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RESEARCH ARTICLE

The nexus between environmental strategy and environmental performance: analyzing the roles of green product innovation and mechanistic/organic organizational structure

Noman Mustafa[1] · Muhammad MansoorAsghar[2] · Rozeia Mustafa[3] · Zahoor Ahmed[4,5] · Husam Rjoub[6] · Rafael Alvarado[7]

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Abstract

The relationship between environmental strategy and environmental performance has been extensively analyzed in the environmental management literature. However, this relationship is spurious due to the inconsistence outcomes, lack of intervening mechanism, and scarcity of appropriate context. This study undertakes these considerations by exploring the underlying moderation-mediation mechanism through which proactive corporate environmental strategy affects corporate environmental performance. The hypotheses of the study were empirically tested on the data gathered from 147 ISO 14001:2015 certified firms in Pakistan. The data was statistically validated and then tested with Bootstrapping method using Preacher and Hayes Process Macros. The findings of the study revealed that a proactive corporate environmental strategy predicts corporate environmental performance through green product innovation. Moreover, the moderation hypothesis of the organizational structure variable in the nexus between proactive corporate environmental strategy and green product innovation was not supported in the full sample, whereas the split sample based on organizational size indicated moderation effects in the small firm's sample. The findings of the study carry important implications for firms related to corporate environmental strategy and green product innovation strategy.

Keywords Natural resource-based view (NRBV) · Environmental strategy · Green product innovation · Environmental performance · International Standard Organization

Responsible Editor: Philippe Garrigues

✉ Zahoor Ahmed
zahoorahmed83@yahoo.com

Noman Mustafa
noman.phdstudent@lum.it

Muhammad MansoorAsghar
drmansoor@uoj.edu.pk

Rozeia Mustafa
rozeia@gmail.com

Husam Rjoub
hrjoub@ciu.edu.tr

Rafael Alvarado
rafaalvaradolopez@gmail.com

[1] Department of Management, LUM University, Casasmassima, Bari, Italy

[2] Department of Management Sciences, University of Jhang, Punjab, Pakistan

[3] Kids U Inc, AB, Calgary, Canada

[4] Department of Accounting and Finance, Faculty of Economics and Administrative Sciences, Cyprus International University, Mersin 10, Haspolat 99040, Turkey

[5] Department of Business Administration, Faculty of Management Sciences, ILMA University, Karachi, Pakistan

[6] Department of Business Administration, Sekolah Tinggi Ilmu Administrasi Abdul Haris, 90244 Makassar, Indonesia

[7] Esai Business School, Universidad Espíritu Santo, Samborondon 091650, Ecuador

Introduction

The early twenty-first century is witnessing environmental degradation as the greatest global problem (Mert & Caglar 2020; Ahmed et al. 2022b). There is mounting evidence in the literature that the rising level of GHG (greenhouse gas) emissions is a primary reason behind this problem (Asghar et al. 2022; Caglar et al. 2022a; Caglar & Ulug 2022). However, in contrast to the early literature on corporate environmentalism which focused intensively on developed countries due to their extreme GHG emissions and striking environmental regulations (Caglar & Mert 2022; Caglar et al. 2022b), the current literature has shifted its focus on the GHG emissions of developing countries due to their rapid economic development (Mishra & Yadav 2021; Ahmed et al. 2021). This evolving scenario in literature has attracted the focus of academics and practitioners in studying the relationship between the environmental strategy of the firms and innovation which is considered to be the most comprehensive and consistent approach to battle environmental degradation and deteriorating eco-system caused by the intensive economic activities of the firms (Mishra & Yadav 2021; Mulaessa & Lin 2021).

The current study focuses on the three research gaps in the environmental management and green innovation literature. First, notwithstanding the fact that several studies can be found in the literature of environmental management which examined the relationship of firm environmental strategy and environmental performance via variables of eco-innovation, such as firm new sources (Fousteris et al. 2018), environmental product quality (Chen et al. 2015), technological eco-innovation (Ryszko 2016), service innovation capability (Fernando et al. 2019), and green product innovation (Chan et al. 2016), these research studies still lack investigations in the context of those firms which have acquired an actual certification in implementation of environmental management standards on a strategic level. To put it simply, empirical evidence of a relationship between proactive corporate environmental strategy and environmental performance in ISO 14001:2015 certified firms is lacking in the literature.

