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Organizational Policies and Environmental Innovation: The Mediating Role of Environmental Partnerships

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ABSTRACT

Although cross-sector collaborations drive innovation, organizational policies as legitimization signals attracting such collaborations remain unexplored. This study examines the mediating role of environmental partnerships between organizational policies and environmental innovation. Using panel data (2014–2024) comprising 3372 firm-year observations from 454 consumer sector firms across 45 countries, we employ the causal mediation framework with fixed-effects regression to analyze human rights-oriented, consumer-oriented, and market-oriented policies. Results reveal that environmental partnerships mediate the effects of human rights-oriented and consumer-oriented policies but not market-oriented policies, and that this mediated pathway operates within consumer discretionary but not consumer staples firms. These findings demonstrate that organizational policies function as legitimization signals that attract environmental partners by communicating social responsibility commitments to proximate stakeholders rather than market compliance. We contribute to the environmental innovation literature by integrating legitimacy theory with the institutional approach, revealing that institutional conformity, although necessary, requires stakeholder proximity to effectively mobilize partnership-mediated innovation.

1 | Introduction

With global greenhouse gas emissions reaching a record 57.7 billion tonnes of CO₂ equivalent in 2024 (United Nations Environment Programme 2025), firms in industries such as manufacturing, retail, and food production face increasing pressure to meet regulatory requirements and stakeholder expectations amid climate challenges. In this context, environmental innovation contributes not only to mitigating environmental impacts but also to achieving operational efficiency, cost reductions, and improved financial performance (Farza et al. 2021; de las Heras-Rosas et al. 2026; Vasileiou et al. 2022; Wedari et al. 2023; Xie et al. 2022). Although extant research has primarily examined the direct links between various innovation modes and environmental outcomes (Chistov et al. 2021; Rehman et al. 2021;

Russo Spena and Di Paola 2020), much less is known about the indirect mechanisms that foster environmental innovation. Understanding these mechanisms helps bridge the gap between innovation drivers and outcomes by moving beyond the assumption of linear relationships. One such indirect mechanism involves legitimization strategies (Scherer et al. 2013), which can be activated, for example, through firms' adoption of organizational policies that signal conformity with societal norms and regulatory expectations (Suchman 1995). These policies can enhance firms' perceived appropriateness as collaboration partners, thereby expanding their access to potential partners (Dacin et al. 2007; Rizzuni et al. 2026). To address this gap, this study analyzes whether organizational policies influence environmental innovation indirectly through their effects on environmental partnerships.

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As environmental challenges increasingly demand cross-sector responses that exceed any single organization's capacity (Li and Zhang 2026; Rondinelli and London 2003), and consistent with the collaborative approaches underlying open social innovation research (Pacheco et al. 2025), understanding the indirect mechanisms that foster environmental innovation becomes critical. At the macrolevel, research has clarified the ways in which policy instruments drive green innovation through channels such as environmental disclosure, instrument synergies, institutional substitution dynamics, and differential effects across policy designs between developed and emerging markets (Gebhardt et al. 2026; Lapologang and Zhao 2023; Liao 2018; Miroshnychenko et al. 2026). At the firm level, evidence indicates that heterogeneous stakeholder pressures steer differentiated innovation strategies depending on stakeholder salience and investment horizons (Cheng et al. 2025; Dong et al. 2026; Yue et al. 2025). Despite this progress, existing models remain anchored in direct policy–innovation and stakeholder–innovation pathways, treating legitimation as a uniform mechanism that does not differentiate collaborative outcomes by stakeholder orientation.

To examine this mediation mechanism, this study distinguishes between organizational policies (Six and Sorge 2008) oriented toward different stakeholder groups. Specifically, we examine mediation patterns across three relevant stakeholder-oriented policy categories: human rights-oriented, consumer-oriented, and market-oriented policies. Human rights-oriented policies focus on demonstrating commitment to employees and communities through ethical labor practices and workplace standards (del-Castillo-Feito et al. 2022; Wettstein 2015). Consumer-oriented policies demonstrate care for consumer welfare beyond the point of sale through product safety and responsible marketing practices (Cope et al. 2010; van Dijk et al. 2008). Market-oriented policies establish conduct standards for fair competition and business ethics (Elmawazini et al. 2022; Yu et al. 2024). Despite these distinctions, empirical evidence regarding whether partnerships mediate policy effects differently across these policy categories remains lacking.

We apply the causal mediation framework developed by Valeri and VanderWeele (2013), which accommodates exposure–mediator interactions within a counterfactual approach, to panel data (2014–2024) comprising 3372 firm-year observations from consumer sector firms sourced from the London Stock Exchange Group (LSEG) Workspace database. Results reveal distinct patterns across policy categories: an indirect-only effect for human rights-oriented policies, both direct and indirect effects for consumer-oriented policies, and no significant mediation for market-oriented policies. Additionally, sector-specific analyses show that the partnership-mediated mechanism operates within consumer discretionary firms but not within consumer staples firms. These findings suggest that legitimation signals function more effectively when directed toward socially proximate stakeholders, such as employees and consumers, who share direct relationships with the firm, rather than toward distant market actors governed by competition policies. This pattern aligns with evidence that socially proximate stakeholders exert a stronger influence on firms' sustainable behavior than distant regulatory actors (Ernst et al. 2022). This relational

proximity, however, requires stakeholder attention and scrutiny to generate effective legitimation, and such scrutiny varies with sector visibility.

This study makes distinct contributions to the environmental innovation and organizational legitimacy literature. First, we contribute to environmental innovation research by integrating legitimacy theory (Suchman 1995) with the institutional approach (North 1990). Specifically, we examine the indirect pathway through which organizational policies, differentiated by the proximity of the stakeholder audience they address, function as legitimation signals that attract cross-sector partnerships for tackling environmental challenges. Previous research has examined direct policy–innovation (Elmawazini et al. 2022) and partnership–innovation relationships (Chistov et al. 2021) without theorizing the conditions under which specific policy signals differentially activate partnership formation. Moreover, recent work on responsibility signals in alliance formation has examined signal valence (Yu et al. 2025) and institutional contingencies (Wang et al. 2023) rather than how signals targeting distinct stakeholder audiences generate different collaborative pathways to innovation. Our findings address this gap by demonstrating that the innovation effects of organizational policies operate through partnership formation when these policies target socially proximate stakeholders. This finding extends current theory by revealing that legitimation effectiveness depends on stakeholder proximity: Human rights and consumer policies generate partnership-mediated innovation, whereas broad market policies do not.

Second, we advance the understanding of collaborative environmental innovation by identifying differential mediation mechanisms across policy categories. Prior research has examined partnerships as channels for external knowledge sourcing in environmental innovation (Ghissetti et al. 2015) and has conceptually distinguished competency-oriented from legitimacy-oriented alliances (Lin and Darnall 2015) but has not empirically tested which specific policy signals activate partnership-mediated innovation pathways. Our results show that partnership formation responds selectively to specific legitimation signals. By demonstrating complete mediation for human rights-oriented policies versus no mediation for market-oriented policies, we reveal that social responsibility signals attract innovation-enhancing partners, whereas regulatory compliance signals do not. This evidence indicates that certain policy signals fail to shape perceptions in ways that foster cross-sector collaboration, thereby underscoring the need to target the types of legitimacy cues that effectively mobilize partners.

Third, we support theoretical propositions linking stakeholder proximity to “corporate environmental legitimacy” (Rizzuni et al. 2026, 12) and extend their application to innovation outcomes. Specifically, the findings indicate that the legitimacy conferred by socially proximate stakeholders is a necessary condition for mobilizing partnership-mediated innovation, whereas the broad compliance signals characteristic of distant market actors fail to trigger this collaborative mechanism, as they lack the stakeholder attention required to activate effective legitimation.

The remainder of the paper is organized as follows. Section 2 provides the conceptual framework and reviews the literature

to develop our hypotheses. Section 3 details the methodology, including models, data, and variables. Section 4 presents the empirical results and robustness tests. Finally, Section 5 draws conclusions, discusses implications, identifies limitations, and suggests future research directions.

2 | Theoretical Background and Hypotheses

2.1 | Environmental Innovation and Environmental Partnerships

The growing interest in reducing organizations' environmental impact has led to a proliferation of concepts related to environmental innovation. The literature includes terms such as "eco-innovation" and "green innovation" that are often used interchangeably with environmental innovation (Schiederig et al. 2012). Depending on the perspective adopted, these concepts may differ in their focus on the innovation object, degree of novelty, stage of the process, or similar characteristics (Díaz-García et al. 2015). For this study, we adopt the term environmental innovation in line with recent research (Chen et al. 2026; Liao et al. 2025). Environmental innovation is broadly defined as "new or modified processes, techniques, practices, systems, and products to avoid or reduce environmental harms" (Beise and Rennings 2005, 6).

