Environmental pressures and eco-innovation in manufacturing SMEs: the mediating effect of environmental capabilities

Khalid Mady
Faculty of Business and Economics and Social Development,
Universiti Malaysia Terengganu (UMT), Kuala Terengganu, Malaysia and
Faculty of Commerce, Kafrelsheikh University, Kafr el-Sheikh, Egypt

Muhammad Abi Sofian Abdul Halim and Khatijah Omar
Faculty of Business and Economics and Social Development,
Universiti Malaysia Terengganu (UMT), Kuala Terengganu, Malaysia

Mohamed Battour
College of Business Administration, A'Sharqiyah University, Ibra, Oman and
Faculty of Commerce, Tanta University, Tanta, Egypt, and

Reda Shaker Abdelkareem
Faculty of Commerce, Kafrelsheikh University,
Kafr el-Sheikh, Egypt and Bournemouth University Business School,
Bournemouth University, Bournemouth, UK

Abstract

Although environmental pressures have hugely been covered as one of the drivers of eco-innovation in the literature, there remain inconsistency of empirical results concerning the effects of these pressures on eco-innovation behavior. Hence, this paper aims to investigate the effects of environmental pressures (regulatory pressure, green demand, and competitive pressure) on eco-innovation. Moreover, it examines the mediating role of environmental capabilities in environmental pressure – eco-innovation relationship. 183 valid questionnaires were collected from managers and owners of manufacturing SMEs. Results of data analysis using Smart-PLS reveal that among environmental pressures, only green demand has a direct effect on eco-innovation. In addition, environmental capabilities have only mediated the effect of competitive pressure on eco-innovation. The study constitutes one of the few studies addressing the issue of how the drives of eco-innovation interact. It also provides SMEs managers and owners and policymakers with practical implications.

Introduction

Green transformation has recently become a major business imperative, which is an increasing challenge for firms to involve environmental concerns in their different conducts (Dieu Thu et al., 2018; Pereira et al., 2020). With global interest in environmental sustainability, a rising pressure has been exerted on business world to adopt proactive environmental strategies aiming to avoid or reduce adverse environmental impacts (R. Y. K. Chan et al., 2012; Xue et al., 2019). Of these strategies, the eco-innovation strategy is conceived as a "win-win" strategy, which is broader than using green technologies; it has extended to renovating the whole innovation cycle not only to relieve environmental pressures from regulatory bodies, customers, or society, but also to provide firms with opportunities to sustain their competitive advantage (Bonzanini et al., 2016; Fernando et al., 2019; Mady et al., 2021; Sanni, 2018). There has therefore been a growing body of literature on eco-innovation and the drivers which can contribute to foster eco-innovation practices, in particular among small and medium sized enterprises because of huge environmental footprint resulting from their operations (Mitchell et al., 2020; Pacheco et al., 2018). A large stream of these studies has increasingly debated the driving role of external pressures, such as regulatory pressure, customer pressure, and competitive pressure, in motivating firms to adopt proactive environmental paradigms, especially eco-innovation practices.

Environmental pressures are not always expected to pay off; they are alone insufficient to foster eco-innovation practices (Huang et al., 2016). Prior studies argue that there has been a heterogeneity between the firms in their responses to the same environmental pressures within the same industry (Daddi et al., 2016; L. H. Lin & Ho, 2016). Responding to these pressures, potential three responses can be adopted by SMEs, which range from resistant and reactive to proactive (Klewitz & Hansen, 2014; Mondéjar-Jiménez et al., 2015). Firms may respond to external pressures from regulatory entities or stakeholders by ignorance of these pressures or implementing limited actions just enabling them to comply with these pressures (Hansen & Klewitz, 2012). Such heterogeneity in the proactivity of environmental practices may be due to internal features of the firm, such as goal-specific resources, rather than the external pressures on the firms (Huang et al., 2016; Kang & He, 2018). Therefore, evidence is needed to prove how the firm's internal characteristics affect firms` response to environmental pressures when fostering their eco-innovation practices.

Although the knowledge is ample on the driving factors of eco-innovation which are divided into two sets of factors: internal drivers and external pressures (Horbach et al., 2012; Kesidou & Demirel, 2012; Maldonado-Guzmán & Garza-Reyes, 2020; Salim et al., 2019), few studies accentuate the importance of synergy of internal and external drivers of eco-innovation to adopt eco-innovation. Using institution theory, a large part of literature has accentuated the prominence of institutional pressures (environmental pressures) in spurring eco-innovation practices. In contrast, other studies have highlighted that these pressures are slightly influential in stimulating eco-innovations (Frondel et al., 2008; Mady et al., 2021), reflecting a failing institutional theory alone to explain how to external pressures determine eco-innovation practices (Huang et al., 2016). As justified by Majid et al., (2019) and Keshminder & del Río, (2019), these mixed results have been due to the fact that these studies have disregarded examining the influence of external pressures and internal driving factors of eco-innovation simultaneously. In other words, there is a need to integrate the internal driving forces to better explain the relationship between external pressures and adopting eco-innovation (Kang & He, 2018; Majid et al., 2019). However, few studies have investigated the intermediary role of internal mechanism in the relationship between external pressures and eco-innovation, aiming to boost the explanatory power of such relationship.

Environmental capabilities, however, are substantially considered one of the most important internal drivers of eco-innovation (Triguero et al., 2013). Although environmental capabilities play a vital role in implementing proactive environmental initiatives in SMEs (Aboelmaged & Hashem, 2019; Oxborrow & Brindley, 2013), empirical evidence on the role of environmental capabilities in firms` response to adopt eco-innovation is still needed. Therefore, this study contributes to the existing body of knowledge of eco-innovation by investigating the direct and indirect effect of environmental pressure (regulatory pressure, green demand, and competitive pressure) on eco-innovation. Examining the mediating role of environmental capabilities is one of the attempts that could solve the inconsistent relationship of environmental pressure on eco-innovation. The study provides SMEs' managers with empirical evidence to put more emphasis on environmental capabilities to foster eco-innovation.

Literature review and Hypotheses development

Eco-innovation is becoming a highly proactive environmental strategy playing two mutually reinforcing roles, namely, sustainability and innovation, which are sources of competitive advantage (Mondéjar-Jiménez et al., 2015). With growing the relevance of sustainability as a key strategic issue affecting the future of businesses, an increasing number of firms tend to adopt more environmentally oriented measures (Gabler et al., 2015). Of these proactive environmental measures, eco-innovation is a common notion that refers to "the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resource use compared to relevant alternatives" (Kemp & Pearson, 2007, p.7). The hallmark of eco-innovation is that it is adopted to achieve two main objective; acquiring competitive edge over other rivals and reducing environmental impacts, although the latter objective is often coming as a side effect of these innovations (Hojnik & Ruzzier, 2016a; Horbach et al., 2012). Therefore, eco-innovation has been the focus of debate in recent literature, the bulk of which has addressed the driving factors of eco-innovation (Arranz et al., 2021; Mady et al., 2021).

There have been two sets of drivers of eco-innovation, which are internal drivers and external drivers (Maldonado-Guzmán & Garza-Reyes, 2020). The latter set of drivers refer to the institutional and societal pressures that have been exerted by external parts on the firm to adopt proactive environmental strategies (Daddi et al., 2016). Based on institutional theory, the success of firms comes from the acquisition of support and legitimacy by complying with external pressures (DiMaggio & Powell, 1983). In the context of institutional theory, there are three different types of pressure that can affect firms' choices and attitudes: coercive, normative, and mimetic pressure (DiMaggio & Powell, 1983; Meyer & Scott, 1983). In the literature of eco-innovation, environmental pressures have also placed into three different pressures; regulation or regulatory pressure, green demand or customer pressure, and competitive pressure, which reflect institutional pressures suggested in institutional theory (Cai & Li, 2018; Hojnik & Ruzzier, 2016a).