Second, empirical research points to the necessity of a proactive environmental strategic focus for enhanced environmental performance (Zhang et al. 2019). On the contrary, some empirical findings suggest that implementation of a proactive environmental strategy does not always imply improved performance (Lee & Rhee 2007; Li et al. 2016). Furthermore, Ateş et al. (2012) indicated that the manner of interpretation of environmental strategy, the absence of significant intervening variables, and the incompatibility of strategy and organizational structure may be the sources of these contradictory empirical findings (Feng et al. 2014). This study attempts to address these gaps by empirically investigating the mediating role of green product innovation in the relationship between proactive corporate environmental strategy and environmental performance under the framework of Hart (1995) NRBV.

Third, only a few research studies have considered the organizational structure in which the pro-environmental strategy is applied (Christ & Burritt 2013; Feng et al. 2014). Kessler et al. (2017) indicated in their meta-analysis study on the mechanistic and organic structures that organizations with organic structures are more successful in adopting innovation than organizations with mechanistic structures. According to Wang and Liu (2020), vision sharing and open-mindedness are important drivers for green product innovation, and open communication is a vital component of an organic structure that enables creativity and innovation in an organization (Pan et al. 2012). This means that rather than applying end-of-pipe solutions, a firm strategy of incorporating environmental factors into product designs and lifecycles with clean technologies would necessitate informal structures with open communication approaches that will foster creative ideas and decision-making among employees (Christ & Burritt 2013). Therefore, this research explores the moderating role of the mechanistic/organic structure in the relationship between environmental strategy and green product innovation in ISO 14001:2015 certified firms.

Cumulating these research gaps with a framework of NRBV, the study was empirically investigated among heterogeneous industries with a sample of 147 manufacturing firms certified with ISO 14001:2015 environmental management standards in Pakistan. The statistical test was applied by using Preacher and Hayes Process Marcos in SPSS which revealed the positive association between the constructs of proactive corporate environmental strategy and environmental performance. Furthermore, green product innovation was found to fully mediate the relationship between strategy and performance thus supporting the importance of natural resources in determining environmental performance. However, results did not support the moderation effect of organizational structure construct in the relationship between proactive corporate environmental strategy and green product innovation (Fig. 1). A detailed discussion of results follows in the empirical section of the article.

The rest of the article comprised of section two which discussed the literature review with a discussion of the relationship among variables which are followed by the hypotheses of the study. The section three entails the research methodology of the study and it is followed by statistical analysis in section four. The section five and six sums up the results discussions, conclusion, implications, and limitations of the study.

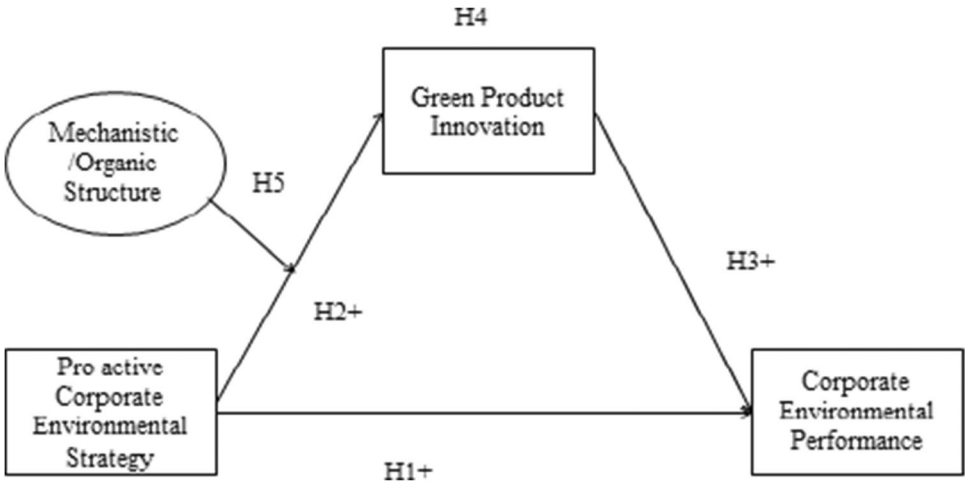

Fig. 1 Conceptual model

Literature review

Relationship of proactive corporate environmental strategy and environmental performance