Analyzing environmental innovation determinants, Bossle et al. (2016) identify external factors (regulatory pressures, normative pressures, market demand, cooperation, and technology) and internal factors (efficiency, managerial environmental concerns, environmental capability, and human resources). Similarly, Liao and Liu 2021 classify determinants into four categories: policy factors (environmental regulations and government subsidies), market factors (customer demand and market concentration), resource capacity factors (knowledge sources, technological capabilities, organizational performance, and environmental management systems), and organizational characteristics. These reviews provide evidence of previous empirical research on partnerships, both in a broad sense of cooperation (Bossle et al. 2016) and in a specific sense through external knowledge sourcing, also referred to as open eco-innovation (Ghisetti et al. 2015). Furthermore, regardless of the particular cooperation type examined, previous studies have suggested a positive relationship between external collaboration approaches and environmental innovation (Bitencourt et al. 2020; Cainelli et al. 2015; De Marchi 2012; Doran and Ryan 2016; Horbach 2008).

Following Stadtler and Lin (2019) and Ullah et al. (2022), we define environmental partnerships as collaborative initiatives between firms and cross-sector partners (nongovernmental organizations [NGOs], governments, and supragovernmental organizations, etc.) focused on addressing environmental issues. Although this notion can be traced back decades to industrialization processes (Poncelet 2001), recent approaches such as Open Social Innovation have highlighted the diversity of models and initiatives for orchestrating cross-sector collaborations (Pacheco et al. 2025). More specifically, Ullah et al. (2022) demonstrate a direct positive relationship between environmental partnerships and environmental innovation in the context of developing

countries. This relationship can be explained in part through Chesbrough's (2003) open innovation framework, whereby environmental partnerships facilitate access to diverse external knowledge that would otherwise be unavailable internally. Consistent with this logic, collaborations with secondary stakeholders, including civil society organizations and environmental groups, have been found to be particularly associated with eco-innovation outcomes (Ozdemir et al. 2023). Consequently, this inflow of knowledge and additional resources enhances firms' ability to develop environmental innovations, particularly in contexts where such innovations require heterogeneous expertise (Mariani et al. 2022).

2.2 | Organizational Policies and Environmental Partnerships

Following Perrow (1961), Six and Sorge (2008), and Mert et al. (2025), we define organizational policies as deliberately designed rules, governance mechanisms, and principles that shape individual behavior and collective action to achieve corporate goals and meet societal expectations. To frame our understanding of the mediating role of environmental partnerships in the relationship between organizational policies and environmental innovation, we draw on two complementary theoretical perspectives, namely, the institutional approach and legitimacy theory. These frameworks have previously been employed to examine environmental innovation and its determinants (e.g., Garrone et al. 2018; Ren et al. 2022; Truong and Berrone 2022) and are particularly suited to our research because the institutional approach accounts for why organizations design policies in response to external pressures, whereas legitimacy theory explains how the adoption and disclosure of such policies enable organizations to attract cross-sector partners (Lee et al. 2026; Riandita 2022). Individually, neither perspective accounts for why legitimation signals differ in their partnership-generating capacity across different stakeholder audiences. Together, however, these perspectives underpin the prediction that organizational policies, through the legitimacy they confer, facilitate the formation of environmental partnerships that in turn enhance environmental innovation.

We build on the institutional approach (North 1990), which posits that organizational behavior is shaped by formal rules of both national (laws and regulations) and international (human rights conventions) origin, establishing the general minimum framework for organizational operation. Accordingly, organizations design their policies in response to institutional pressures, aligning their practices with the regulatory frameworks and industry norms of the environment in which they operate (Roxas 2022). While some of these policies represent mandatory regulatory responses, others reflect voluntary adoption that exceeds legal minimums. Although informal institutions such as culturally embedded norms and values also shape organizational behavior (North 1990), the policy variables examined here operationalize formalized commitments that respond primarily to regulatory and normative frameworks. Regardless of this distinction, the signaling effect relevant to our study operates through the formalization and public disclosure of policies rather than through legal obligation per se. That is, by formalizing and disclosing their policies, organizations signal conformity with societal

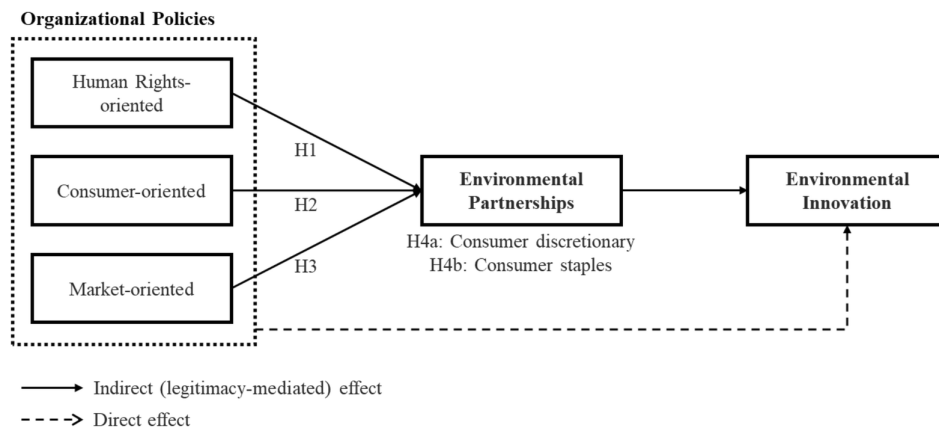


FIGURE 1 | Conceptual model.

expectations, thereby establishing the basis for legitimacy claims within their institutional context.

Building on this institutional foundation, we outline the legitimization process linking policy adoption to environmental partnerships. Following Suchman (1995), we understand legitimacy as a generalized perception that organizational actions are desirable, proper, or appropriate within socially constructed systems of norms, values, and beliefs. We distinguish between legitimacy as this generalized perception and legitimization as the active process through which organizations gain, maintain, or repair such perceptions. Legitimacy, so defined, constitutes a critical resource that not only enhances organizational survival (Baum and Oliver 1991; Singh et al. 1986) but also enables organizations to attract alliance partners and complementary resources (Dacin et al. 2007; Spanuth and Urbano 2024). We argue that the adoption of organizational policies functions as a key legitimization mechanism. By formalizing and disclosing policies aligned with institutional expectations, organizations enhance their perceived appropriateness as partners for environmental initiatives, given that both internal and external stakeholders observe these actions and form legitimacy judgments accordingly (Ruef and Scott 1998; Suchman 1995).

Depending on their focus, organizational policies vary in their scope of application. They may have broad scope, for example, when targeting stakeholders such as markets, customers, and society. Conversely, they may exhibit a narrower scope of application when addressing a smaller subset of stakeholders, such as employees or shareholders. In the context of this study, these so-called niche policies (Poček et al. 2024) would typically focus on the organization's internal workforce and directly affect employees' human rights at work by regulating their employment status and relationships through issues such as employee health and safety, minimum wage, and working hours (e.g., decent work as defined by International Labour Organization human rights standards).

This distinction in stakeholder targeting reflects a clear difference in policy orientation: Externally oriented policies govern firm behavior toward outside actors (i.e., customers, competitors, and markets), whereas internally oriented policies primarily govern employees' human rights. Although both types of policies respond to institutional pressures, they target different

legitimacy audiences. Externally oriented policies signal conformity with market regulations and consumer protection standards, whereas internally oriented policies, despite governing employment relations, serve as critical signals to partners who particularly value evidence of respect for human rights and social responsibility when selecting collaborators.

Building on this distinction, we analyze organizational policies according to their orientation toward human rights (internal), consumer (external), or market (external) stakeholders (see Figure 1). We study these three policy categories because each targets distinct legitimacy audiences whose evaluations influence partnership formation differently, depending on evaluators' capacity to observe, verify, and act upon organizational signals (Bitektine 2011; Suchman 1995). Proximate audiences, such as employees and consumers, possess direct observational access to organizational conduct, which renders policy signals more verifiable and, consequently, more credible as bases for partnership selection. In contrast, distant audiences, such as competition authorities and market regulators, evaluate policies through aggregate conformity indicators that lack the relational specificity needed to differentiate genuine commitment from symbolic adoption. Accordingly, human rights-oriented policies signal to civil society and labor advocates; consumer-oriented policies signal to end users and protection regulators; market-oriented policies signal to competition authorities. This analytical structure enables us to examine whether environmental partnerships differentially mediate policy effects on innovation across varying levels of evaluator proximity, a distinction not addressed in prior classifications that group policy factors alongside resource capacity and organizational characteristics (Liao and Liu 2021).

