

#### 3.2.2 | Stakeholder ties

Following Yi et al. (2022), we captured stakeholder ties as a second-order construct entailing intra-industry stakeholder ties and extra-industry stakeholder ties. Accordingly, the intra-industry stakeholder ties scale was measured with four items while the extra-industry stakeholder ties scale was captured with six items.

#### 3.2.3 | Eco-product innovation

We used four from Chen (2008) to measure eco-product innovation. CEOs were asked to indicate how their firms have performed in terms of eco-product innovation practices over the past 3 years.

#### 3.2.4 | New product performance

We measured new product performance with four items from Atuahene-Gima et al. (2005). The items were modified to reflect new eco-product performance.

#### 3.2.5 | Control variables

We employed variables that were identified as having a potential impact on product innovation outcomes as controls (Adomako et al., 2023). The size of the firms was measured in terms of the number of full-time employees. Firm age was determined by the number of years the company has been in operation. To distinguish between high-technology and low-technology industries, we used the coding scheme of 1 = high-technology and 0 = low-technology, based on the firm's research

**TABLE 1** Measurement items and validity analysis.

| Details of measures | Factor loadings |
|---|---|
| **Intra-industry stakeholder ties: α = 0.90; CR = 0.91; AVE = 0.73** | |
| In the past 3 years, the top management team members: | |
| Established a good relationship with customers | 0.77 |
| Established a good relationship with managers of suppliers | 0.89 |
| Established a good relationship with managers of distributors | 0.90 |
| Established a good relationship with managers of other firms in the industry | 0.86 |
| **Extra-industry stakeholder ties: α = 0.93; CR = 0.93; AVE = 0.71** | |
| In the past 3 years, the top management team members: | |
| Established a good relationship with various trade associations | 0.67 |
| Established a good relationship with the universities | 0.78 |
| Established a good relationship with scientific research institutions | 0.88 |
| Established a good relationship with media organizations | 0.89 |
| Established a good relationship with various social organizations | 0.90 |
| Established a good relationship with other firms' managers in other industries | 0.92 |
| **Eco-product innovation: α = 0.88; CR = 0.87; AVE = 0.63** | |
| In the past 3 years… | |
| The company has improved and designed environmentally friendly packaging for existing and new products | 0.78 |
| The company has used materials for the product that consume the least amount of energy and resources for conducting the product development or design | 0.79 |
| The company has used the smallest possible number of materials to create the product for conducting the product development or design | 0.80 |
| The company has deliberately evaluated whether the product was easy to recycle, reuse and decompose for conducting the product development or design | 0.81 |
| **New product performance: α = 0.89; CR = 0.90; AVE = 0.69** | |
| The extent to which your company has achieved its product development objectives in terms of the following in the last 3 years: | |
| Revenues from new eco-products compared with business objectives | 0.80 |
| Growth in revenue from new eco-products compared with business objectives | 0.82 |
| Growth in sales of new eco-products compared with business objectives | 0.85 |
| Profitability of new eco-products compared with business objectives | 0.86 |

and development (Tang et al., 2012). Additionally, we accounted for the age of the CEO by using their age as a control variable. Education was categorized as '1' for high school, '2' for associate degree, '3' for bachelor's degree, '4' for master's degree, and '5' for doctoral degree.

# 4 | ANALYSES

## 4.1 | Common method bias, reliability, and validity assessment

To minimize potential problems with common method variance (CMV), information on the variables was gathered from multiple sources. However, further tests were conducted for each country to assess the extent of CMV. First, the Lindell and Whitney (2001) test for CMV was carried out by identifying a marker variable item that is not conceptually related to any constructs in the model. We identified an item (i.e., I like the color red) as the marker item in this study. The correlation between this marker item and the dependent variable, eco-product innovation, was found to be non-significant ($r = -0.02$; $p > .10$), indicating that CMV was not a major factor in the relationships among the constructs studied. Moreover, the correlations between the marker item and other constructs were low and non-significant, ranging from 0.00 to 0.04. Second, Harman's one-factor test in CFA was performed, which resulted in a poor model fit for the data ($\chi^2$ (d.f.) = 3652.66 (591); $p < .001$; RMSEA = 0.18; NNFI = 0.33; CFI = 0.40), indicating that a bias factor is unlikely to explain the variances in the measures.