The extant literature on corporate environmentalism distinguishes the construct of proactive environmental strategy due to its inherited nature, i.e., going beyond compliance or voluntary measures taken by firms. For instance, Ateş et al. (2012) define the "proactive environmental strategy as a set of environmental goals, visions, plans and processes that are developed to prevent negative environmental impacts and go beyond mere compliance with environmental regulations." Similarly, the recent study of Mishra and Yadav (2021) cited the definition of proactive environmental strategy from the critical study of Aragón-Correa and Rubio-Lopez (2007) which describes the proactive environmental strategy as a "systematic pattern of voluntary practices" that are above institutional standards to reduce the environmental impact of the firm. A proactive environmental strategy, according to the NRBV, allows a company to utilize its resources economically and effectively to reduce consumption and pollution while also improving performance (Hart 1995).

A positive association between proactive environmental planning and performance is well documented in the literature. A dozen of empirical investigations on the constructs of environmental strategy and performance was shown to have a positive association with moderating and mediating variables in a literature review conducted by Zhang et al. (2019). Dai et al. (2017) examined the relationship between proactive environmental strategy and operational performance through the use of a green supply chain and green process innovation. The findings demonstrated a favorable relationship between the variables. Ateş et al. (2012) also investigated this relationship with the mediation of environmental investments. The study's findings confirmed a full mediation model. In a reactive environmental strategy, a firm's priority is to minimally comply with the regulations and cope with external pressure. Whereas in a proactive environmental strategy, firms take voluntary or proactive actions to decrease the negative impact of their activities on the natural environment (González-Benito & González-Benito 2005). A proactive environmental strategy, according to Sharma and Vredenburg (1998), leads to the creation of distinctive organizational capabilities as a constituent in the resource-based view which improves a firm's competitive performance. Therefore, based on the above literature analysis, the following hypothesis is proposed:

H1: Proactive environmental strategy is positively related to environmental performance.

Relationship between proactive environmental strategy and green product innovation

Green product innovation involves considering negative environmental externalities such as material and energy consumption in existing and new product designs with the objective of producing environmentally friendly products (Dangelico & Pujari 2010). Recent studies suggest that green innovation must not be considered as a firm's reactive initiative toward stakeholder scrutiny but as a proactive measure to enhance the environmental performance as a competitive advantage (Hussain et al. 2022; Kratzer et al. 2017; Singh et al. 2020). As previously stated, the environmental strategy consists of a set of goals, visions, and plans to reduce a company's negative environmental impact (Ateş et al. 2012). These objectives and aspirations are critical components of an environmental strategy that has been empirically proven to be a precursor to green product innovation in the form of internal integration (Wang & Liu 2020). Furthermore, these objectives and goals are thoroughly ingrained in the firms' day-to-day initiatives, such as training, audits, and product and service reviews. Environmental strategy is a

firm's internal plan for meeting internal and external environmental challenges by making effective use of resources (Dangelico & Pujari 2010). In Dangelico (2016) study, this internal strategy is also highlighted as a cost-cutting and energy-saving approach as an antecedent of green product innovation. Finally, using the framework of RBV, Singh et al. (2020) provide arguments for proactive environmental strategy as an agenda of green product innovation and supported the notion that green innovation stimulates environmental performance. Thus, green product innovation is an important organizational resource that firm uses to enhance its environmental performance. Therefore, it is assumed that:

H2: Proactive environmental strategy is positively related to green product innovation.

Relationship between green product innovation and environmental performance

In the literature, the relationship between green product innovation and environmental performance has not been properly explored (Seman et al. 2019). However, as stated before, green product innovation enhances the firm's environmental performance (Singh et al. 2020). This direct relationship has been found positive in the studies of Seman et al. (2019) and Singh et al. (2020). Firms that consistently adopt a green product innovation approach increase productivity and product quality by improving efficiency and lowering costs, contributing to increased company profitability (Chan et al. 2016). Green product innovation also reduces hazardous waste and lowers the cost of toxic waste disposal while meeting external regulations and stakeholder pressures (Chiou et al. 2011). So, given the positive relationship of these constructs, this study also assumes that:

H3: Green product innovation is positively related to environmental performance.