Human rights-oriented policies align with formal institutions mandating ethical standards such as workers' rights and equality (Wettstein 2015). These policies reflect normative alignment (Scott 2013) with institutionalized expectations while simultaneously signaling commitment to ethical principles that transcend national boundaries (Boyle 2012). Although internally focused, these policies operationalize democratic governance principles through formalized worker representation structures, thereby enhancing firms' legitimacy among external actors (del-Castillo-Feito et al. 2022). Environmental NGOs and research institutions screen for evidence of internal democratic practices (often

disclosed in companies' annual reports) when selecting collaboration partners, viewing such policies and their disclosure as indicators of stakeholder engagement capacity, legitimacy, and credible sustainability commitment (Boiral et al. 2015; Friske et al. 2023; Ruef and Scott 1998). Accordingly, recent empirical evidence indicates that workplace inclusion policies oriented toward human rights enhance environmental performance partly through environmental innovation (Demiralay et al. 2025). Indeed, Ernst et al. (2022) find that proximate employee pressures enhance sustainability outcomes, whereas distant regulatory pressures diminish them. Consistent with these findings, evidence from the green human resource management literature indicates that employee-oriented sustainability practices mediate the relationship between leadership commitment and green innovation outcomes (Singh et al. 2020). Therefore, we pose the following hypothesis:

Hypothesis 1. *The adoption of human rights-oriented policies promotes environmental partnerships and subsequently enhances environmental innovation.*

Whereas narrow, or niche, policies typically focus on the organization's internal workforce, broader-scope policies target the organization's external audiences. External stakeholder-oriented organizational policies encompass those that directly or indirectly affect external parties such as consumers, suppliers, and competitors. These policies can be examined through stakeholder theory (Freeman 2010), which emphasizes the importance of attending to the interests of all groups or individuals affected by firms' actions. Complementarily, stakeholder salience theory (Mitchell et al. 1997) posits that stakeholders possessing greater power, legitimacy, and urgency generate stronger evaluative pressure on organizations. From an institutional perspective, firms also adopt organizational policies in response to formal institutions, specifically the regulations of the countries in which they operate. This response relates to the sanctioning mechanisms embedded in formal institutions, which penalize organizational behavior contrary to formal rules and can result in the loss of both financial resources and reputation. Indeed, pressures to align with externally oriented market and customer-related formal rules stem from multiple stakeholders who demand different bases of legitimacy, including legal conformity, cultural congruence, and alignment with shared cognitive schemas, thereby exposing the organization to normative pressures. Here, we focus on two sets of externally oriented organizational policies driven by formal institutions and normative pressures, namely, those related to customers and those related to markets.

Consumer-oriented policies operationalize risk management capabilities through formalized product quality control, hazard mitigation, and transparent labeling (Cope et al. 2010; van Dijk et al. 2008). Moreover, these policies respond to formal institutions regulating consumer protection. Consumer activism increasingly targets environmental and human rights misconduct, pressuring firms to formalize responsible conduct toward consumers (Narayanan and Singh 2025). Consequently, these mechanisms provide verifiable evidence of organizational capacity to manage complex regulatory requirements, a screening criterion employed by prospective environmental partners to assess collaboration risks and capabilities (Héroux and Roussy 2020; Melander 2018). Additionally, fair trade policies,

marketing practices, and organizational transparency can strengthen consumer attitudes and green purchase intentions (e.g., Nekmahmud et al. 2022), which in turn signals commitment to ethical business practices. By doing so, organizations build a favorable reputation for responsible engagement, which strengthens their standing as environmental partners and helps foster innovation (Melander 2017). Consistent with this logic, empirical evidence indicates that customer Environmental, Social, and Governance (ESG) discourse power can effectively enhance supplier green innovation through green cognitive, behavioral, and management convergence (Wang et al. 2025). Therefore, we pose the following hypothesis:

Hypothesis 2. *The adoption of consumer-oriented policies promotes environmental partnerships and subsequently enhances environmental innovation.*

Market-oriented policies codify governance mechanisms for market integrity and intellectual property protection, thereby addressing specific transaction hazards in environmental collaborations (Elmawazini et al. 2022; Telg et al. 2023). These policies enhance legitimacy among competition authorities and prospective collaborators (Doh et al. 2017), becoming a strategic resource for attracting environmental partnerships in contexts where institutional weakness heightens partner selection uncertainties (Ma et al. 2021). Antibribery and business ethics policies exemplify measures that complement fair competition standards by establishing transparent operational frameworks that reduce risks of opportunistic behavior. As market-oriented policies diffuse and become institutionalized, they shift from voluntary signals to expected partnership prerequisites (Altura et al. 2021), thereby reducing the policy uncertainty that otherwise delays environmental investments (Kyaw 2022). Given the high asset specificity of environmental innovations, which require joint research and development investments with uncertain appropriability, such policies establish ex ante safeguards that enable deeper knowledge exchange between partners (Yu et al. 2024). Based on these considerations, we pose the following hypothesis:

Hypothesis 3. *The adoption of market-oriented policies promotes environmental partnerships and subsequently enhances environmental innovation.*

As discussed above, organizational policies function as signals whose perceived legitimating power, specifically their credibility, depends on observability and evaluator scrutiny (Forcadell et al. 2023). Drawing on prior research distinguishing between high- and low-proximity stakeholders based on their evaluative capacity (Finch et al. 2015; Schons and Steinmeier 2016), we define stakeholder proximity as the intensity of evaluative attention that legitimacy audiences direct toward organizational conduct. This construct builds on the notion that social proximity, rooted in relational embeddedness, shapes how stakeholders perceive and respond to organizational behavior (Lähdesmäki et al. 2019). It further implies that legitimation is an audience-selective process whereby the same organizational signal can generate different legitimacy evaluations depending on the evaluator's relational position. Rather than serving as an independent variable in our model, stakeholder proximity provides the theoretical rationale for examining sector type as a boundary

condition of the mediated pathway, capturing the degree to which stakeholders are positioned to observe, interpret, and respond to organizational policy signals.

Prior research establishes that attention and visibility intensify stakeholder scrutiny, fundamentally affecting both evaluators' legitimacy judgments and the behavior of evaluated actors (Bitektine 2011; Cheng et al. 2025; He et al. 2024; Jin et al. 2024; Suddaby et al. 2017). Legitimacy evaluators hold heterogeneous expectations shaped by contextual characteristics (Lamin and Zaheer 2012), particularly sector visibility, with regulatory pressures proving especially salient in environmentally visible contexts (Baah et al. 2020). Therefore, firms with highly visible activities and significant social impact face greater legitimacy needs, as stakeholders more closely monitor their alignment with societal expectations (Dacin et al. 2007; Yu et al. 2017). For instance, discretionary sectors, especially consumer-facing and controversial industries (Forcadell et al. 2023), are characterized by high product visibility to end consumers and contested social outputs, which attract heightened scrutiny and consumer activism (Narayanan and Singh 2025). Conversely, staple sectors serving functional necessity-driven demand have lower end-consumer visibility and thus reduced stakeholder attention (Pollach and Schaper 2023), thereby operating under attenuated evaluator scrutiny. Although these sectors differ across multiple dimensions including regulatory exposure and product differentiation, the legitimization mechanism under examination depends on whether policy signals are sufficiently observed and evaluated by external audiences (Bitektine 2011; Lamin and Zaheer 2012) to generate partner-attracting legitimacy. In summary, when evaluator attention and scrutiny are high, formal policies generate sufficient perceived legitimacy to activate the partnership–innovation pathway. Conversely, when monitoring is attenuated, partnerships may form through alternative mechanisms bypassing policy-based signaling. Therefore, we pose the following hypotheses:

Hypothesis 4a. *For consumer discretionary firms, environmental partnerships mediate the relationship between organizational policies (i.e., human rights-oriented, consumer-oriented, and market-oriented) and environmental innovation.*

Hypothesis 4b. *For consumer staples firms, environmental partnerships do not mediate the relationship between organizational policies (i.e., human rights-oriented, consumer-oriented, and market-oriented) and environmental innovation.*

3 | Methodology

3.1 | Data Source and Sample

We collected data from the LSEG Workspace database (formerly Refinitiv Eikon), which aggregates and processes ESG data from corporate reports, regulatory filings, and media sources worldwide. We specifically filtered for firms within the consumer discretionary and consumer staples sectors, as defined by the Global Industry Classification Standard (GICS), that reported information on our analytical variables. Characterized by pronounced interfirm innovation transfers, these sectors provide an appropriate empirical context for testing partnership-mediated

mechanisms (Costantini et al. 2017) and encompass a diverse range of companies across subsectors such as manufacturing, retail, and food production, which have direct environmental footprints and varying potential for environmental innovation. The analytical sample was constructed by sequentially excluding observations with incomplete data on the analytical variables and firms lacking within-firm variation in the mediator and then computing Mundlak within-group means for the correlated random effects (CRE) specification (see Table 1). The final sample comprises 454 listed companies spanning an 11-year period from 2014 to 2024, covering 45 countries and resulting in an unbalanced panel of 3372 firm-year observations. This database was selected because it constitutes one of the most widely utilized data sources in sustainability and environmental innovation research (e.g., Albitar, Al-Shaer, and Liu 2023; Orazalin and Mahmood 2021; Ullah et al. 2022).