Environmental Regulation

Regulation is regarded as the most external pressure impacting on firms to adopt eco-innovation (Hojnik & Ruzzier, 2016a; Huang et al., 2016; Sanni, 2018). As opposed to other external pressures, regulative pressure is a coercive mechanism enforcing firms to bring a target change by imposing penalties for non-compliance or tying resources to requirements (Berrone et al., 2013; Simpson, 2012). Legislation and policy initiatives can act as standards of behavior imposed by regulatory bodies for encouraging firms to adopt certain practices (Simpson, 2012). As indicated by Zhang et al., (2020), regulatory pressure via command and control regulation can constitute an effective enabler of knowledge sharing and help firms in identifying opportunities for innovations. In the same vein, H. K. Chan et al., (2016) conclude that environmental regulations play a pivotal role in developing eco-innovations such as eco-product innovation that can in turn offset the cost afforded by firms to be compliant with these regulations. This conclusion was supported by Porter hypothesis assuming that environmental regulations with high level of stringency and well-designed can not only induce firms to adopt proactive environmental measures, but they also lead to compensate the financial burdens resulting from the compliance of these regulations (Porter & Van Der Linde, 1995).

However, other prior studies have found that environmental regulations do not act as a driver of eco-innovation. For example, the study of Eiadat et al., (2008) indicates that the pressure exerted by governmental environmental regulation negatively affects adopting eco-innovation. Although Cai & Li, (2018) mention that only minimal degree of eco-innovation can be driven by environmental regulations, their study has found that eco-innovation behavior is not triggered by strict environmental regulations. Similarly, Mady et al., (2021) have found that environmental regulation has no direct impact on applying any eco-innovation practices. Hence, Daddi et al., (2016) accentuate that eco-innovation practices are not necessarily driven by strict regulations because these practices are more likely to be a willingly innovative response rather than resulting from forced choice. As the role of environmental regulation in encouraging firms to foster eco-innovation is still disputed, the study suggests the following hypothesis (see figure 1):

H1: the pressure exerted by environmental regulations positively impacts on adopting eco-innovation among manufacturing SMEs.

Green demand

With worsening the environmental problems, customers are beginning to be responsible for addressing these problems through adopting "green consumerism" which reflects a willingness and preference of customers to purchase eco-friendly products, , even with their high prices (Akhtar et al., 2021; Chekima et al., 2016). Shifting the conventional consumption into green consumerism reflecting prevailing social norms is putting a normative pressure on firms to be greener (Y. Li, 2014; Mondéjar-Jiménez et al., 2015).

In market-economy, sustainable profitability has become a key driver for the majority of corporation actions, which can urge firms to meet consumers` green demands (Huang et al., 2016). Customers in the market of eco-friendly products willingly pay a premium price for indirect green benefits of these products, opening up a business opportunity which should be seized by innovating more eco-friendly products and operations (Sanni, 2018). As inferred by Cai & Li, (2018), the customer demand for eco-friendly products is deemed a significant predictor for eco-innovation behavior. With high competition in eco-friendly product market, customer`s green value should be aligned by implementing eco-innovation practices, especially eco-product innovation that plays a key role in differentiating firm`s products (R. J. Lin et al., 2013). Kesidou & Demirel, (2012) suggest that firms often respond to the pressure of green demand with minimum degree of eco-innovations which are thought to be enough to reflect firms` orientation toward "green issues". However, Frondel et al., (2008) argue that among pressure groups, customers do not affect the decision to implement environmental innovation. Likewise, Mady et al., (2021) conclude that eco-innovation practices, either eco-produce, eco-process, or eco-organizational innovation are not significantly influenced by green demand pressure. As empirical results related to impact of green demand in fostering eco-innovation remain disputed, the study develops the following hypothesis (see figure1):

H2: the pressure exerted by green demand positively impacts on adopting eco-innovation

Competitive pressure

Based on institutional theory, mimetic pressure has been third type of institutional pressure that comes from the tendency of the firm to emulate other successful rival firms (Daddi et al., 2016; Hojnik & Ruzzier, 2016b). "Going green" has become a trend to which strategic-minded businesses shift to promote a green image and achieve a competitive edge. Eco-innovation constitutes a fashionable business approach that provides firms with worthy opportunities to gain a competitive edge through developing and producing new green products, processes, and firm`s business models (Cabrita et al., 2014; Szilagyi et al., 2018). On proactive environmental strategy, green-oriented firms make use eco-innovations to gain "first-mover advantage" enabling them to aligning with customer green values (Yue et al., 2020). On the other hand, intensified competition and increasing green demand have forced other firms into mimicking rivals` successful environmental initiatives related to eco-innovation (H. Lin et al., 2014). Although several studies contend that competitive pressure is seen as one of the external environmental pressures that can be the most effective driving factor of eco-innovation adoption (e.g. Cai & Li, 2018; Hojnik & Ruzzier, 2016b; Y. Li, 2014; Yalabik & Fairchild, 2011), others, for example, the study of Mady et al., (2021) found that the impact of competitive pressure in pursuing eco-innovation practices is insignificant. Relatedly, Tyler et al., (2018) conclude that environmental practices as a competitive opportunity tend to be adopted by SMEs managers in the case of weaker competitive pressure. Hence, the current study argues that the competitive pressure on manufacturing SMEs can play a critical role in fostering eco-innovations. As such, the following hypothesis is postulated (see figure1):

H3: the pressure exerted by competitors positively impacts on adopting eco-innovation.

Environmental capabilities

Alongside external environmental pressures, adopting eco-innovation can also be driven by internal characteristics of a firm such as internal capabilities (Salim et al., 2019). Based on resource-based view, prior studies accentuate that the success of environmental strategy followed by a firm is highly influenced by its resources and capabilities enabling it to manage change and exploit potential opportunities (Kang & He, 2018; Sumrin et al., 2021). The concept of "Green or environmental capabilities" is used to reflect a bundle of distinctive skills, competencies, and knowledge that can serve as a facilitating factor for adopting green practices, such as Environmental Management System (EMS), green technologies, eco-infrastructure (Nkrumah et al., 2021). As mentioned by Triguero et al., (2013), engaging in and fulfilling eco-innovation requires specific capabilities that tend to be more specialized, complex and highly costly. Using the idea of path dependence, the ability of the firm to espouse greener innovative responses is highly reliant on what capabilities the firm owned (Zhu et al., 2013). Wugan Cai & Li (2018) found that firms that own technological capabilities, either in the form of tangible technologies or specialized knowledge related to the environment, are more likely to implement eco-innovation practices. Huang et al., (2016) and D. Li et al., (2019) argue that the impact of firms` environmental capabilities in pursuing eco-innovation is attributable to its role in identifying environmental targets and revealing profitable opportunities in the domain of eco-innovation. Besides, the existence of environmental capabilities such as an environmental management system (EMS) make a firm better able to adapt to the changes that occur in the internal and external environment (Aragón-Correa et al., 2008). However, there is relatively a lack in the literature interested in investigating the influence of internal factors, such as environmental capabilities, on stimulating eco-innovation (Dieu Thu et al., 2018). As such, the following hypothesis is formulated in this study (see figure 1):

H3: environmental capabilities positively impact on adopting eco-innovation.