To assess the reliability and validity of the constructs, we conducted exploratory factor analyses for each sample and refined the items in confirmatory factor analysis (CFA) using LISREL 8.7 with covariance matrices as input data. The final CFA results indicate a good fit to the data ($\chi^2$ [degree of freedom [d.f.]] = 880.22 [499]; $p < 0$; root mean square error of approximation [RMSEA] = 0.05; non-normed fit index [NNFI] = 0.94; comparative fit index [CFI] = 0.95). Factor loadings for each construct are significant at 1%, supporting the convergent validity of the measures (Bagozzi & Yi, 1988). Reliability was assessed using three indicators of convergent and discriminant validity: composite reliability, average variance extracted (AVE), and highest shared variance (HSV). For each construct, the indices for construct reliability assessment (see Table 1) are larger than the recommended threshold value of 0.70 (Bagozzi & Yi, 1988). The discriminant validity of each construct was evaluated using Fornell and Larcker's (1981) procedure, which examines whether the AVE for each construct is greater than the shared variances (i.e., squared correlations) of each pair of constructs. Discriminant validity is demonstrated for each construct in both samples, as the AVE for each construct is greater than the HSV between each pair of constructs. Correlations between constructs are provided in Table 1.

## 4.2 | Structural model estimation

We employed LISREL 8.80 and employed structural equation modeling (SEM) with maximum likelihood estimation to examine a series of nested structural models. To simplify the models, we created mean values for the dependent and moderating variables. Specifically, composite scores were generated by calculating averages for each multi-item construct. However, for the dependent variables (strategic agility and international performance), we used the full information approach, which involved using the individual measurement items instead of the mean values for model estimation. By utilizing both averages and the full information approach, we addressed the potential issue of model under-identification caused by insufficient information in the structural model (see Hair et al., 2017).

Following Cortina et al. (2001), we employed moderated structural equation modeling to test the hypothesized moderation relationships. Consequently, we created two moderating terms (eco-innovation X environmental R&D Spending) using the moderating variable (environmental R&D Spending). To avoid multicollinearity, the constructs used to generate the moderation terms were mean-centered before calculating their cross-products. In total, we sequentially tested five models. Model 1 focused on eco-innovation as the dependent variable, while Models 2 to 5 examined new product performance as the dependent variable. Model 1 estimated the effects of intra-industry stakeholder ties and extra-industry stakeholder ties on eco-innovation. Model 2 evaluated the direct effects of intra-industry stakeholder ties and extra-industry stakeholder ties on new product performance Model 3 included the effects of eco-innovation and the moderating variable. Model 4 introduced the interaction effect variables (1) eco-innovation X environmental R&D spending. Finally, following recent mediation estimation procedures (e.g., Adomako et al., 2022; Zahoor & Al-Tabbaa, 2021), we estimated Model 5, which encompassed the full structural model with both eco-innovation and new product performance as dependent variables. By employing the single model estimation procedure, we were able to simultaneously test both paths. After estimating each model, we reported model fit indices and variations in squared multiple correlations ($R^2$) where applicable.

## 4.3 | Results

The descriptive statistics and correlations are presented in Table 2. The results are shown in Table 3. Hypothesis 1 comprises two sub-hypotheses: H1a proposes a positive association between intra-industry stakeholder ties and eco-innovation, while H1b suggests a positive association between extra-industry stakeholder ties and eco-innovation. The results of the model estimation (Table 3), support both hypotheses. The extent to which firms use intra-industry stakeholder ties exhibits a positive relationship with eco-innovation ($\beta = 0.22$; $t = 3.31$; $p < .01$), and extra-industry stakeholder demonstrates a positive relationship with eco-innovation ($\beta = 0.30$; $t = 5.49$; $p < .01$).

Our second hypothesis consists of two sub-hypotheses, H2a, and H2b. H2a receives support as eco-innovation mediates the relationship between intra-industry stakeholder ties and new product performance. Specifically, the model estimates reveal a positive relationship between intra-industry stakeholder ties and eco-innovation ($\beta = 0.20$; $t = 3.16$; $p < .01$). Further, we find a positive association between intra-industry stakeholder ties and new product performance ($\beta = 0.22$; $t = 3.31$; $p < .01$). Additionally, a positive relationship exists between eco-innovation and new product performance ($\beta = 0.14$; $t = 2.45$; $p < .01$).