3.2 | Measures

3.2.1 | Dependent Variable

Prior research has examined environmental innovation through multiple approaches including inputs, processes, products, and proxies such as patents (Cheng and Shiu 2012). Following Albitar, Borgi, et al. (2023) and Konadu et al. (2022), we operationalize the dependent variable as the LSEG ESG Environmental Innovation score ranging from 0 to 100, which “reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes, or eco-designed products” (LSEG 2024, 29).

3.2.2 | Independent Variables

The independent variables consist of three composite indices measuring organizational policies related to transnational company agreements and standards as cataloged by the International Labour Organization and the European Commission (2019). These indices, constructed from ESG policy data (LSEG 2024), are composed of binary organizational policy indicators where each component variable takes a value of 1 if companies report adopting the respective policy and 0 otherwise. Although regulatory requirements vary across the 45 countries in our sample, these indicators capture formalized policy commitments regardless of specific jurisdictional mandates.

TABLE 1 | Sample construction process.

Stage	Firms	Firm-year observations
Initial panel	2080	22,880
Complete cases on analytical variables	1829	10,635
Final sample (mediator variation)	454	3372

Each index is calculated as the arithmetic mean of three component policies, ranging from 0 to 1, reflecting the proportion of adopted policies within each respective domain. The three independent variables are (1) the human rights-oriented index, comprising human rights policy, forced labor policy, and child labor policy, which captures companies' commitment to ensuring respect for fundamental human rights and protecting vulnerable workers across their operations; (2) the consumer-oriented index, consisting of fair trade policy, customer health and safety policy, and responsible marketing policy, which measures companies' adoption of policies that protect consumer welfare, ensure product safety, and promote responsible market practices; and (3) the market-oriented index, encompassing fair competition policy, antibribery policy, and business ethics policy, which assesses companies' commitment to maintaining market integrity through codes of conduct that promote competitive fairness and prevent corruption (LSEG 2024).

3.2.3 | Mediating Variable

The environmental partnerships variable is binary, equal to 1 if companies report partnerships or initiatives with specialized NGOs, industry organizations, or governmental or supragovernmental organizations focused on addressing environmental issues, as defined in the LSEG Workspace data dictionary. This variable reflects the cross-sectoral collaborative relationships that have been identified as fundamental to Open Social Innovation approaches (Pacheco et al. 2025). In prior empirical studies examining direct relationships, Su et al. (2024) incorporate it as part of an index measuring environmental management practices related to firm profitability, whereas Ullah et al. (2022) use this variable as a control in environmental innovation research adopting an institutional approach. Consistent with these precedents, our model focuses on whether firms establish formalized cross-sectoral environmental collaborations, which constitute the theoretically relevant condition for the legitimization mechanism under examination.

3.2.4 | Control Variables

In testing our conceptual model, we control for three groups of variables identified in prior research as potential determinants of environmental innovation: firm size and financial performance, board characteristics, and the existence of environmentally related committees. First, variables related to organizational size and financial characteristics, such as the number of employees, total assets, total debt divided by total capital, and return on equity, have been found to influence environmental innovation (Albitar, Al-Shaer, and Liu 2023; Nadeem et al. 2020; Ullah et al. 2022). Additionally, prior literature has considered the relationship between environmental innovation and various board characteristics (Albitar, Al-Shaer, and Liu 2023; Nadeem et al. 2020; Orazalin and Mahmood 2021; Ullah et al. 2022), including the total number of members, proportion of independent directors, proportion of female directors, and proportion of board members with industry experience. Finally, consistent with prior research (Nadeem et al. 2020; Palea et al. 2024), we control for whether firms have environmental or Corporate Social Responsibility (CSR) committees. Table 2 provides a comprehensive summary of all variables

employed in this study, including their operational definitions and corresponding LSEG Workspace item codes.

3.3 | Estimation

Given the panel structure of our data, we employ the causal mediation approach developed by Valeri and VanderWeele (2013), which extends classical mediation analysis to accommodate exposure–mediator interactions within a counterfactual framework (Robins and Greenland 1992). Unlike the traditional Baron and Kenny (1986) approach, this framework provides formal definitions of natural direct and indirect effects that allow for proper total effect decomposition even when the exposure and the mediator interact in their effect on the outcome (VanderWeele 2010). This approach has been applied across diverse research settings, including entrepreneurship (Klyver et al. 2020), agricultural economics (Lin et al. 2022), and financial risk analysis (De Novellis et al. 2024).

As depicted in Figure 2, the natural direct effect (NDE) captures the policy's influence on environmental innovation through pathways other than partnerships (path c'), whereas the natural indirect effect (NIE) captures the portion of the effect operating through the partnership mechanism (paths $a \times b$). The total effect decomposes additively as $TE = NDE + NIE$, a property that holds even in the presence of exposure–mediator interaction (Valeri and VanderWeele 2013). Identification of these effects requires standard no-unmeasured-confounding assumptions conditional on measured covariates (VanderWeele and Vansteelandt 2009). To address these conditions, we include firm fixed effects to absorb time-invariant unobserved heterogeneity, year fixed effects to control for common temporal shocks, and a comprehensive set of time-varying controls. All policy indices are lagged by 1 year to mitigate reverse causality and simultaneity concerns. Although observational panel designs cannot fully eliminate endogeneity bias, the combination of firm and year fixed effects with lagged policy indices reduces the primary identification threats in this setting. This approach is consistent with established mediation research practice (e.g., Kumar and Operti 2025; Qiu et al. 2020).

The estimation requires two regression models corresponding to the continuous outcome and binary mediator case in the appendix of Valeri and VanderWeele (2013). The mediator model specifies the binary environmental partnership variable using logistic regression.

$$\text{logit } P(ENV_PARTNER_{i,t} = 1) = \beta_0 + \beta_1 \cdot L_POLICY_{i,t-1} + \beta'_2 \cdot X_{i,t} + \tau_t \quad (1)$$

This model is estimated using a CRE specification (Wooldridge 2019), which includes within-firm means of all time-varying covariates as additional regressors to control for time-invariant unobserved heterogeneity while avoiding the incidental parameters problem of fixed-effects logistic regression. The outcome model specifies the environmental innovation score as a linear function of the lagged policy index, the mediator, and their interaction.

$$ENV_INNOV_{i,t} = \theta_0 + \theta_1 \cdot L_POLICY_{i,t-1} + \theta_2 \cdot ENV_PARTNER_{i,t} + \theta_3 \cdot (L_POLICY_{i,t-1} \times ENV_PARTNER_{i,t}) + \theta'_4 \cdot X_{i,t} + \alpha_i + \tau_t + \epsilon_{i,t} \quad (2)$$

TABLE 2 | Description of variables.

Variable	Variable label	Description	LSEG item code
Dependent			
Environmental innovation	<i>EnvInnov</i>	A score for environmental innovation that “reflects a company’s capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes, or eco-designed products”; ranges from 0 to 100	(ENPIDP019)
Independent			
Human rights-oriented	<i>HR-Oriented</i>	A score reflecting a company’s adoption of human rights-oriented policies, based on corporate reporting of three organizational policies (Human Rights Policy, Forced Labor Policy, Child Labor Policy); ranges from 0 to 1	(SOHRDP0105, SOHRDP0104, SOHRDP0103)
Consumer-oriented	<i>Cons-Oriented</i>	A score reflecting a company’s adoption of consumer-oriented policies, based on corporate reporting of three organizational policies (Fair Trade Policy, Customer Health and Safety Policy, Responsible Marketing Policy); ranges from 0 to 1	(SOPRDP015, SOPRDP012, SOPRDP014)
Market-oriented	<i>Mkt-Oriented</i>	A score reflecting a company’s adoption of market-oriented policies, based on corporate reporting of three organizational policies (Fair Competition Policy, Anti-Bribery Policy, Business Ethics Policy); ranges from 0 to 1	(SOPRDP0121, SOBCDP0103, SOBCDP0101)
Mediator			
Environmental partnerships	<i>EnvPartner</i>	A binary variable for environmental partnerships that is “equal to 1 if companies report partnerships or initiatives with specialized NGOs, industry organizations, or governmental or supragovernmental organizations that are focused on addressing environmental issues”; ranges from 0 to 1	(ENERDP070)
Control			
Number of employees	<i>LnEmployees</i>	Natural logarithm of the total number of employees	(WC07011)
Firm size	<i>LnSize</i>	Natural logarithm of total assets	(WC02999)
Leverage	<i>Leverage</i>	Total debt divided by total capital (%)	(WC08221)
Return on equity	<i>ROE</i>	Return on equity (%)	(WC08301)
Board size	<i>BoardSize</i>	Total number of board members	(CGBSDP060)
Board independence	<i>BoardIndep</i>	Proportion of independent board members (%)	(CGBSO07V)
Board gender diversity	<i>BoardFemale</i>	Proportion of female board members (%)	(CGBSO03V)
Board industry experience	<i>BoardSkills</i>	Proportion of board members with industry experience (%)	(CGBSO04V)
Environmental management team	<i>EnvTeam</i>	A binary variable for environmental team	(ENRRDP004)
CSR committee	<i>CSRComm</i>	A binary variable for CSR committee or team	(CGVSDP005)