Mediating role of environmental capabilities

Using institutional theory, an extensive stream of literature has investigated the impact of external or institutional pressures on embracing proactive environmental strategy (e.g. Cai & Li, 2018; H. Lin et al., 2014; Sarkis et al., 2010). Such theory is anchored in a key theoretical foundation that the firms under the same external pressures (i.e. institutional pressures) are supposed to act similarly and implement homologous practices in the so-called "Homogeneity of organizational actions" (DiMaggio & Powell, 1983). However, empirical results on the effects of environmental pressures on adopting environmental initiatives have been disputed, emphasizing that these pressures can provoke heterogeneous responses that may not be environmentally proactiveness. The institutional theory is therefore alone inadequate to explain how institutional pressures either formal institutions such as regulation or informal institutions such as customer preference and mimetic pressure affect environmental practices, thereby numerous studies argue that such relationship should be explained by internal mechanism as defined by resource-based view (RBV)(e.g. Majid et al., 2019; Shubham et al., 2018) (Kang & He, 2018).

Integrating both institutional theory and RBV, some eco-innovation scholars considering the impact of institutional pressures on eco-friendly practices have involved the internal mechanism to increase the exploratory power of such relationship. For example, Shubham et al., (2018) accentuated that absorptive capacity serve as an internal mechanism in the nexus between institutional pressures and implementation of environmental practices. Liao, (2018) has hypothesized that institutional pressures affect environmental innovation strategy through mediating knowledge acquisition which is an organizational capability enabling firms to providing and exploiting knowledge on the external environment. Keshminder & del Río, (2019) have confirmed the mediating role of environmental strategy in the relationship between external pressures, such as customer pressure and eco-innovation. Majid et al., (2019) have concluded that firms can respond to institutional pressures with developing eco-friendly business strategies as a valuable internal firm`s resource to adopting practices improving environmental results such as pollution prevention, recycling and waste reduction. Arguably, our theoretical framework suggests that environmental pressures play an influential role in encouraging SMEs to build and develop their environmental capabilities, thereby inducing eco-innovations.

The regulatory pressure through environmental regulations can be effective to adopt proactive environmental practices only when it directly facilitates a firm`s decision to invest in resources and capabilities necessary to facing environmental concerns (Sarkis et al., 2010; Simpson, 2012). The regulatory requirements can be faced with many choices which do not necessarily lead to proactive environmental practices. More precisely, increasing regulatory pressure makes firms more focused on implement practices that seem to be visible but not effective in addressing environmental concerns as a result of lack of necessary internal capabilities (Cainelli et al., 2015; Simpson, 2012). In the same vein, Huang et al., (2016) have used the notion of green organizational responses to reflect internal capabilities that can be triggered by institutional pressures, namely, regulatory pressure and customer pressure. In their study, regulatory pressure is positively associated with application of environmental organization capabilities such as ecological monitoring and environmental auditing. Similarly, The role played by environmental regulations in facilitating the firm`s decision of adopting EMS as a core element of environmental capabilities has empirically been illustrated by Zhao et al., (2015). As concluded by H. Lin et al., (2014), EMS can be driven by environmental regulation exerted on business community to espouse environmental practices. On the other hand, meeting environmental regulations, firms can obtain external rewards and resources enabling them to develop their environmental capabilities and thereby being eco-innovators (Cainelli et al., 2015; Phan & Baird, 2015). Hence, we argue that firms that lack environmental capabilities are more likely to fail to translate regulatory pressures into innovative solutions in the environmental context. Hence, the following hypotheses have been established (see figure1):

H5: the environmental regulation positively impacts on environmental organizational capabilities

H8: the relationship between environmental regulation and eco-innovation is mediated by environmental organizational capabilities.

Customer pressure can pay off in adopt eco-innovation within SMEs when it triggers firms to strengthen and develop their environmental capabilities. Baranova &

Meadows, (2017) elaborate that customers are regarded one of environmental stockholder groups that can engage in developing environmental capabilities. In the same context, Huang et al., (2016) accentuate that the more responsive to green consumers` demand firms are, the more efficient the development of environmental capabilities is. In the study of Delmas & Montiel, (2009), the results demonstrate that firms that follow the customers` needs are more tending to establish ISO14001 as one of certified EMS. Through a rich collaborative relationship, customers are therefore expected to help firm in selecting and developing environmental capabilities (Jahanshahi & Brem, 2018). Under customer pressure, firms without supporting capabilities might be highly prone to implement suboptimal responses. Put differently, customer preferences are viewed as a "interest without responsibility" which may make some firms tend to adopt reactive or non-proactive environmental solutions such as end-of-pipe solutions because of lack of goal-oriented resources (Simpson, 2012). Arguably, environmental capabilities are important for firms to respond to green demand with adopting environmentally innovative responses. Hence, the following hypotheses have been formulated (figure 1):

H6: the green demand positively impacts on environmental organizational capabilities

H9: the relationship between environmental regulation and eco-innovation is mediated by green demand.

Pertaining to environmental management, firms are facing strong competitive pressures exerted by market pioneers who carry out actions that extend beyond compliance and thereby raise the environmental standard for all rivals in their industry (Sharfman et al., 2004). With stronger competitive pressures, environmental capabilities, especially EMS, are imperative for firms to sustain and strengthen their competitiveness (Phan & Baird, 2015; Sharfman et al., 2004). As competitors pressure is considered as influential in developing environmental capabilities, the study argues that competitive pressure have indirect effect on eco-innovation by mediating environmental capabilities. Therefore, the following hypotheses have been postulated (see figure 1)

H7: the competitive pressure positively impacts on environmental organizational capabilities

H10: the relationship between environmental regulation and eco-innovation is mediated by competitive pressure