For the second part of H2 (H2b), the analysis indicates a positive association between extra-industry stakeholder ties and new product performance ($\beta = 0.16$; $t = 2.15$; $p < .05$) and eco-innovation ($\beta = 0.30$; $t = 5.49$; $p < .01$). Furthermore, eco-innovation demonstrates a positive relationship with new product performance ($\beta = 0.14$; $t = 2.45$; $p < .01$). These findings confirm H2b: eco-innovation acts as a mediator between extra-industry stakeholder ties and new product performance.

The subsequent part of the analysis explores the moderating effect of environmental R&D on the relationship between eco-innovation and new product performance. We propose that the positive relationship between eco-innovation and new product performance is strengthened by environmental R&D spending (H3). Table 3 presents evidence supporting this notion, as the effect of eco-innovation on new product performance is enhanced by environmental R&D spending ($\beta = 0.29$; $t = 4.79$; $p < .01$).

To determine the direction of the interaction effects, we utilized standard techniques to calculate simple slopes (Figure 2) based on values one standard deviation above and below the moderator's

**TABLE 2** Descriptive statistics and correlations.

| No. | Variables | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Firm size | 144.01 | 367.22 | | | | | | | | | |
| 2 | Firm age | 19.59 | 15.46 | −0.05 | | | | | | | | |
| 3 | Industry | 0.61 | 0.49 | −0.03 | 0.03 | | | | | | | |
| 4 | CEO age | 45.44 | 12.94 | 0.05 | −0.01 | −0.02 | | | | | | |
| 5 | Education | 2.96 | 1.19 | −0.07 | −0.03 | −0.01 | 0.03 | | | | | |
| 6 | Intra-industry stakeholder ties | 4.48 | 1.19 | −0.11 | 0.13* | 0.23** | 0.06* | 0.06 | | | | |
| 7 | Extra-industry stakeholder ties | 4.91 | 1.57 | 0.09 | −0.14* | 0.16* | −0.09 | 0.01 | 0.29** | | | |
| 8 | Eco-innovation | 4.52 | 0.83 | 0.14* | 0.08 | −0.09 | −0.11 | 0.10 | 0.24** | 0.29** | | |
| 9 | Environmental R&D spending‡ | 0.08 | 2.48 | 0.17* | 0.23** | 0.11 | 0.02 | 0.11 | 0.14* | 0.12 | 0.13* | |
| 10 | New product performance | 4.48 | 1.42 | 0.11 | 0.03 | 0.06 | −0.09 | 0.08 | 0.23** | 0.22** | 0.27** | 0.12 |

*Note*: *$p < .05$; **$p < .01$. ‡, Natural log; SD, standard deviation.

TABLE 3 Results of structural model estimation.

| | Independent variables | | | | Dependent variables | |
|---|---|---|---|---|---|---|
| | Eco-innovation | New product performance | | | Eco-innovation | New product performance |
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | |
| **Control paths** | | | | | | |
| Firm size | 0.11 (1.12) | 0.09 (1.09) | 0.08 (0.90) | 0.03 (0.35) | 0.05 (0.51) | 0.04 (0.37) |
| Industry | −0.07 (−0.50) | 0.05 (0.52) | 0.04 (0.61) | 0.07 (0.63) | −0.03 (−0.40) | 0.02 (0.40) |
| Firm age | 0.06 (0.20) | 0.04 (0.19) | 0.05 (0.57) | 0.07 (0.81) | 0.02 (0.22) | 0.08 (0.86) |
| CEO age | −0.09 (−0.49) | −0.05 (−0.39) | −0.04 (−0.42) | −0.06 (−0.77) | −0.05 (0.50) | −0.06 (−0.74) |
| Education | 0.08 (1.55) | 0.07 (1.31) | 0.09 (1.17) | 0.08 (1.21) | 0.09 (0.67) | 0.10 (1.34) |
| **Direct effect paths** | | | | | | |
| Intra-industry stakeholder ties | 0.22 (3.31)** | 0.20 (3.16)** | 0.16 (2.34)* | 0.11(1.48) | 0.21 (3.15)** | 0.11 (1.48) |
| Extra-industry stakeholder ties | 0.30 (5.49)** | 0.16 (2.16)* | 0.13 (2.54)* | 0.11 (1.36) | 0.35 (6.20)** | 0.14 (2.46)* |
| Eco-innovation | | | 0.14 (2.45)* | 0.25 (2.88)** | | 0.26 (3.27)** |
| Environmental R&D spending (ER&D) | | | | 0.12 (1.52) | | 0.12 (1.52) |
| **Two-way interaction paths** | | | | | | |
| Eco-innovation * ER&D | | | | 0.29 (4.79)** | | 0.25 (3.35)** |
| **Goodness of Fit Indices** | | | | | | |
| $R^2$ | 0.27 | 0.17 | 0.19 | 0.23 | 0.28 | |
| $\Delta R^2$ | — | — | 0.02 | 0.04 | 0.05 | |
| $\chi^2$/D.F. | 1.60 | 1.50 | 1.45 | 1.46 | 1.99 | |
| CFI | 0.92 | 0.93 | 0.95 | 0.96 | 0.91 | |
| NNFI | 0.94 | 0.90 | 0.92 | 0.95 | 0.91 | |
| RMSEA | 0.05 | 0.06 | 0.04 | 0.05 | 0.04 | |