This model is estimated via within-firm fixed-effects linear regression. The interaction term θ_3 captures the extent to which the policy effect on innovation depends on partnership status, and vice versa. The Hausman test ($p < 0.001$) confirms the appropriateness of fixed effects over random effects for

this specification. Cluster-robust standard errors at the firm level are employed throughout to account for potential heteroskedasticity and serial correlation within firms. Given that the three policy indices are bounded between 0 and 1 and that the mediator is a binary variable, these predictors enter

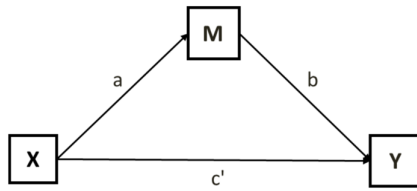


FIGURE 2 | Mediation model framework.

the models without transformation. In contrast, continuous controls are log-transformed where appropriate, consistent with standard econometric guidelines for functional form (Wooldridge 2010).

Using the estimated coefficients from both models, the natural effects are computed at the observation level following the closed-form expressions for the continuous outcome–binary mediator case (Valeri and VanderWeele 2013), as follows:

$$NDE_i = \{\theta_1 + \theta_3 \cdot P(M_i = 1 | a^*, c_i)\} \cdot (a - a^*) \quad (3)$$

$$NIE_i = \{\theta_2 + \theta_3 \cdot a\} \cdot \{P(M_i = 1 | a, c_i) - P(M_i = 1 | a^*, c_i)\} \quad (4)$$

where $P(M_i = 1 | a, c_i)$ denotes the predicted probability of partnership from the mediator model, and $P(M_i = 1 | a^*, c_i)$ is the corresponding counterfactual probability. The contrast compares full policy adoption ($a = 1$) with no adoption ($a^* = 0$) within each policy domain, and population-average effects are obtained by averaging across all firm-year observations. This procedure is implemented separately for each of the three policy indices to examine distinct mediating pathways.

Statistical inference relies on a nonparametric bootstrap with 5000 replications using cluster resampling at the firm level (Cameron et al. 2008). Both models are re-estimated and effects recomputed on each resampled panel. Mediation is supported when the percentile-based 95% confidence interval for the NIE excludes zero (MacKinnon et al. 2004). When the NIE is significant and the NDE is not, the evidence suggests that the effect operates primarily through the indirect pathway; when both are significant, the effect operates through both the mediated pathway and other channels (VanderWeele 2015).

4 | Results

Table 3 presents correlations and descriptive statistics for all variables. The environmental innovation score averages 28.567, and environmental partnerships are observed in 49.5% of the firm-year observations. Pairwise correlations among the variables remain below conventional thresholds, with the exception of the two firm-size proxies (number of employees and total assets), whose high correlation is expected given their conceptual overlap. Among the independent variables, the largest correlation is 0.317 (between the human rights-oriented index and the market-oriented index), indicating no multicollinearity concerns. This assessment is confirmed by variance inflation factor (VIF) diagnostics: The maximum value across all substantive variables is 2.67, well below the conventional threshold of 10 (Ryan 1997), and the mean VIF

is 2.01. Table 4 shows the distribution of the 3372 firm-year observations from the consumer discretionary (2130) and consumer staples (1242) sectors over the 2015–2024 period.

Table 5 presents the mediator model estimates, and Table 6 presents the outcome model estimates for each policy index. Across all three outcome models, the exposure–mediator interaction term is not statistically significant ($p > 0.10$), indicating that the controlled direct effect and the natural direct effect do not substantially differ across policy types.

In the mediator model, human rights-oriented policies significantly predict environmental partnerships (Model 1: $\beta = 0.826$, $p < 0.01$). In the outcome model (Model 4), when both the policy index and the mediator are included alongside their interaction, environmental partnerships show a significant positive association with environmental innovation ($\theta_2 = 7.575$, $p < 0.01$), whereas the direct policy coefficient is only marginally significant ($\theta_1 = 3.817$, $p < 0.10$), and the exposure–mediator interaction term is not statistically significant ($\theta_3 = -3.840$, $p > 0.10$). Bootstrap analysis with 5000 cluster-level replications (Table 7) reveals a significant NIE ($b = 0.645$, $SE = 0.273$, 95% CI [0.110, 1.180]). Because the percentile-based confidence interval excludes zero, this result indicates that human rights-oriented policies influence environmental innovation through the environmental partnerships pathway. The natural direct effect is not statistically significant ($b = 2.427$, 95% CI [−1.207, 6.062]), suggesting no evidence of an effect operating through channels other than environmental partnerships. The total effect does not reach statistical significance ($b = 3.072$, 95% CI [−0.563, 6.707]); however, mediation can be present even without a significant total effect in cases of inconsistent mediation (Valeri and VanderWeele 2013). Notwithstanding this caveat, the mediation analysis results for human rights-oriented policies support Hypothesis 1, as the significant NIE confirms that the effect operates through the environmental partnership pathway. The proportion mediated is not reported because the total effect does not reach statistical significance, rendering this ratio unreliable (MacKinnon et al. 1995).

The mediation analysis for consumer-oriented policies reveals a significant effect in the mediator model (Model 2: $\beta = 2.138$, $p < 0.01$) and a significant total effect on environmental innovation ($b = 11.431$, 95% CI [2.263, 20.600]). In the outcome model (Model 5), both environmental partnerships ($\theta_2 = 5.846$, $p < 0.01$) and the direct policy effect ($\theta_1 = 10.591$, $p < 0.05$) remain significant, with a nonsignificant interaction term ($\theta_3 = -3.320$, $p > 0.10$). Bootstrap analysis (Table 7) reveals a statistically significant NIE ($b = 1.478$, $SE = 0.496$, 95% CI [0.506, 2.451]), indicating that consumer-oriented policies influence environmental innovation through the environmental partnerships pathway. The natural direct effect is also statistically significant ($b = 9.953$, 95% CI [0.908, 18.999]), indicating that these policies additionally affect environmental innovation through channels other than environmental partnerships. These results support Hypothesis 2. The proportion mediated (NIE/TE) indicates that 12.9% of the total effect of consumer-oriented policies on environmental innovation is transmitted through the environmental partnerships pathway.

TABLE 4 | Number of observations by subsector and year.

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Consumer discretionary	128	154	173	198	219	237	251	263	273	234	2130
Consumer staples	76	88	102	113	125	139	149	156	158	136	1242
Total	204	242	275	311	344	376	400	419	431	370	3372

Note: 2014 omitted due to $t-1$ lags of independent variables.

TABLE 5 | Regression estimates for environmental partnerships (mediator model).