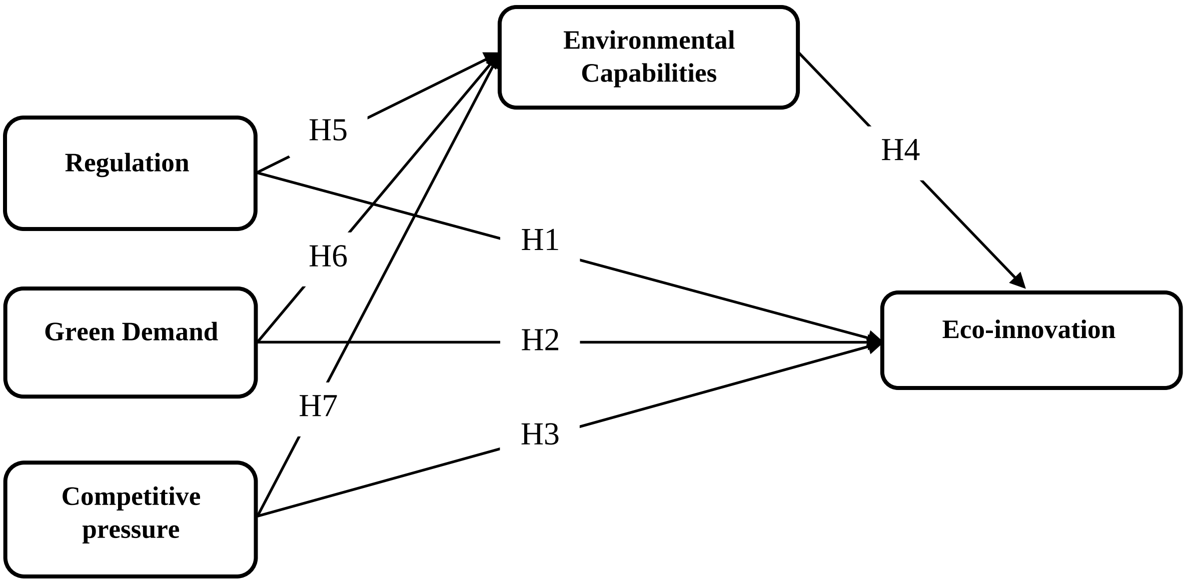

Figure 1 : Theoretical framework

Methodology

To test the hypothesized model, quantitative data were collected using an online self-reported questionnaire survey. The questionnaire was divided into two sections. The first section included demographic variables. The second part included the constructs measurements that were developed from the literature. Given the importance of the tool's face validity, the questionnaire was reviewed by three academics and six SMEs senior managers. Moreover, the translation and re-translation technique was used to avoid translation errors (Saunders et al., 2009), where the tool developed from English literature and the respondents were Arabic speakers.

Measure

This study used five constructs including regulations, greed demand, competitive pressure, environmental capabilities, and eco-innovation. A 5-point Likert scale ranging from 1= “strongly disagree” to 5= “strongly agree” was used for all constructs. Regulations were measured using 3-items measure used by Cai & Li, (2018). Green demand was measured by the scale consist of 4 items adapted from Hojnik & Ruzzier, (2016b). A 3-items scale adapted from Hojnik & Ruzzier, (2016b) was used to measure competitive pressure. To measure environmental capabilities, however, a measurement developed by Cai & Li, (2018) consist of 4 items were employed. Eco-innovation is the dependent variable which was measured depending on 17 statements adapted from Peng & Liu, (2016)

Sample

A random sample of manufacturing SMEs operate in Egypt was chosen. 650 online questionnaires with a covering letter explaining the purpose of the study were sent to SMEs managers or owners subject to contact details availability. 209 questionnaires were returned, of these, 183 questionnaires were usable representing a response rate of 28.15%. Table (1) shows the sample characteristics. While most of respondents (66.7%) have more than 20 years of experience, only 5.5% of respondents have 10 years’ experience or less. The ratio of position quite balanced with 93 of the respondents were owners (50.8%) and 90 of respondents were managers (49.2%). However, most of the respondents holds a university degree (70.5%). While 88.5% of the surveyors were male, 11.5% were female. In terms of size, the largest part of the surveyed firms were small sized firms 111 (60.7%).

Table 1: sample profile

	Item	Frequency	Percentage
Gender	Male	162	88.5%
	Female	21	11.5%
Experience	10 years or less	10	5.5
	11-15	21	11.5
	16-20	30	16.4
	More than 20	122	66.7
Position	Owner	93	50.8
	Manager	90	49.2
Education	High school	9	4.9
	Bachelor	129	70.5
	Postgraduate	45	24.6
Industry type	Metal	18	9.8
	Pharmaceutical	6	3.3
	Building	12	6.6
	Chemicals	27	14.8
	Electronics	9	4.9
	Plastics	9	4.9
	Furniture	24	13.1
	Textile	30	16.4
	Papers	9	4.9
	Food	27	14.8
	Machinery and repair	12	6.6
Firm size	Small	111	60.7
	Medium	72	39.3

Data analysis and results

The research model proposed in this study has consisted of ten hypothesized relationships of which three relationships have been hypothesized to examine the mediating role of a given construct. Hence, Smart-PLS was initially a suitable technique opted to develop and test the hypothesized structural model. Additionally, the multivariate normality test using WebPower software showed that the collected data is non-normal data (see appendix A). Consequently, Smart-PLS, which is considered an effective analytical technique for non-normal data analysis (Hair Jr et al., 2014), was selected. Using Smart-PLS 3, two phases of data analysis were conducted, namely, measurement model assessment and structural model assessment respectively.

Measurement model:

The measurement model was assessed prior to testing the hypotheses in terms of convergent validity, unidimensionality, and discriminant validity. Convergent validity was assessed using CFA where all items' loadings were above 0.60 (Gefen & Straub, 2005). Unidimensionality, however, was ensured using three criteria (Gefen et al., 2011). First, higher internal consistency where the lowest item loadings were 0.629 (Chin, 2010), after deleting three items including EI6, EI7, and EI9 which were below the threshold of 0.60. Second, Composite Reliability (CR) for all constructs was greater than the cut-off value of 0.80 (Henseler et al., 2016)(as shown in Table 1).Third, the Average variance extract (AVE) for all constructs was above 0.50. Discriminant validity was ensured by the new criterion of Heterotrait–Monotrait ratio (HTMT) (Henseler et al., 2015). The results indicate the discriminant validity where the average of correlations of the indicators across constructs relative to the average of correlations of the constructs within the same construct was below 0.85 (Table 2). All in all, the measurement model has met the criteria of convergent validity, unidimensionality, and discriminant validity; therefore, the structural model can be tested.

Table 2: Construct reliability and Validity

Construct	items	Loadings	CR	AVE
Competitive pressure (CP)	CP1	0.891	0.941	0.842
	CP2	0.947		
	CP3	0.914		
Eco-innovation (EI)	EI1	0.843	0.951	0.580
	EI10	0.629		
	EI11	0.699		
	EI12	0.802		
	EI13	0.702		
	EI14	0.752		
	EI15	0.763		
	EI16	0.808		
	EI17	0.703		
	EI2	0.870		
	EI3	0.808		
	EI4	0.794		
	EI5	0.783		
	EI8	0.669		
Environmental capabilities (EC)	Env_Cap1	0.835	0.881	0.649
	Env_Cap2	0.790		
	Env_Cap3	0.725		
	Env_Cap4	0.867		
Green demand (GD)	GD1	0.812	0.894	0.678
	GD2	0.815		
	GD3	0.848		
	GD4	0.818		
Regulation (R)	R1	0.815	0.898	0.746
	R2	0.890		

	R3	0.884

Notes: AVE: Average Variance Extracted; CR: Composite reliability; EI6, EI7, and EI9 were deleted

Table 3. Discriminant validity (HTMT)

	EI	EC	R	CP	GD
EI					
EC	**0.717**				
R	**0.504**	**0.378**			
CP	**0.632**	**0.615**	**0.462**		
GD	**0.605**	**0.478**	**0.512**	**0.642**	

Structural model:

Structural equation modeling partial least square methodology with bootstrapping 5000 resampling was applied to test the pre-sited hypotheses using Smart Pls 3.0. however, the goodness of the structural model was tested prior testing the hypotheses using Hair's five-step approach (Hair et al., 2013). 1- collinearity was assessed among constructs as the highest VIF is 1.836 which means the model does not suffer from the collinearity problem (Table 3). 2- path coefficient of the structural model was examined to empirically assess the significance of the postulated hypotheses. Table 5 (also Appendix B) show the estimated path coefficients. 3- coefficient of determination. This study shows reasonable R^2 value for all the dependent variables (EI= 0.575; EC= 0.328) (Table 4). 4- effect size F^2, the results conclude that all constructs have moderate to high effect size (Table 4). 5- the predictive power of the model Q^2. All the dependent variables have Q^2 values above zero which indicates the predictive power of the model (Table 4).