*Note*: Critical values of the *t* distribution for $\alpha = 0.05$ and $\alpha = 0.01$ (two-tailed test) are * = 1.96, and ** = 2.58, respectively (*t*-values are reported in parentheses).

mean. As anticipated, we discovered a robust slope in the relationship between eco-innovation and new product performance when environmental R&D spending is high (simple slope = 0.29, $t = 3.36$, $p < .01$).

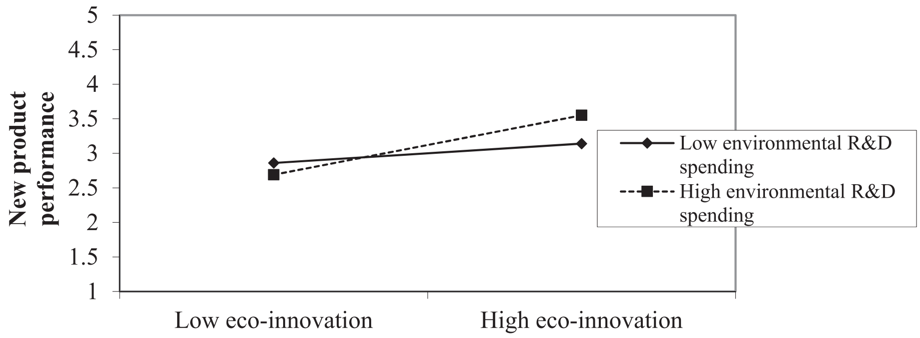
## 5 | DISCUSSION AND CONCLUSION

Drawing upon stakeholder theory (Freeman, 1984; Freeman, 2010; Freeman et al., 2012), this study investigates the influence of industry stakeholder ties on new product performance in established firms through eco-innovation. First, we find that intra-industry stakeholder ties and extra-industry stakeholder ties positively affect eco-innovation. This sheds light on the previously overlooked role of industry stakeholder ties in firms' eco-innovation activities. By incorporating insights from recent research that highlights industry stakeholder ties (Yi et al., 2022; Yoo et al., 2009), this study argues that industry stakeholder ties play a significant role in the eco-innovation activities of firms. Second, we find that eco-innovation serves as a mediating mechanism between industry stakeholder ties and new product performance. This provides new evidence that firms engaging in greater industry stakeholder management can yield greater new product success through eco-innovation activities. Third, we find that the impact of eco-innovation on new product performance is moderated by environmental R&D spending. Thus, we highlight that a firm's level of environmental R&D expenses interacts with eco-innovation activities to improve new product performance. These findings provide several implications for theory and practice.

### 5.1 | Theoretical contribution

Our research makes several contributions to the existing literature in multiple areas. First, our findings enhance our understanding of the role of industry stakeholder ties in facilitating new product performance. Traditionally, stakeholder issues in organizations have been viewed as pressure to implement and improve environmental and social sustainability activities (D'Souza et al., 2022; Helmig et al., 2016). However, our study expands on this perspective by proposing that ties with industry stakeholders also enable firms to implement eco-innovation activities which ultimately leads to new product success. This comprehensive understanding of stakeholder management fills a gap in the literature and aligns with the call for a broader perspective on the concept (Adomako et al., 2023; Fernandez-Feijoo et al., 2014).

FIGURE 2 Interaction effect of eco-innovation and environmental R&D spending on new product performance.