	Model 1 HR-oriented	Model 2 Consumer-oriented	Model 3 Market-oriented
HR-oriented _{t-1} (H1)	0.826*** (0.305)		
Consumer-oriented _{t-1} (H2)		2.138*** (0.651)	
Market-oriented _{t-1} (H3)			0.689 (0.442)
<i>Controls</i>			
LnEmployees	0.221 (0.338)	0.275 (0.331)	0.264 (0.330)
LnSize	1.412*** (0.418)	1.380*** (0.416)	1.423*** (0.416)
Leverage	0.181 (0.817)	0.185 (0.821)	0.111 (0.802)
ROE	0.008 (0.006)	0.009 (0.007)	0.009 (0.007)
BoardSize	0.025 (0.059)	0.028 (0.059)	0.029 (0.058)
BoardIndep	0.723 (0.932)	0.708 (0.936)	0.862 (0.935)
BoardFemale	0.009 (1.088)	0.094 (1.093)	0.180 (1.090)
BoardSkills	1.840*** (0.627)	1.865*** (0.630)	1.852*** (0.622)
EnvTeam	1.308*** (0.270)	1.298*** (0.263)	1.331*** (0.262)
CSRComm	1.240*** (0.271)	1.247*** (0.271)	1.275*** (0.269)
Constant	-3.835*** (1.174)	-4.336*** (1.158)	-4.318*** (1.153)
Observations	3372	3372	3372

Note: Cluster-robust standard errors in parentheses. CRE logit. Within-firm means included but not shown. Year fixed effects included.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

The mediation analysis results for market-oriented policies do not support Hypothesis 3. Bootstrap analysis (Table 7) reveals no significant natural indirect effect for these policies ($b = 0.565$, $SE = 0.381$, 95% CI $[-0.181, 1.311]$), as the confidence interval includes zero. Market-oriented policies show neither a significant total effect on environmental innovation ($b = 1.905$, 95% CI $[-3.153, 6.963]$) nor a significant relationship with environmental partnerships in the mediator model (Model 3: $\beta = 0.689$, $p > 0.10$). Consequently, despite environmental partnerships maintaining their positive association with environmental innovation in the outcome model (Model 6: $\theta_2 = 6.337$, $p < 0.01$), the nonsignificant natural indirect effect provides no evidence of mediation through this pathway for market-oriented policies.

Additionally, several control variables show consistent relationships across the models. In the outcome models (Table 6), return on equity shows a small but statistically significant

positive association with environmental innovation (θ ranging from 0.070 to 0.074, $p < 0.01$). The presence of environmental management teams (θ ranging from 4.020 to 4.257, $p < 0.01$) and CSR committees (θ ranging from 4.060 to 4.295, $p < 0.05$) is consistently associated with higher environmental innovation scores. In the mediator models (Table 5), firm size as measured by total assets (β ranging from 1.380 to 1.423, $p < 0.01$), the proportion of board members with industry experience (β ranging from 1.840 to 1.865, $p < 0.01$), environmental management teams (β ranging from 1.298 to 1.331, $p < 0.01$), and CSR committees (β ranging from 1.240 to 1.275, $p < 0.01$) significantly predict the likelihood of environmental partnership engagement.

Table 8 shows sector-specific mediation patterns for consumer discretionary firms ($n = 2130$). The bootstrap confidence intervals reveal that for human rights-oriented policies, the natural indirect effect is statistically significant ($NIE = 0.799$,

TABLE 6 | Regression estimates for environmental innovation (outcome model).

	Model 4	Model 5	Model 6
	HR-oriented	Consumer-oriented	Market-oriented
HR-oriented _{t-1} (H1)	3.817* (2.295)		
Consumer-oriented _{t-1} (H2)		10.591** (5.082)	
Market-oriented _{t-1} (H3)			1.931 (2.886)
<i>Mediator and interaction</i>			
EnvPartner	7.575*** (1.847)	5.846*** (1.574)	6.337*** (2.327)
Policy _{t-1} × EnvPartner	−3.840 (2.429)	−3.320 (5.196)	−1.547 (2.901)
<i>Controls</i>			
LnEmployees	2.882 (1.896)	3.176* (1.901)	2.974 (1.925)
LnSize	1.258 (1.986)	1.330 (1.968)	1.579 (2.023)
Leverage	0.094 (4.596)	−0.119 (4.552)	−0.197 (4.556)
ROE	0.070*** (0.024)	0.074*** (0.025)	0.074*** (0.024)
BoardSize	−0.262 (0.349)	−0.271 (0.346)	−0.259 (0.353)
BoardIndep	1.762 (5.397)	1.596 (5.299)	2.268 (5.374)
BoardFemale	−3.502 (6.275)	−3.812 (6.304)	−3.336 (6.293)
BoardSkills	5.602 (3.502)	5.619 (3.495)	5.493 (3.509)
EnvTeam	4.075*** (1.552)	4.020*** (1.538)	4.257*** (1.534)
CSRComm	4.097** (1.682)	4.060** (1.696)	4.295** (1.691)
Constant	−35.067 (28.054)	−39.413 (27.484)	−41.177 (28.431)
Observations	3372	3372	3372

Note: Cluster-robust standard errors in parentheses. Within-firm fixed effects. Year fixed effects included.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

95% CI [0.037, 1.562]), whereas the natural direct effect is not (NDE = 2.342, 95% CI [−2.385, 7.070]), indicating that the effect operates through the environmental partnership pathway. For consumer-oriented policies, both the natural indirect effect (NIE = 1.638, 95% CI [0.394, 2.881]) and the natural direct effect (NDE = 13.354, 95% CI [2.217, 24.490]) are statistically significant, indicating that the effect operates both through environmental partnerships and through other channels. The proportion mediated indicates that 10.9% of the total effect is transmitted through the environmental partnerships pathway. For market-oriented policies, the natural indirect effect is not statistically significant (NIE = 0.419, 95% CI [−0.591, 1.430]), providing no evidence of mediation. These patterns mirror the full-sample results and provide evidence that the partnership-mediated mechanism for human rights-oriented and consumer-oriented policies operates within the consumer discretionary sector, partially supporting Hypothesis 4a.

Table 9 presents results for the consumer staples sector ($n = 1242$). The bootstrap confidence intervals reveal no significant natural indirect effects for any of the three policy types: human rights-oriented policies (NIE = 0.397, 95% CI [−0.237, 1.030]), consumer-oriented policies (NIE = 1.128, 95% CI [−0.319, 2.574]), and market-oriented policies (NIE = 0.465,

95% CI [−0.432, 1.361]). Because all confidence intervals include zero, these results provide no evidence that the partnership-mediated pathway operates within the consumer staples sector, supporting Hypothesis 4b. Table 10 summarizes the empirical findings for all four hypotheses.

4.1 | Robustness Checks

To validate our findings, we replicated the mediation analysis using the Baron and Kenny (1986) three-step procedure, which has been widely employed in management and innovation research (e.g., Martínez-Alonso et al. 2025; Miremadi et al. 2023; Qiu et al. 2020). This approach estimates the total effect of each policy index on environmental innovation (path c), the effect on the mediator (path a), and the direct effect controlling for the mediator (path c'). The indirect effect is computed as the product of coefficients ($a \times b$). Because this specification employs linear probability models for the binary mediator within a fixed-effects framework, it does not require within-firm variation in the mediator variable. This yields an expanded sample of 10,635 firm-year observations (1829 firms). Statistical inference relies on a nonparametric bootstrap with 5000 cluster-level replications (Cameron

TABLE 7 | Mediation results for full sample (H1–H3).

Policy index	Total effect			Natural direct effect			Natural indirect effect			Mediation evidence
	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI	
Human rights-oriented (H1)	3.072	1.855	(−0.563, 6.707)	2.427	1.854	(−1.207, 6.062)	0.645	0.273	(0.110, 1.180)	Indirect only
Consumer-oriented (H2)	11.431	4.678	(2.263, 20.600)	9.953	4.615	(0.908, 18.999)	1.478	0.496	(0.506, 2.451)	Both direct and indirect
Market-oriented (H3)	1.905	2.581	(−3.153, 6.963)	1.340	2.566	(−3.689, 6.370)	0.565	0.381	(−0.181, 1.311)	No evidence

Note: Bootstrap with 5000 cluster-level replications. Percentile-based 95% confidence intervals.

et al. 2008). Mediation is deemed significant when the percentile-based 95% confidence interval for the indirect effect excludes zero (MacKinnon et al. 2004).

The results for the full sample (Table A1) are consistent with our main findings. Human rights-oriented policies show a significant indirect effect ($b = 0.41$, 95% CI [0.120, 0.701]) consistent with complete mediation, consumer-oriented policies exhibit a significant indirect effect ($b = 0.735$, 95% CI [0.140, 1.329]) consistent with partial mediation, and market-oriented policies show no significant mediation ($b = 0.138$, 95% CI [−0.197, 0.474]). The sectoral analyses for consumer discretionary firms (Table A2) and consumer staples firms (Table A3) similarly confirm the patterns observed in the primary analysis, with significant indirect effects for human rights-oriented and consumer-oriented policies in the consumer discretionary sector and no mediation in the consumer staples sector.

5 | Discussion and Conclusion

This study examines whether environmental partnerships mediate the effects of organizational policies on environmental innovation using panel data from 454 consumer sector firms spanning 2014–2024. Our results reveal differential mediation patterns: an indirect-only effect for human rights-oriented policies, direct and indirect effects for consumer-oriented policies, and no evidence of mediation for market-oriented policies. These findings suggest that legitimization signals function more effectively when directed toward socially proximate stakeholders who share direct relationships with firms rather than toward more distant regulatory audiences.