Mediating role of green product innovation

Most scholars have stated that there is a sparse direct relationship in the literature between proactive environmental strategy and environmental performance (Blanco et al. 2009; Ryszko 2016; Seman et al. 2019). This opens up the research avenue to investigate the indirect link between proactive environmental strategy and environmental performance. In literature, only two studies have used the construct of green innovation as a mediating variable as per the author's knowledge. The study of Seman et al. (2019) investigated the indirect relationship between proactive environmental strategy and environmental performance under the framework of the Porter hypothesis. The findings supported the mediating role of green innovation. The study of Singh et al. (2020) used the RBV framework to investigate the mediating role of green innovation in the relationship between green supply chain practices and environmental performance.

The later study provides two important ramifications for the current study. First, the literature justifies the use of the RBV framework for green product innovation. The NRBV postulates that a corporation is made up of unique, inimitable resources, and that scarcity of these resources provides a firm with a long-term competitive advantage in the market (Hart 1995). According to Menguc and Ozanne (2005), NBRV indicates that a proactive environmental strategy helps firms to amass these distinctive resources and capacities to avert environmental threats by developing and producing environmentally friendly products. McDougall et al. (2019) substantiated the existence of four NRBV resources in a recent qualitative study. These resources include pollution prevention, product stewardship, clean technologies, and the base of the pyramid.

Green product innovation, which stems from internal variables such as proactive environmental strategy (Dangelico 2016), allows a company to reduce pollution while also preserving costs and enhancing production efficiency and quality, resulting in better environmental and economic consequences (McDougall et al. 2019). Green product innovation is defined in the literature as the consideration of environmental factors in product design with the primary goal of reducing negative environmental effects across the product's life cycle (Dangelico & Pujari 2010). This definition shows that green product innovation may be employed as a mediating variable in the relationship between proactive environmental strategy and environmental performance by assessing the enhanced NRBV perspective on pollution prevention. This gives rise to the following assumption that:

H4: Green product innovation mediates the relationship between proactive environmental strategy and environmental performance.

Interaction of mechanistic/organic organizational structure in the relationship of proactive corporate environmental strategy and green innovation

Burns and Stalker (1961) theory of mechanistic and organic structure, which was developed in response to the limitations of existing structural contingency theories, provides a detailed examination of mechanistic and organic organizational structure (Kessler et al. 2017). According to the environment in which organizations operate, this theory stressed the location and applicability of mechanistic and organic structures. While there are several external factors such as macroeconomic factors which affects the environmental performance (Ahmed et al. 2022a), this theory argues that firms developed their organizational structures in response

to change in external as well as internal environment of the firm (Covin & Slevin 1989). Comparatively, mechanistic structures are more suited to stable conditions, while organic structures are better suited to dynamic organizational conditions, according to the authors. Furthermore, when compared to mechanical structures, organic structures serve to generate more shared values and beliefs.

The recommendation of Burns and Stalker (1961) regarding the suitability of organic structure in a dynamic environment prompted scholars to investigate the link between organic structure and organizational innovation and change, and they discovered that organic structures facilitate innovation (Albors-Garrigos et al. 2010; Camison & Villar-López 2012; Sheng et al. 2015). Firms develop environmental policies in response to present or projected requirements, as well as pressure from stakeholders (Chan et al. 2016). Empirical studies based on Burns and Stalker (1961) theory of mechanistic and organic structures indicate that innovation is a response to the dynamic environment faced by the firms, and those firms having an organic structure can foster green product innovation more than the organizations having a mechanistic structure organization. Thus, it could be assumed that:

H5: Mechanistic/organic structure will moderate the relationship between proactive environmental strategy and green product innovation given that this relationship will be stronger in the presence of organic structure.

Research methodology

Survey instrument development and measures

In this study, the author designed and distributed a self-reporting questionnaire for survey in order to test the above-stated hypotheses. For the development of the measuring instrument, the author adapted several items (questions) from the peer review articles in management literature. The questionnaire was consisted of two parts. In part one, the respondents were asked to provide their demographic information as well as information related to their organization such as name, no. of employees, and industry. In the second part, items of the constructs were listed which were measured on the Likert scale ranging from strongly disagree (1) to strongly agree (7). The coding of items was based on the short abbreviation of the construct such as ES for environmental strategy, GPI for green product innovation, and EP for environmental performance. The sixteen items for measuring proactive corporate environmental strategy were adapted from the study of Ryszko (2016). The five items for measuring environmental performance were adapted from the study of Lisi (2015). To measure green product innovation, four items were adapted from the empirical study of Chan et al. (2016).