Second, our study contributes to the eco-innovation literature by highlighting the benefits of eco-innovation as a mechanism for the relationship between industry stakeholder ties and new product performance. While previous research has predominantly focused on the effect of eco-innovation on firm performance (Adomako et al., 2023; Cai & Li, 2018; García-Granero et al., 2018), our findings demonstrate the importance of eco-innovation in the stakeholder-new product performance linkage. This highlights the long-term impact of eco-innovation on organizations, extending beyond the direct performance outcomes.

Finally, our research advances our understanding of the boundary conditions that influence the effects of eco-innovation. Despite extensive investigations into the effects of eco-innovation, there remains a lack of consensus in the literature. Our study addresses this gap by empirically examining the boundary conditions of eco-innovation. Specifically, our results indicate that environmental R&D spending acts as one such boundary condition. In eco-innovation activities, a higher environmental R&D expenditure facilitates the effect of eco-innovation on new product performance. Therefore, environmental R&D expenditure amplifies the effects of eco-innovation on new product success. Collectively, our study contributes by expanding the understanding of industry stakeholder ties in promoting new product success through eco-innovation and environmental R&D expenditure as a crucial boundary condition for the effects of eco-innovation.

### 5.2 | Practical contribution

Beyond the theoretical contributions, this paper has implications for managers. First, it is crucial for companies to actively develop ties with industry stakeholders in response to initial environmental pressures rather than waiting for them to escalate. By doing so, organizations will be in a better position to take advantage of emerging opportunities. Meeting the demands of environmentally conscious stakeholders leads to improvements in new product performance. This is because stakeholders' support, such as access to subsidies, entry into new markets, and backing from local authorities, contributes to the enhancement of product performance. Managers should also recognize that the impact of industry stakeholder ties on performance, through eco-innovation, may vary depending on country-specific factors.

Furthermore, the findings of the study offer significant implications for managers who aim to enhance their environmentally friendly management practices to foster new product success. Additionally, managers operating in developing nations are advised to prioritize eco-innovation in new product development, as it has notable ramifications for new product success. Our research specifically indicates that eco-innovation plays a vital role in facilitating new product performance. This correlation provides managers with a clear understanding of the impact of eco-innovation. Ultimately, the outcomes of our study not only emphasize the crucial influence of environmental R&D spending on the relationship between eco-innovation and new product performance but also underscore the importance for managers to acknowledge green expenditure on R&D within organizations. Finally, the paper's findings can inform policymakers, and organizations about the importance of eco-innovation for sustainable development. It highlights the need for supportive policies and frameworks to encourage and incentivize eco-innovations that align with the SDGs.

## 6 | LIMITATIONS AND FUTURE RESEARCH DIRECTION

This research has certain limitations that offer opportunities for future research. First, the data used in the study is limited to one emerging market, which restricts the generalizability of the findings beyond the country under investigation. Vietnam may not be considered a typical representative of an emerging market. However, Vietnam shares similar socioeconomic characteristics with other major emerging markets such as Brazil, China, and India (Hoskisson et al., 2000). To address this limitation, future research should aim to include a broader and more diverse sample of developed and emerging market countries. Second, this study solely focuses on new product performance as an outcome variable. To gain a comprehensive understanding, future research could explore other dimensions of organizational performance, such as overall financial success. It could also investigate the determinants of industry stakeholder ties by examining internal organizational factors and external environmental factors that either foster or hinder the integration of industry stakeholders in less-developed markets. Third, considering that increased institutional voids can hinder the success of innovative products in emerging markets, further studies are required to examine how varying levels of institutional development influence the impact of stakeholder ties on business success in emerging markets. Moreover, it could be argued that environmental dynamism affects the performance outcomes of stakeholder ties differently in firms, as firms may operate in sectors where the effect of dynamism differs. Future research endeavors could shed light on this question.

Finally, while our study maintained methodological rigor by gathering data on the dependent and independent variables from separate sources to mitigate the issue of spurious correlations often present in single-source data (Podsakoff et al., 2012), there are still some limitations that highlight potential avenues for future research. One such limitation pertains to our inability to establish causality, as we did not employ manipulation or random assignment techniques, despite utilizing time-lagged data between the dependent and independent variables. To address this limitation, future research endeavors could consider adopting a longitudinal design that spans multiple years. Therefore, it is suggested that future research endeavors consider examining firms over an extended period to provide a more comprehensive understanding of the subject matter.

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