Table 5 summarizes the direct hypotheses tests as follows: three out of seven hypotheses were supported. While the analysis shows a significant positive impact for green demand (β= 0.194; t=2.179; $p < 0.05$) and environmental capability (β= 0.433; t= 4.604; $p < 0.05$) on eco-innovation, the impact of regulations (β= 0.153; t= 1.401; $p > 0.05$) and competitive pressure (β= 0.184; t= 1.324; $p > 0.05$) on eco-innovation was nonsignificant. Therefore, H2 & H4 were supported and H1 & H3 were not supported. Furthermore, the results indicate the non-significant effect of regulations (β= 0.107; t= 1.215; $p > 0.05$) and green demand (β= 0.135; t= 1.330; $p > 0.05$) on environmental capability. Hence, H5 and H6 were rejected. Lastly, H7 was accepted (β= 0.428; t=4.460; $p < 0.05$) as results depict that competitive pressure has a significant positive effect on environmental capability.

Table 4. Results of lateral collinearity

	EI-VIF	EC-VIF
EC	1.489	

R	1.291	1.274
CP	1.836	1.564
GD	1.617	1.590

Table 5. Coefficient of determination (R2), and effect size (f2)

Construct		**F2**	**R2**	**Q2**
EI	EC	0.296	0.575	0.311
	R	0.043		
	CP	0.044		
	GD	0.055		
EC	R	0.013	0.328	0.190
	CP	0.174		
	GD	0.017		

Table 6. Path coefficients for direct relationships

Hypothesis	**B**	**SE**	**t**	**2.5%**	**97.5%**	**Decision**
H1: R -> EI	0.153	0.110	1.401	-0.062	0.369	Not accepted
H2: GD -> EI	0.194	0.089	2.179	0.019	0.369	Accepted
H3: CP -> EI	0.184	0.139	1.324	-0.089	0.458	Not accepted
H4: EC -> EI	0.433	0.094	4.604	0.248	0.618	Accepted
H5: R -> EC	0.107	0.088	1.215	-0.066	0.281	Not accepted
H6: GD -> EC	0.135	0.102	1.330	-0.064	0.335	Not accepted
H7: CP -> EC	0.428	0.096	4.460	0.239	0.616	Accepted

Mediating effect testing

Table 6 shows the mediating effect testing. this research examines the significance of mediating effect of environmental capability. The mediating effect is acceptable if the indirect relationship is significant. The results reveal that environmental capability significantly mediate the relationship between green demand eco-innovation (β= 0.185; t=3.879; p< 0.05). therefore, H10 was supported. However, H8 and H9 were rejected. Environmental capability neither mediate the relationship between regulations and eco-innovation (β= 0.047; t= 1.081; p> 0.05) nor the relationship between green demand and eco-innovation (β= 0.059; t= 1.217; p> 0.05).

Table 7. Path coefficients for indirect relationships

Hypothesis	**B**	**SE**	**t**	**2.5%**	**97.5%**	**Decision**
H8: R -> EC -> EI	0.047	0.043	1.081	-0.038	0.131	Not accepted
H9: GD -> EC -> EI	0.059	0.048	1.217	-0.031	0.148	Not accepted
H10: CP -> EC -> EI	0.185	0.048	3.879	0.090	0.280	Accepted

Discussion

The question of the driving factors of eco-innovation and how they interact has increasingly been the focus of recent literature. As a result, the study comes as an extension of this stream of literature by investigating the indirect impact of environmental external pressure on adopting eco-innovation using environmental organizational capabilities as a mediator. Of ten hypothesized relationships outlined in the study framework, results, as afore-mentioned before, illustrated that only four hypotheses have been confirmed. First, among environmental pressures examined in this study, only green demand had a direct effect on eco-innovation. Second, environmental capabilities also had a significant effect on eco-innovation. Third, environmental capabilities have significantly been influenced by competitive pressure. Forth, among the hypothesized three mediating effects, environmental capabilities have only mediated the effect of competitive pressure on eco-innovation.

The findings have revealed that environmental capabilities were shown to be a major internal determinant of eco-innovation. This is substantiated by several scholars, such as Triguero et al., (2013) and Salim et al., (2019) who have concluded that organizational capabilities, in particular these are related to environmental orientation, have emerged as a critical driver for SMEs to foster eco-innovative solutions. Likewise, Cai & Li, (2018) assert that environmental capabilities allow green-oriented firms to access to environmental knowledge and facilitate integrating eco-innovation elements toward sustainable development. To justify this result, the study has used the logic of RBV that a firm`s success in the innovation process is essentially dependent on its own resources and capabilities (Subrahmanya, 2015). Given the fact that Eco-innovation seems to be complex and a high novelty in comparison to other innovations, specialized environmental capabilities are more needed to spur eco-innovative solutions that can enable SMEs to seize market opportunities (Ghisetti et al., 2015; J. A. Zhang & Walton, 2017).

Whereas an extensive line of literature on eco-innovation accentuates the role of environmental regulation in encouraging firms to be eco-innovators (e.g. Hojnik & Ruzzier, 2016a; Huang et al., 2016; Sanni, 2018), our findings have indicated that environmental regulation was found to have an insignificant effect on adopting eco-innovation. This result, proved by Mady et al., (2021); however, it could be explained by the inadequacy of environmental regulation to convince SMEs that eco-innovation adoption would have positive economic and social implications. Additional possible justification for this result is that eco-innovation practices are entirely considered as voluntary and innovative choices, which are not influenced by environmental regulation as a forced mechanism (Daddi et al., 2016). These previous explanations could also explain the insignificant influence of environmental regulation on environmental capabilities and thereby on eco-innovation indirectly.

Our empirical examination indicates that green demand is the most environmental pressure force that promote eco-innovation decisions within SMEs has been confirmed by plenty of prior studies (e.g. Cai & Li, 2018; Hojnik & Ruzzier, 2016b; Keshminder & del Río, 2019; Kesidou & Demirel, 2012). With raising the number of consumers with highly environmental consciousness, the demand for eco-friendly products is nowadays becoming a promising segment of market, thereby exerting extensive pressure on SMEs to grasp market opportunities through creating more eco-innovative alternatives. Nevertheless, the findings have unveiled that green demand pressure fails to stimulate the decision of SMEs to develop and invest in environmental capabilities necessary to implement eco-innovations. Therefore, environmental capabilities were not mediated the relationship between green demand and eco-innovation. This result might be attributed to the justification that there is no evident channel through which customers can cooperate with firms in develop their environmental capabilities.

In contrast to prior research on eco-innovation (e.g. Cai & Li, 2018; Yalabik & Fairchild, 2011) that accentuate the relevance of competitive pressure in inducing eco-innovation behavior, our findings have evidenced that eco-innovation was not a direct consequence of competitive pressure. Nonetheless, as illustrated by the findings, competitive pressure exhibited an indirect significant effect on eco-innovation by mediating environmental capabilities. This can be ascribed to that in the face of increased rivalry, SME managers would shift their focus away from competitive risks and toward optimizing value creation through the existing established strategies rather than new competitive alternatives such as eco-innovative practices (Tyler et al., 2018). However, by environmental capabilities, SMEs would be able to respond to competitive pressures and deal with them through creating new environmentally value-added. In addition, given the fact that specialized environmental capabilities on which eco-innovation is dependent are hard to imitate by rivals (Ghisetti et al., 2015; J. A. Zhang & Walton, 2017), firms with these capabilities can achieve a competitive edge from eco-innovation practices.