And finally, the moderating variable of mechanistic/organic structure was measured with seven items adapted from the study of Covin and Slevin (1989). This scale of organizational structure was originally designed in the study of Khandwalla (1976). The items for both structures were paired side by side in this scale describing the characteristics of each structure. Between each pair, there was a Likert scale from one to seven indicating a higher index toward the organic structure. The respondents were asked to read both statements parallel to each other and rate their responses on the Likert scale by considering characteristics of organic structure. The higher the rating from the respondents, the more inclination toward organic structure and vice versa. Three control variables *firm age*, *firm size*, and *industry heterogeneity* were also included in the analysis. According to previous studies, these factors can influence the innovation process of the firms (Kessler et al. 2017; Linder et al. 2015). The *industry heterogeneity* was categorized into high, moderate, and low pollutant industries by using Hutchinson (1996) industry classification model.

Data collection and sample

The IS0 14,001:2015 environmental management standards are part of the ISO 14000 family of standards. Since this study was intended for those firms which were certified with ISO 14001: 2015 environmental management standards, therefore, their information, sampling, and access to the firm representative were done in two steps. The primary reason for targeting ISO 14001:2015 certified firms is that their environmental management systems are based on stringent environmental standards and they are strongly committed to environmental sustainability goals. In the first step, the researcher contacted the ISO certification provider organization in order to access the list of those firms which were on the active status on the certification. The ISO certification is for a limited time period. Firms need to be get evaluated on a periodical basis in order to continue their certification. Approximately 500 firms were identified on the active status of certification. In the second step, the researcher collaborated with a data collection firm to get in contact with the representative of these firms because they were geographically dispersed all over Pakistan. To reduce the common method biases (MacKenzie & Podsakoff 2012), a cover letter was attached to each questionnaire explaining the purpose of data collection and ensuring the strict confidentiality of data. The units of observation were quality assurance managers/health and safety officers. A total of 147 complete responses were gathered within a span of two months. The overall demographical information of respondents can be seen in Table 1.

Table 1 Characteristics of sample, $N = 147$

	Classification	Frequency	Percentage (%)
Industry	Agriculture	3	2.0
	Energy	10	6.8
	Engineering	18	12.2
	Food & beverages	19	12.9
	Healthcare	4	2.7
	Others	15	10.2
	Packaging	7	4.8
	Pharmaceutical	11	7.5
	Services	4	2.7
	Sugar	6	4.1
	Textile	50	34.0
Firm size	50–250	15	10.2
	251–500	46	31.3
	501–1000	59	40.1
	> 1000	27	18.4
Organizational age	6–10 yrs	41	27.9
	11–15 yrs	33	22.4
	16–20 yrs	40	27.2
	> 20yrs	33	22.4
Gender	Male	127	86.4
	Female	20	13.6

Analysis and results

Measuring instrument validation

The data were analyzed using the statistical software SPSS 21(Statistical Package for the Social Sciences) and AMOS (Analysis of Moment Structures). Prior to assessing the scale's construct validity, the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) tests were conducted. The presence of five factors with values larger than one were detected using principal component analysis and the varimax rotation method. Two items were eliminated because the factor loading was less than 0.50. Similar to the study of Ryszko (2016), two-factor constructs were formed from the items of proactive environmental strategy which were labeled as planning and organizing proactive environmental strategy (P&O-PES) and operational proactive environmental strategy (O-PES). These two dimensions were combined to develop the proactive corporate environmental strategy. Overall, exploratory factor analysis revealed the presence of five factors as measured in the scale.

The convergent and discriminant validity was explored to determine the construct validity. Tables 2 and 3 show the tests for measuring reliability and validity. Each construct has a Cronbach's alpha value greater than 0.70, indicating that the items are internally consistent. Additionally, composite reliability (CR) scores are nearly identical to Cronbach's alpha value, confirming the instrument reliability (Hair et al. 2010). The discriminant validity of the constructs is provided in Table 3 in which all squared correlations of constructs are less than the square root of average variance extracted (AVE).

The CFA provided absolute model fit indices that include $\chi^2 = 522.160$, Dof = 395, $p = 0.000$, RMSEA = 0.047, and CFI = 0.954 indicating the overall good model fitness for data compared to the rule of thumb values (Kline 2015).

Table 4 provides the overall mean, standard deviation, and correlation values of the constructs. Tables 5, 6, and 7 present the model summary, interaction summary, and *R*-square change.