The indirect-only effect for human rights-oriented policies indicates that these policies influence environmental innovation exclusively through partnership formation. Despite their internal orientation toward employee welfare, human rights-oriented policies serve as signals that attract environmental partners, given that NGOs and other collaborators screen for evidence of ethical labor practices when selecting potential allies (Ullah et al. 2022). We extend this finding by showing that the legitimacy conferred by such policies enables partnership formation, which in turn drives environmental innovation. For firms, this implies that adopting human rights-oriented policies without actively pursuing partnerships is unlikely to yield environmental innovation gains, since partnership formation constitutes the sole operative pathway. In contrast, consumer-oriented policies reveal dual pathways to environmental innovation, as direct and indirect effects are both statistically significant. Consumer-oriented policy signals thus operate through multiple channels, generating environmental innovation both internally (through product safety and quality improvements) and externally (through collaborative relationships). This pattern may reflect the dual role of consumer-oriented policies in operational risk management and stakeholder engagement.

The absence of a significant indirect effect for market-oriented policies suggests that broad regulatory compliance signals fail to mobilize cross-sector collaborations for innovation. These null findings align with Haack and Rasche's (2021) paradox perspective, according to which market-oriented policies may

TABLE 8 | Mediation results for consumer discretionary sector firms (H4a).

Policy index	Total effect			Natural direct effect			Natural indirect effect			Mediation evidence
	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI	
Human rights-oriented	3.142	2.453	(−1.665, 7.949)	2.342	2.412	(−2.385, 7.070)	0.799	0.389	(0.037, 1.562)	Indirect only
Consumer-oriented	14.991	5.79	(3.643, 26.340)	13.354	5.682	(2.217, 24.490)	1.638	0.634	(0.394, 2.881)	Both direct and indirect
Market-oriented	4.312	3.087	(−1.737, 10.362)	3.893	3.131	(−2.244, 10.029)	0.419	0.516	(−0.591, 1.430)	No evidence

Note: Bootstrap with 5000 cluster-level replications. Percentile-based 95% confidence intervals.

TABLE 9 | Mediation results for consumer staples sector firms (H4b).

Policy index	Total effect			Natural direct effect			Natural indirect effect			Mediation evidence
	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI	
Human rights-oriented	4.398	2.797	(−1.084, 9.879)	4.001	2.821	(−1.529, 9.530)	0.397	0.323	(−0.237, 1.030)	No evidence
Consumer-oriented	2.704	6.739	(−10.506, 15.913)	1.576	6.758	(−11.670, 14.821)	1.128	0.738	(−0.319, 2.574)	No evidence
Market-oriented	−2.398	4.105	(−10.442, 5.647)	−2.862	4.019	(−10.740, 5.016)	0.465	0.458	(−0.432, 1.361)	No evidence

Note: Bootstrap with 5000 cluster-level replications. Percentile-based 95% confidence intervals.

gain acceptance through accessible compliance requirements but fail to signal the substantive commitment that environmental partners seek. Additionally, the temporal structure of our 1-year lag specification may partly account for these results, as market-oriented policies may require longer maturation periods to build trust and credibility with environmental partners (Liu et al. 2021). Whereas human rights-oriented and consumer-oriented policies generate more immediately recognizable legitimacy signals, market-oriented policies addressing competition and antibribery may require extended field-level diffusion before becoming effective partnership facilitators (Altura et al. 2021).

The subsector analysis reveals that environmental partnerships do not mediate the relationship between organizational policies and environmental innovation for consumer staples firms, supporting Hypothesis 4b. This null mediation pattern across all three policy types contrasts with the consumer discretionary results (Hypothesis 4a) and reveals a boundary condition: Legitimation signals require stakeholder attention to function effectively. Consumer staples firms operate in low-visibility contexts characterized by necessity-driven demand and standardized products, which attenuate stakeholder scrutiny and thereby weaken the signaling mechanism through which policies attract environmental partners. Importantly, partnerships retain their positive effects on environmental innovation when present, indicating that mediation failure stems from the inability of policies to attract partners in low-attention environments rather than from diminished partnership effectiveness. These sectoral differences could alternatively reflect differences in regulatory intensity or business model characteristics. However, if regulatory

exposure were the primary driver, market-oriented policies should exhibit mediation in the more heavily regulated subsector, yet they show no mediation in either context. Similarly, the persistence of partnership effectiveness in both subsectors weakens business model explanations, localizing the failure in the signaling stage. Consumer-facing industries characterized by high product visibility and stakeholder activism likely amplify legitimation effects (Adomako and Tran 2025), whereas contexts characterized by attenuated consumer scrutiny may require alternative mechanisms for partnership formation.

5.1 | Theoretical Implications

Our differential mediation patterns suggest that signaling effectiveness hinges on stakeholder proximity, conceptualized as closeness to the evaluating audience (Spanuth and Urbano 2024), rather than on regulatory breadth. Signals aimed at stakeholders possessing power, legitimacy, and urgency (Mitchell et al. 1997; Suchman 1995) are more likely to trigger partnership formation, whereas broad market-compliance signals fail to activate this collaborative mechanism. These results also reveal a boundary condition for the institutional approach (North 1990). Although alignment with formal institutions explains policy adoption across all three categories, such institutional conformity does not predict effectiveness in generating collaborations. Rather, institutional conformity appears necessary but insufficient for partnership formation, consistent with evidence that regulative institutions require complementary normative and cultural-cognitive legitimation to be effective (Urbano et al. 2026).

TABLE 10 | Summary of empirical results.

Hypotheses	Evidence		Results
H1 The adoption of human rights-oriented policies promotes environmental partnerships and subsequently enhances environmental innovation.	Significant indirect effect through partnerships		Supported
H2 The adoption of consumer-oriented policies promotes environmental partnerships and subsequently enhances environmental innovation.	Significant indirect and direct effects		Supported
H3 The adoption of market-oriented policies promotes environmental partnerships and subsequently enhances environmental innovation.	No significant effects		Not supported
H4a For consumer discretionary firms, environmental partnerships mediate the relationship between organizational policies and environmental innovation.	Significant indirect effects for human rights-oriented and consumer-oriented policies only		Partially supported
H4b For consumer staples firms, environmental partnerships do not mediate the relationship between organizational policies and environmental innovation.	No significant indirect effects		Supported

These findings extend legitimacy theory (Suchman 1995) by demonstrating that signaling effectiveness varies systematically with the proximity of the evaluating audience. This pattern reveals what Suddaby et al. (2017) characterize as legitimacy-as-process, whereby legitimation occurs through interactive mechanisms between organizations and evaluating audiences. Because these audiences differ in their capacity to verify organizational signals depending on their relational position, the same policy can generate divergent legitimacy outcomes. In this regard, the exclusively indirect pathway observed for human rights-oriented policies underscores the centrality of collaborative mechanisms for internally oriented policy signals, as their innovation effect depends entirely on the legitimation-partnership channel.

Beyond direct policy-innovation relationships examined in previous research (Elmawazini et al. 2022), our mediation framework reveals that certain policies require collaborative channels to generate innovation effects. This finding extends the open innovation framework (Chesbrough 2003) by identifying organizational policy adoption as a previously unexplored antecedent of external knowledge acquisition. Whereas open innovation presupposes that collaborative relationships exist, our results demonstrate that specific legitimacy cues are required to activate these mechanisms. This supports the notion that firms can leverage internally oriented policies to build their perceived worthiness as alliance partners (Dacin et al. 2007), thereby attracting environmental collaborators through the legitimation process rather than through direct resource provision.

5.2 | Policy Implications

These findings carry implications for both environmental and innovation policy design. The absence of mediation for market-oriented policies suggests that regulatory frameworks emphasizing competition compliance and anti-corruption standards, whereas valuable for market integrity, may prove insufficient for stimulating environmental innovation through collaborative channels. Conversely, the significant mediation effects for human rights-oriented and consumer-oriented policies indicate that governments seeking to promote green innovation may achieve greater impact by incentivizing the adoption of labor standards and consumer protection measures through instruments such as tax credits for certified ethical labor practices, preferential access to green finance for firms meeting consumer welfare benchmarks, or supply chain due diligence requirements that reward formalized human rights commitments. Sustainable finance frameworks and ESG assessment criteria could similarly weight these stakeholder-proximate policies more heavily when evaluating firms' environmental innovation potential.