Conclusion and implications

This study has contributed to the theoretical development of eco-innovation through using environmental capabilities as a mediate to widely understand why eco-innovation behavior differs among firms responding to similar environmental pressures. Whereas several studies have sought to identify the driving factors that spur eco-innovations among SMEs (Kesidou & Demirel, 2012; Pacheco et al., 2018; Triguero et al., 2013), there is a paucity of studies that provide valuable evidence regarding how these factors interact to motivate eco-innovation behavior (Keshminder & del Río, 2019; Majid et al., 2019). As such, this study set out to investigate the influence of environmental pressures on SMEs to adopt eco-innovation, coupled with the mediating effect of environmental capabilities in such a relationship. The results from 183 questionnaires analyzed using Smart-PLS reveals that among environmental pressures, only green demand pressure triggers eco-innovation adoption. In addition, environmental capabilities are only mediated the relationship between the competitive pressure and eco-innovation.

The study has provided several practical implications either SMEs managers or policymaker. First, SMEs managers should prioritize developing their environmental capabilities that can help them track environmental knowledge necessary for eco-innovation adoption. In addition, environmental capabilities can not only enable SMEs to understand and respond to rivals' pressure, but it can also provide them with first-mover advantage over their rivals. Second, although the study has revealed that environmental regulation did not affect eco-innovation either directly or indirectly, regulatory bodies and policymakers can have a major role in encourage firms to adopt eco-innovation through raising environmental awareness for customers as the study has accentuated that the demand for eco-friendly products induce SMEs to implement eco-innovative products and processes.

Limitations and future study

Despite the theoretical and managerial contributions of this research, there are several possible limitations that can highly be opportunities for further studies. Firstly, the study has considered the environmental capabilities as an internal mechanism to explore the relationship between environmental pressures and eco-innovation. Therefore, this framework can be more powerful by including other internal mechanisms such as green absorptive capacity, and environmentally managerial awareness or mediating green capabilities elements such as environmental training, and capability of R&D. Secondly, the research framework has been restricted to investigating only three external pressures. Based on stakeholder theory, other green pressure groups, such as media, society or financial shareholders (Baranova & Meadows, 2017), can be recommended for future research to explore their effect on developing environmental capabilities and then foster eco-innovation practices. Thirdly, the study has been conducted in manufacturing SMEs in one of emerging market. As such, further studies can be carried out in different context, for instance, developed countries, service context, and other emerging market.

Reference:

Aboelmaged, M., & Hashem, G. (2019). Absorptive capacity and green innovation adoption in SMEs: The mediating effects of sustainable organisational capabilities. *Journal of Cleaner Production*, *220*, 853–863. https://doi.org/10.1016/j.jclepro.2019.02.150

Akhtar, R., Sultana, S., Masud, M. M., Jafrin, N., & Al-Mamun, A. (2021). Consumers' environmental ethics, willingness, and green consumerism between lower and higher income groups. *Resources, Conservation and Recycling*, *168*(September 2020), 105274. https://doi.org/10.1016/j.resconrec.2020.105274

Aragón-Correa, J. A., Hurtado-Torres, N., Sharma, S., & García-Morales, V. J. (2008). Environmental strategy and performance in small firms: A resource-based perspective. *Journal of Environmental Management*, *86*(1), 88–103. https://doi.org/10.1016/j.jenvman.2006.11.022

Arranz, N., Lopez, N., & Carlos, J. (2021). How do internal , market and institutional factors affect the development of eco-innovation in firms ? *Journal of Cleaner Production*, *297*. https://doi.org/https://doi.org/10.1016/j.jclepro.2021.126692

Baranova, P., & Meadows, M. (2017). Engaging with environmental stakeholders: Routes to building environmental capabilities in the context of the low carbon economy. *Business Ethics*, *26*(2), 112–129. https://doi.org/10.1111/beer.12141

Berrone, P., Fosfuri, A., Gelabert, L., & Gomez-Mejia, L. R. (2013). Necessity As The Mother Of 'Green' Inventions: Institutional Pressures And Environmental Innovations. *Strategic Management Journal*, *34*, 891–909. https://doi.org/10.1002/smj

Bonzanini, M., Dutra, M., Barcellos, D., & Marques, L. (2016). The drivers for adoption of eco-innovation. *Journal of Cleaner Production*, *113*, 861–872. https://doi.org/10.1016/j.jclepro.2015.11.033

Cabrita, M. do R., Cruz-Machado, V., & Matos, F. (2014). *How to Make Eco-innovation a Competitive Strategy: A Perspective on the Knowledge-Based Development BT - Eco-Innovation and the Development of Business Models: Lessons from Experience and New Frontiers in Theory and Practice* (S. G. Azevedo, M. Brandenburg, H. Carvalho, & V. Cruz-Machado (eds.); pp. 39–53). Springer International Publishing. https://doi.org/10.1007/978-3-319-05077-5_3

Cai, W., & Li, G. (2018). The drivers of eco-innovation and its impact on performance: Evidence from China. *Journal of Cleaner Production*, *176*, 110–118. https://doi.org/10.1016/j.jclepro.2017.12.109

Cainelli, G., De Marchi, V., & Grandinetti, R. (2015). Does the development of environmental innovation require different resources? Evidence from Spanish manufacturing firms. *Journal of Cleaner Production*, *94*, 211–220. https://doi.org/10.1016/j.jclepro.2015.02.008

Chan, H. K., Yee, R. W. Y., Dai, J., & Lim, M. K. (2016). The moderating effect of environmental dynamism on green product innovation and performance. *International Journal of Production Economics*, *181*, 384–391. https://doi.org/10.1016/j.ijpe.2015.12.006

Chan, R. Y. K., He, H., Chan, H. K., & Wang, W. Y. C. (2012). Environmental orientation and corporate performance: The mediation mechanism of green supply chain management and moderating effect of competitive intensity. *Industrial Marketing Management*, *41*(4), 621–630. https://doi.org/10.1016/j.indmarman.2012.04.009

Chekima, B. C., Syed Khalid Wafa, S. A. W., Igau, O. A., Chekima, S., & Sondoh, S. L. (2016). Examining green consumerism motivational drivers: Does premium price and demographics matter to green purchasing? *Journal of Cleaner Production*, *112*, 3436–3450. https://doi.org/10.1016/j.jclepro.2015.09.102

Chin, W. W. (2010). How to Write Up and Report PLS Analyses. In V. Esposito Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 655–690). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-32827-8_29

Daddi, T., Testa, F., Frey, M., & Iraldo, F. (2016). Exploring the link between institutional pressures and environmental management systems effectiveness: An empirical study. *Journal of Environmental Management*, *183*, 647–656. https://doi.org/10.1016/j.jenvman.2016.09.025

Delmas, M., & Montiel, I. (2009). Greening the supply chain: When is customer pressure effective? *Journal of Economics and Management Strategy*, *18*(1), 171–201. https://doi.org/10.1111/j.1530-9134.2009.00211.x

Dieu Thu, P. Do, Paillé, P., & Halilem, N. (2018). Systematic review on environmental innovativeness: A knowledge-based resource view. *Journal of Cleaner Production*, *211*, 1088–1099. https://doi.org/10.1016/j.jclepro.2018.11.221

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited : Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, *48*(2), 147–160. https://doi.org/10.1016/j.jclepro.2015.02.067

Eiadat, Y., Kelly, A., Roche, F., & Eyadat, H. (2008). Green and competitive? An empirical test of the mediating role of environmental innovation strategy. *Journal of World Business*, *43*(2), 131–145. https://doi.org/10.1016/j.jwb.2007.11.012