Hypothesis testing

The hypotheses of the study were tested by using Preacher and Hayes Process Macros v3.3 to test for the mediation and moderation hypotheses. The Preacher and Hayes technique is commonly used in social sciences research for testing the mediation and moderation models. Since this technique utilizes the default settings of numerous models in the SPSS setup (Preacher & Hayes 2004), for this study, model 1 (moderation) and model 4 (indirect effect) were utilized.

Figure 2 represents schematic paths commonly associated as path "a" (IV → M), "b" (M → DV), and "c" (IV → DV) in the mediation model while using Preacher and Hayes technique. According to Hayes (2017), the significant regression weights of the path "a," "b,", and "c" and non-zero existence between the lower and upper confidence interval of the indirect effect are indications of mediation occurring in the model.

Figure 3 represents the standardized regression weights from the output of Preacher and Hayes (2004) indirect effect in SPSS. The regression coefficient between proactive corporate environmental strategy and green product innovation (path "a") is $\beta = 0.6997$ with $p < 0.000$ which indicates the significant and positive relationship between both constructs thus supporting hypothesis 2 of the study. The regression coefficient between green product innovation and corporate environmental performance (path "b") is $\beta = 0.3150$ with $p < 0.000$ which statistically support hypothesis 3 of the study discussed in the literature analysis. Finally, the total effect of 0.8609*** between proactive corporate environmental strategy and environmental performance (path "c") which is positive and statistically significant supported the hypothesis 1 of the study, thus, statistically confirming the positive and significant relationship between both constructs.

Testing for the indirect effect The indirect effect for mediation analysis was tested with a 5000 boot-strap

Table 2 The measurement model

Variable	Item	Standardize factor loadings	C-α	CR	AVE
Planning & organizing proactive environmental strategy (P&O-PES)	ES-1	.718	.882	.882	.519
	ES-2	.740			
	ES-3	.730			
	ES-4	.599			
	ES-5	.723			
	ES-7	.725			
	ES-8	.797			
Operational proactive environmental strategy (O-PES)	ES-9	.795	.928	.929	.622
	ES-10	.745			
	ES-11	.740			
	ES-12	.775			
	ES-13	.768			
	ES-14	.790			
	ES-15	.845			
	ES-16	.848			
Environmental performance (EP)	EP-1	.891	.939	.910	.757
	EP-2	.904			
	EP-3	.878			
	EP-4	.838			
	EP-5	.840			
Green product innovation (GPI)	GPI-1	.773	.827	.829	.550
	GPI-2	.773			
	GPI-3	.659			
	GPI-4	.756			
Mechanistic/organic structure (M/OS)	OMS-2	.752	.863	.865	.519
	OMS-3	.754			
	OMS-4	.654			
	OMS-5	.643			
	OMS-6	.708			
	OMS-7	.800			

sample with a 95% confidence interval. The standardized indirect effect was 0.2204 (0.6997*0.3150) with a value of 0.12 LLCI and a value of 0.34 ULCI indicating non-zero existence between both values. The overall indirect effect results statistically supported the mediation case of green product innovation occurring in the model and, therefore, confirmed hypothesis 4 of the study.

Table 3 Discriminant validity

Variables	P&O-PES	O-PES	EP	GPI	M/OS
P&O-PES	**.789**				
O-PES	.499	**.720**			
EP	.656	.535	**.870**		
GPI	.533	.552	.642	**.720**	
M/OS	.662	.614	.687	.581	**.741**

Testing for moderation effect To test the fifth hypothesis concerning moderating effect of mechanistic/organic structure between the relationship of exogenous and mediating variables, the Preacher and Hayes moderation test as discussed earlier was conducted to assess the significance of interaction effect, i.e., proactive corporate environmental strategy* mechanistic/organic structure → green product innovation. All three variables were centered and entered simultaneously in the equation along with control factors of *firm size*, *organizational age*, and *industry heterogenity*. The moderating variable was median split into two categories (Tavitiyaman et al. 2012). The below-median sample was labeled as "mechanistic structure" while the above-median sample was labeled as "organic structure."