Innovation grant programs and public procurement frameworks could incorporate formal human rights and consumer welfare policies as eligibility or evaluation criteria. Governments may also establish matching programs that connect firms demonstrating strong stakeholder engagement records with environmental NGOs and research institutions seeking corporate partners. The differential mediation patterns across consumer discretionary and

consumer staples sectors further suggest that such instruments may prove more effective in high-visibility industries, where stakeholder scrutiny amplifies legitimation signals. In low-visibility sectors, by contrast, policy interventions may need to facilitate environmental partnership formation directly (for instance, through sector-specific intermediary platforms or mandatory environmental collaboration disclosure requirements) rather than relying on firm-level policy signals to attract collaborators. These interventions present implementation challenges, particularly verification difficulties that could invite symbolic rather than substantive policy adoption. Such challenges warrant careful program design and monitoring mechanisms.

5.3 | Limitations and Future Research

This study has several limitations that suggest directions for future research. First, although fixed-effects specifications and lagged independent variables mitigate endogeneity, residual concerns remain. Time-varying confounders, such as leadership transitions or strategic reorientations, could simultaneously influence policy adoption, partnership formation, and innovation outcomes. Similarly, environmental partnerships may be codetermined with innovation, and persistently innovative firms may both attract partners and adopt policies, generating selection dynamics that lagged specifications attenuate but do not eliminate. Future research could employ instrumental variable approaches or difference-in-differences designs exploiting exogenous regulatory shocks to strengthen causal identification.

Second, our reliance on binary operationalizations introduces measurement limitations along multiple dimensions. The environmental partnerships variable may obscure heterogeneity in collaboration intensity, mechanisms, duration, and quality, which could affect mediation strength. Future research leveraging Open Social Innovation approaches (Pacheco et al. 2025) could explore whether partnerships employing exploration-oriented orchestration models mediate policy effects differently than those using exploitation-oriented models. Similarly, although the policy indices partially address binary measurement concerns by aggregating three component indicators into a continuous composite, these variables capture formal adoption but cannot distinguish substantive implementation from symbolic adoption, which constitutes a distinction central to legitimacy theory. Relatedly, our composite indices do not differentiate between mandatory regulatory compliance and voluntary adoption exceeding legal minimums across the countries in our sample. Subsequent studies could investigate whether voluntary adoption moderates the partnership-mediated pathway, as partners may differentially value policies signaling genuine commitment over baseline compliance. Additionally, triangulating ESG data with primary data collection or employing process tracing methods could directly test whether partners explicitly evaluate policies during partner selection.

Third, the unbalanced panel structure, although providing broad coverage, may introduce selection effects if firm entry and exit correlate with unmeasured innovation determinants. However, the use of lagged independent variables and fixed-effects specifications mitigates these concerns, and the

consistency of patterns across multiple policy types strengthens confidence in the core findings. Additionally, our sample of LSEG-covered listed firms exhibits selection toward larger, more transparent organizations. These findings may not generalize to small- and medium-sized enterprises or private firms facing distinct legitimation dynamics and resource constraints. Fourth, our consumer sector sample limits generalizability to contexts with high stakeholder visibility. Indeed, the subsector analysis demonstrates that mediation patterns vary substantially even within the consumer sector, as legitimation effectiveness depends on the intensity of stakeholder scrutiny. These within-sector differences suggest that extrapolation to other sectors requires careful consideration of each sector's stakeholder dynamics, visibility conditions, and predominant legitimation channels. Future research should test whether legitimation-based mediation mechanisms operate in low-visibility business-to-business (B2B) industries or extractive sectors where regulatory scrutiny, rather than consumer activism, predominates. Moreover, direct measurement of stakeholder evaluative attention through survey instruments or media salience indicators would allow for more precise identification of the mechanisms underlying sectoral differences, beyond the categorical sector comparison employed here.

Fifth, although we frame our findings through legitimacy theory, alternative mechanisms warrant consideration. For example, from a resource-based perspective (Barney 1991), firms capable of adopting formal policies may also possess complementary resources that independently facilitate partnerships and innovation, potentially confounding the legitimation pathway. Moreover, our mediation design captures the statistical pathway from policies through partnerships to innovation but does not directly observe the legitimation process, which is inferred from differential mediation patterns rather than measured through direct indicators of perceived legitimacy. Future research employing process tracing or survey measures of perceived organizational legitimacy could both distinguish legitimation from resource-based explanations and examine how legitimacy evaluations operate within partnership formation.

Sixth, this study is constrained by the variables available in the LSEG Workspace database, limiting exploration of additional organizational moderating factors. The consistent relationships observed for several control variables suggest that human capital and corporate governance mechanisms may moderate partnership-mediated pathways, warranting further investigation. Additionally, the LSEG Environmental Innovation score aggregates input-, process-, and product-level outcomes into a single composite measure (LSEG 2024). Although this operationalization is consistent with prior research (Albitar, Borgi, et al. 2023; Konadu et al. 2022) and captures the overall environmental innovation capacity of firms, it does not allow for the identification of the specific innovation dimensions through which legitimation mechanisms operate. For instance, the partnership-mediated pathway may more strongly influence process-oriented innovations, where collaborative knowledge exchange is directly relevant, than product-level eco-design outcomes. Future research employing disaggregated innovation measures could provide more granular evidence on these differentiated mediation pathways.

Seventh, our within-firm specification absorbs time-invariant country characteristics but cannot capture how institutional factors moderate mediation pathways across contexts. Although the sample spans 45 countries with diverse levels of economic development, the number of firms per country limits the feasibility of regional or development-level subsample analyses with sufficient statistical power. Institutional arrangements may produce distinct sustainability effects depending on the context (Maaßen et al. 2025). For example, informal institutions such as cultural dimensions may condition the effectiveness of corporate sustainability commitments in generating environmental innovation across countries (Ullah et al. 2022). Future research employing multilevel designs or focusing on specific institutional contexts could examine these moderating mechanisms and their boundary conditions.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Appendix A

TABLE A1 | Robustness mediation test results for the full sample (H1–H3).

Policy index	Total effect (c)			Direct effect (c')			Indirect effect (a × b)			Mediation type
	b	SE	95% CI	b	SE	95% CI	b	SE	95% CI	
Human rights-oriented (H1)	2.47	1.061	(0.391, 4.549)	2.06	1.055	(−0.009, 4.128)	0.41	0.148	(0.120, 0.701)	Complete
Consumer-oriented (H2)	11.526	2.541	(6.546, 16.505)	10.791	2.496	(5.900, 15.682)	0.735	0.303	(0.140, 1.329)	Partial
Market-oriented (H3)	3.429	1.625	(0.245, 6.614)	3.291	1.625	(0.106, 6.476)	0.138	0.171	(−0.197, 0.474)	No mediation

Note: Bootstrap with 5000 cluster-level replications. Percentile-based 95% confidence intervals for indirect effects; 95% CI for total and direct effects based on cluster-robust standard errors. *N* = 10,635 observations; 1829 firms.

TABLE A2 | Robustness mediation test results for consumer discretionary sector firms (H4a).

Policy index	Total effect (c)			Direct effect (c')			Indirect effect (a × b)			Mediation type
	b	SE	95% CI	b	SE	95% CI	b	SE	95% CI	
Human rights-oriented	1.973	1.255	(−0.487, 4.433)	1.519	1.244	(−0.920, 3.957)	0.455	0.21	(0.043, 0.866)	Complete
Consumer-oriented	10.986	3.249	(4.618, 17.354)	9.814	3.131	(3.678, 15.950)	1.172	0.505	(0.182, 2.163)	Partial
Market-oriented	3.065	1.884	(−0.627, 6.758)	2.943	1.903	(−0.786, 6.673)	0.122	0.255	(−0.378, 0.623)	No mediation

Note: Bootstrap with 5000 cluster-level replications. Percentile-based 95% confidence intervals for indirect effects; 95% CI for total and direct effects based on cluster-robust standard errors. *N* = 6786 observations; 1181 firms.

TABLE A3 | Robustness mediation test results for consumer staples sector firms (H4b).

Policy index	Total effect (c)			Direct effect (c')			Indirect effect (a × b)			Mediation Type
	b	SE	95% CI	b	SE	95% CI	b	SE	95% CI	
Human rights-oriented	3.281	1.872	(−0.388, 6.950)	2.938	1.861	(−0.709, 6.584)	0.344	0.21	(−0.068, 0.755)	No mediation
Consumer-oriented	12.409	4.014	(4.541, 20.277)	12.133	3.998	(4.298, 19.969)	0.275	0.318	(−0.348, 0.898)	No mediation
Market-oriented	4.298	2.859	(−1.304, 8.900)	4.197	2.845	(−1.379, 8.773)	0.101	0.22	(−0.331, 0.532)	No mediation

Note: Bootstrap with 5000 cluster-level replications. Percentile-based 95% confidence intervals for indirect effects; 95% CI for total and direct effects based on cluster-robust standard errors. *N* = 3849 observations; 648 firms.