Fernando, Y., Chiappetta Jabbour, C. J., & Wah, W. X. (2019). Pursuing green growth in technology firms through the connections between environmental innovation and sustainable business performance: Does service capability matter? *Resources, Conservation and Recycling*, *141*(September 2018), 8–20. https://doi.org/10.1016/j.resconrec.2018.09.031

Frondel, M., Horbach, J., & Rennings, K. (2008). What triggers environmental management and innovation ? Empirical evidence for Germany. *Ecological Economics*, *66*(1), 153–160. https://doi.org/10.1016/j.ecolecon.2007.08.016

Gabler, C. B., Richey, R. G., & Rapp, A. (2015). Developing an eco-capability through environmental orientation and organizational innovativeness. *Industrial Marketing Management*, *45*(1), 151–161. https://doi.org/10.1016/j.indmarman.2015.02.014

Gefen, D., Rigdon, E. E., & Straub, D. (2011). Editor’s comments: an update and extension to SEM guidelines for administrative and social science research. *Mis Quarterly*, iii–xiv.

Gefen, D., & Straub, D. (2005). A Practical Guide To Factorial Validity Using PLS-Graph: Tutorial And Annotated Example. *Communications of the Association for Information Systems*, *16*, 91–109. https://doi.org/10.17705/1cais.01605

Ghisetti, C., Marzucchi, A., & Montresor, S. (2015). The open eco-innovation mode. An empirical investigation of eleven European countries. *Research Policy*, *44*(5), 1080–1093. https://doi.org/10.1016/j.respol.2014.12.001

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. *Long Range Planning*, *46*(1–2), 1–12. https://doi.org/10.1016/j.lrp.2013.01.001

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2014). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Hansen, E. G., & Klewitz, J. (2012). The role of an SME's green strategy in public-private Eco-innovation initiatives: The case of ecoprofit. *Journal of Small Business and Entrepreneurship*, *25*(4), 451-477,533-534. https://doi.org/10.1080/08276331.2012.10593584

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management and Data Systems*, *116*(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hojnik, J., & Ruzzier, M. (2016a). What drives eco-innovation? A review of an emerging literature. *Environmental Innovation and Societal Transitions*, *19*, 31–41. https://doi.org/10.1016/j.eist.2015.09.006

Hojnik, J., & Ruzzier, M. (2016b). The driving forces of process eco-innovation and its impact on performance: Insights from Slovenia. *Journal of Cleaner Production*, *133*, 812–825. https://doi.org/10.1016/j.jclepro.2016.06.002

Horbach, J., Rammer, C., & Rennings, K. (2012). Determinants of eco-innovations by type of environmental impact - The role of regulatory push/pull, technology push and market pull. *Ecological Economics*, *78*, 112–122. https://doi.org/10.1016/j.ecolecon.2012.04.005

Huang, X. X., Hu, Z. P., Liu, C. S., Yu, D. J., & Yu, L. F. (2016). The relationships between regulatory and customer pressure, green organizational responses, and green innovation performance. *Journal of Cleaner Production*, *112*, 3423–3433. https://doi.org/10.1016/j.jclepro.2015.10.106

Jahanshahi, A. A., & Brem, A. (2018). Antecedents of corporate environmental commitments: The role of customers. *International Journal of Environmental Research and Public Health*, *15*(6). https://doi.org/10.3390/ijerph15061191

Kang, Y., & He, X. (2018). Institutional Forces and Environmental Management

Strategy: Moderating Effects of Environmental Orientation and Innovation Capability. *Management and Organization Review*, *14*(3), 577–605.

Kemp, R., & Pearson, P. (2007). Final report MEI project about measuring eco-innovation. *UM Merit, Maastricht*, *32*(3), 121–124.

Keshminder, J. S., & del Río, P. (2019). The missing links? The indirect impacts of drivers on eco-innovation. *Corporate Social Responsibility and Environmental Management*, *26*(5), 1100–1118. https://doi.org/10.1002/csr.1789

Kesidou, E., & Demirel, P. (2012). On the drivers of eco-innovations: Empirical evidence from the UK. *Research Policy*, *41*(5), 862–870. https://doi.org/10.1016/j.respol.2012.01.005

Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: a systematic review. *Journal of Cleaner Production*, *65*, 57–75. https://doi.org/10.1016/j.jclepro.2013.07.017

Li, D., Tang, F., & Jiang, J. (2019). Does environmental management system foster corporate green innovation? The moderating effect of environmental regulation. *Technology Analysis and Strategic Management*, *31*(10), 1242–1256. https://doi.org/10.1080/09537325.2019.1602259

Li, Y. (2014). Environmental innovation practices and performance: Moderating effect of resource commitment. *Journal of Cleaner Production*, *66*, 450–458. https://doi.org/10.1016/j.jclepro.2013.11.044

Liao, Z. (2018). Institutional pressure, knowledge acquisition and a firm's environmental innovation. *Business Strategy and the Environment*, *27*(7), 849–857. https://doi.org/10.1002/bse.2036

Lin, H., Zeng, S. X., Ma, H. Y., Qi, G. Y., & Tam, V. W. Y. (2014). Can political capital drive corporate green innovation? Lessons from China. *Journal of Cleaner Production*, *64*, 63–72. https://doi.org/10.1016/j.jclepro.2013.07.046

Lin, L. H., & Ho, Y. L. (2016). Institutional Pressures and Environmental Performance in the Global Automotive Industry: The Mediating Role of Organizational Ambidexterity. *Long Range Planning*, *49*(6), 764–775. https://doi.org/10.1016/j.lrp.2015.12.010

Lin, R. J., Tan, K. H., & Geng, Y. (2013). Market demand, green product innovation, and firm performance: Evidence from Vietnam motorcycle industry. *Journal of Cleaner Production*, *40*, 101–107. https://doi.org/10.1016/j.jclepro.2012.01.001

Mady, K., Abdul Halim, M. A. S., & Omar, K. (2021). Drivers of multiple eco-innovation and the impact on sustainable competitive advantage: evidence from manufacturing SMEs in Egypt. *International Journal of Innovation Science*, *ahead-of-p*(ahead-of-print). https://doi.org/10.1108/IJIS-01-2021-0016

Majid, A., Yasir, M., Yasir, M., & Javed, A. (2019). Nexus of institutional pressures, environmentally friendly business strategies, and environmental performance. *Corporate Social Responsibility and Environmental Management*, *July*, 1–11. https://doi.org/10.1002/csr.1837

Maldonado-Guzmán, G., & Garza-Reyes, J. A. (2020). Eco-innovation practices' adoption in the automotive industry. *International Journal of Innovation Science*.

https://doi.org/10.1108/IJIS-10-2019-0094

Meyer, J. W., & Scott, W. R. (1983). Centralization and the legitimacy problems of local government. *Organizational Environments: Ritual and Rationality*, 199–215.