As indicated in Tables 6 and 7, the statistical results did not provide the account for a significant moderating effect because the interaction term corresponded to only $\Delta R^2 = 0.0011$, $p > 0.05$ change in the equation. Also, a zero

Table 4 Descriptive statistics

Variables	*N*	Mean	SD	P&O-PES	O-PES	EP	GPI	M/OS	Firm size	Industry	Org age
P&O-PES	147	5.000	1.087								
O-PES	147	5.011	1.152	.469**							
EP	147	5.002	.961	.605**	.514**						
GPI	147	4.995	1.181	.474**	.499**	.569**					
M/OS	147	3.604	.828	.600**	.572**	.637**	.513**				
Firm size	147	3.666	.893	.104	.087	.135	.102	.160			
Industry	147	7.115	3.439	.003	− .116	− .035	− .042	− .145	.102		
Org age	147	3.442	1.123	.113	.036	.036	− .005	.057	− .043	− .029	1

**Correlation is significant at the .01 level (2-tailed)

Table 5 Model summary

R	*R*-sq	MSE	F	df1	df2	*P*
.5928	.3514	.9381	15.27	5.0000	141.0000	.0000

Table 6 Interaction summary

	Coefficient	SE	*T*	*P*	LLCI	ULCI
Constant	5.1176	.4379	11.6871	.0000	4.2519	5.9832
Org/Mec structure	.4469	.2022	2.2102	.0287	.0472	.8467
Environmental strategy	.5737	.1040	5.5158	.0000	.3681	.7793
Interaction term	.1007	.2086	.4825	.6302	− .3118	.5132
Firm size	.0362	.0906	.3991	.6904	− .1429	.2152
Org age	− .0824	.0721	− 1.1422	.2553	− .2250	.0602
High_pollution industries	− .0061	.0334	− .1826	.1411	− .0577	.3979
Mod_pollution industries	− .1350	.1173	− 1.1505	.2569	− .3724	.1023

DV green product innovation

exists between LLCI and ULCI values cementing the insignificance of the interaction term. Therefore, hypothesis five was not supported by the data pertaining to the study.

Discussion of results

The significant results of hypotheses one, two, three, and four indicate that the outcomes of this study are in line with the previous studies. First, proactive corporate environmental strategy is a significant predictor of environmental performance, confirming the NRBV hypothesis of Hart (1995). Additionally, this outcome is also in line with the findings of Latan et al. (2018), Ryszko (2016), and Zhang et al. (2019) which also reveal the positive outcome of the relationship between both variables. The significant outcomes of hypothesis two support the theoretical intuition that a proactive corporate environmental strategy is a strong predictor of green product innovation. With a proactive strategy, businesses may efficiently overcome environmental challenges such as pollution prevention, toxic waste disposal, and product recycling (Latan et al. 2018). In addition to that, this outcome confirms the assumption of Wang and Liu (2020) meta-analysis that environmental strategies and policies are an important internal antecedent to the development of green product innovation.

The result of hypothesis three supports the outcomes of Seman et al. (2019) who found a significant direct link between green product innovation and environmental performance. Furthermore, this outcome is also supported by the study by Chiou et al. (2011). Because of the positive relationship between these constructs, it stands to reason that when businesses employ green product innovation techniques, such as waste reduction, enhanced product design and packaging, and eco-labeling, the environmental performance will improve.

Table 7 *R*-square change

	ΔR^2	*F*	Df1	Df2	*P*
Interaction term	.0011	.2328	1.00	141.00	.6302

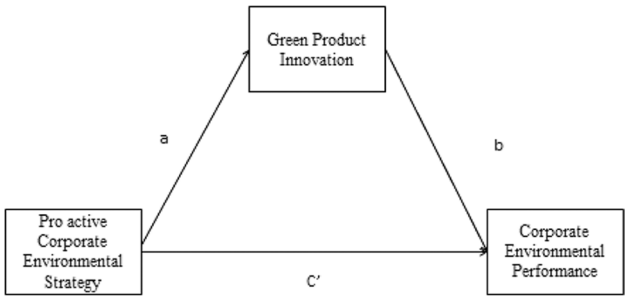

Fig. 2 Path coefficient

The green product innovation's mediating role in the research model has theoretical and empirical interpretations. First, it is supported by the previous studies of Chan et al. (2016) and Chiou et al. (2011) that green product innovation mediates between the green supply chain, proactive environmental strategy, and environmental performance. Second, it confirms the assumption of NRBV theory that a proactive environmental strategy is required to produce environmentally friendly products, and mitigate negative environmental consequences through enhanced product design, and pollution prevention strategies (Dangelico 2016; McDougall et al. 2019; Menguc & Ozanne 2005). As a result of effectively implementing green product innovation processes, environmental performance will increase (McDougall et al. 2019).

The study's fifth hypothesis is related to the firm's mechanistic and organic structure with the assumption that the organic structure will strengthen the association between proactive environmental strategy and green product innovation. The statistical results did not provide support to that assumption. Two possible factors could have influenced the outcome. First, the data set's mean value for the organic/mechanistic construct was 3.6. The elements of this construct were measured using a seven-point Likert scale. The mean value revealed that the majority of respondents did not regard organizational structure as a significant factor in the implementation of proactive environmental strategies and green product innovation techniques.

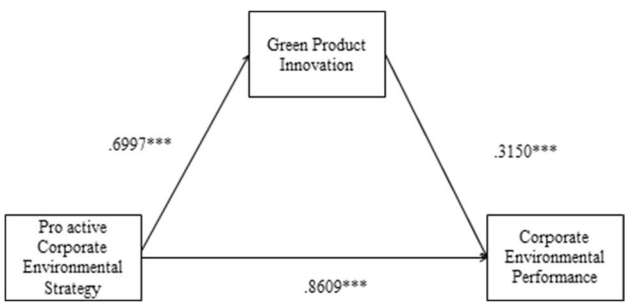

Fig. 3 Path coefficient values

Second, the size of the firm may have influenced the moderating results. When the moderation test was applied to a split sample of small and large firms, the small firm sample showed a significant change in the interaction effect, confirming the organization size effect on the mechanistic/organic structure construct found in the previous study of Linder et al. (2015).

Conclusion and practical implications

The goal of this study was to investigate the role of green product innovation as a mediating variable in the relationship between proactive environmental strategy and environmental performance in IS0 14,001:2015 certified firms in Pakistan. Furthermore, it was also investigated whether mechanistic/organic structure moderates the link between environmental strategy and environmental performance? The statistical results provided evidence of the mediation effect of green product innovation in the sample of 147 multi-sector enterprises; however, there was no statistical evidence of moderation occurring in the model.

The findings also strengthened the theoretical and empirical value of green product innovation as a strategy for improving environmental performance. These findings suggested that enhanced product design and packaging, pollution avoidance systems, as well as fulfilling required environmental requirements, are all important components of the firms' proactive environmental strategy. Firms can also identify, retain, and reproduce their distinguished resources for green product innovation by executing the proactive environmental strategy. Research and development in production design, as well as the use of ecologically friendly products, are examples of these resources.

The findings of the control effect of organizational size provide a very useful insight into that smaller firms are efficient in implementing innovation strategies as compared to large firms. This finding suggests that large firms can learn the effective implementation of innovation strategy from small firms.

From a managerial perspective, this study provides some useful insights. First, managers must generate capabilities for green product innovation while devising a proactive corporate environmental strategy. This implies that managers must build the business as well as the environmental case for a firm to invest its resources in environmentally friendly technologies and, simultaneously, utilize the existing resources to improve the performance of the firm. Second, managers need to be aware of structural barriers in the implementation of proactive corporate environmental strategies. For instance, in large organizations with several reporting ranks, managers must empower employees for decision-making to foster creativity and avoid delays in strategy implementation.

Limitations and future recommendations

This research is not without limitations. First, the data collection for this study was done from 147 multi-sector firms and private and semi-privately owned businesses. This provides the opportunity for future studies to further explore the research model of this study with a comparative analysis between privately owned firms and publicly listed firms. Due to the time constraint, the data collection was cross-sectional. This shortcoming could have influenced the result of the moderation hypothesis. The organic structure, according to Kessler et al. (2017), is better suited to a dynamic environment, whereas the mechanistic structure can also enable incremental innovation in a reasonably stable context. The outcomes of this assumption may be influenced by longitudinal data collecting in future investigations. Second, the data collected from different levels of employees could influence the outcomes in future studies. In this context, top executives with extensive knowledge of organizational strategies for tackling environmental issues could be accessed for data collection. Third, the moderation-mediation hypothesis in this study was not addressed due to the occurrence of insignificant moderation. Perhaps future studies could allow statistically validating this assumption.

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Data availability The datasets can be obtained from the corresponding author on reasonable request.

Declarations

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