Mitchell, S., O'Dowd, P., & Dimache, A. (2020). Environmental Challenges for European Manufacturing SMEs. *International Journal of Sustainable Engineering*, *13*(3), 159–170. https://doi.org/10.1080/19397038.2019.1685609

Mondéjar-Jiménez, J., Segarra-Oña, M., Peiró-Signes, Á., Payá-Martínez, A. M., & Sáez-Martínez, F. J. (2015). Segmentation of the Spanish automotive industry with respect to the environmental orientation of firms: Towards an ad-hoc vertical policy to promote eco-innovation. *Journal of Cleaner Production*, *86*, 238–244. https://doi.org/10.1016/j.jclepro.2014.08.034

Nkrumah, S. K., Asamoah, D., Annan, J., & Agyei-owusu, B. (2021). Examining green capabilities as drivers of green supply chain management adoption. *Management Research Review*, *44*(1), 94–111. https://doi.org/10.1108/MRR-01-2020-0015

Oxborrow, L., & Brindley, C. (2013). Adoption of "eco-advantage" by SMEs: Emerging opportunities and constraints. *European Journal of Innovation Management*, *16*(3), 355–375.

Pacheco, D. A. de J., Caten, C. S. ten, Jung, C. F., Navas, H. V. G., & Cruz-Machado, V. A. (2018). Eco-innovation determinants in manufacturing SMEs from emerging markets: Systematic literature review and challenges. *Journal of Engineering and Technology Management - JET-M*, *48*(April 2017), 44–63. https://doi.org/10.1016/j.jengtecman.2018.04.002

Peng, X., & Liu, Y. (2016). Behind eco-innovation: Managerial environmental awareness and external resource acquisition. *Journal of Cleaner Production*, *139*, 347–360. https://doi.org/10.1016/j.jclepro.2016.08.051

Pereira, R. M., MacLennan, M. L. F., & Tiago, E. F. (2020). Interorganizational cooperation and eco-innovation: a literature review. *International Journal of Innovation Science*, *12*(5), 477–493. https://doi.org/10.1108/IJIS-01-2020-0008

Phan, T. N., & Baird, K. (2015). The comprehensiveness of environmental management systems: The influence of institutional pressures and the impact on environmental performance. *Journal of Environmental Management*, *160*, 45–56. https://doi.org/10.1016/j.jenvman.2015.06.006

Porter, M. E., & Van Der Linde, C. (1995). Green and Competitive: Ending the Stalemate. *Harvard Business Review*, *73*(5), 120–134. https://s3.amazonaws.com/academia.edu.documents/30781638/artigo_porter_linde_thegreenadvantage_1995.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1507566767&Signature=jbYKMTcmudX%2Bs5mY5uI5DTAc9XE%3D&response-content-disposition=inline%3B filename%3DG

Salim, N., Ab Rahman, M. N., & Abd Wahab, D. (2019). A systematic literature review of internal capabilities for enhancing eco-innovation performance of manufacturing firms. *Journal of Cleaner Production*, *209*, 1445–1460. https://doi.org/10.1016/j.jclepro.2018.11.105

Sanni, M. (2018). Drivers of eco-innovation in the manufacturing sector of Nigeria. *Technological Forecasting and Social Change*, *131*(November 2017), 303–314. https://doi.org/10.1016/j.techfore.2017.11.007

Sarkis, J., Gonzalez-Torre, P., & Adenso-Diaz, B. (2010). Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. *Journal of Operations Management*, *28*(2), 163–176. https://doi.org/10.1016/j.jom.2009.10.001

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*. Prentice Hall. https://books.google.com.my/books?id=u-txtfaCFiEC

Sharfman, M. P., Shaft, T. M., & Tihanyi, L. (2004). A Model of the Global and Institutional Antecedents of High-Level Corporate Environmental Performance. *Business & Society*, *43*(1), 6–36. https://doi.org/10.1177/0007650304262962

Shubham, S., Charan, P., & Murty, L. S. (2018). Institutional pressure and the implementation of corporate environment practices: examining the mediating role of absorptive capacity. *Journal of Knowledge Management*, *22*(7), 1591–1613. https://doi.org/10.1108/JKM-12-2016-0531

Simpson, D. (2012). Institutional pressure and waste reduction: The role of investments in waste reduction resources. *International Journal of Production Economics*, *139*(1), 330–339. https://doi.org/10.1016/j.ijpe.2012.05.020

Subrahmanya, M. Hb. (2015). Innovation and growth of engineering SMEs in Bangalore: Why do only some innovate and only some grow faster? *Journal of Engineering and Technology Management*, *36*, 24–40. https://doi.org/https://doi.org/10.1016/j.jengtecman.2015.05.001

Sumrin, S., Gupta, S., Asaad, Y., Wang, Y., Bhattacharya, S., & Foroudi, P. (2021). Eco-innovation for environment and waste prevention. *Journal of Business Research*, *122*(August 2020), 627–639. https://doi.org/10.1016/j.jbusres.2020.08.001

Szilagyi, A., Mocan, M., Verniquet, A., Churican, A., & Rochat, D. (2018). Eco-innovation , a business approach towards sustainable processes , products and services. *Procedia - Social and Behavioral Sciences*, *238*, 475–484. https://doi.org/10.1016/j.sbspro.2018.04.026

Triguero, A., Moreno-Mondéjar, L., & Davia, M. A. (2013). Drivers of different types of eco-innovation in European SMEs. *Ecological Economics*, *92*, 25–33. https://doi.org/10.1016/j.ecolecon.2013.04.009

Tyler, B., Lahneman, B., Beukel, K., Cerrato, D., Minciullo, M., Spielmann, N., & Discua Cruz, A. (2018). SME Managers' Perceptions of Competitive Pressure and the Adoption of Environmental Practices in Fragmented Industries: A Multi-Country Study in the Wine Industry. *Organization & Environment*, 1–27. https://doi.org/10.1177/1086026618803720

Xue, M., Boadu, F., & Xie, Y. (2019). The penetration of green innovation on firm performance: Effects of absorptive capacity and managerial environmental concern. *Sustainability (Switzerland)*, *11*(9). https://doi.org/10.3390/su11092455

Yalabik, B., & Fairchild, R. J. (2011). Customer, regulatory, and competitive pressure as drivers of environmental innovation. *International Journal of Production Economics*, *131*(2), 519–527. https://doi.org/10.1016/j.ijpe.2011.01.020

Yue, B., Sheng, G., She, S., & Xu, J. (2020). *Impact of Consumer Environmental Responsibility on Green Consumption Behavior in China : The Role of Environmental Concern and Price Sensitivity*.

Zhang, J. A., & Walton, S. (2017). Eco-innovation and business performance: the moderating effects of environmental orientation and resource commitment in green-oriented SMEs. *R and D Management*, *47*(5), 26–39. https://doi.org/10.1111/radm.12241

Zhang, J., Liang, G., Feng, T., Yuan, C., & Jiang, W. (2020). Green innovation to respond to environmental regulation: How external knowledge adoption and green absorptive capacity matter? *Business Strategy and the Environment*, *29*(1), 39–53. https://doi.org/10.1002/bse.2349

Zhao, X., Zhao, Y., Zeng, S., & Zhang, S. (2015). Corporate behavior and competitiveness: Impact of environmental regulation on Chinese firms. *Journal of Cleaner Production*, *86*, 311–322. https://doi.org/10.1016/j.jclepro.2014.08.074

Zhu, Q., Cordeiro, J., & Sarkis, J. (2013). Institutional pressures, dynamic capabilities and environmental management systems: Investigating the ISO 9000 - Environmental management system implementation linkage. *Journal of Environmental Management*, *114*, 232–242. https://doi.org/10.1016/j.jenvman.2012.10.006

Appendix A: multivariate normality

Output of skewness and kurtosis calculation

```
Sample size:  176
Number of variables:  5

Univariate skewness and kurtosis
                       Skewness   SE_skew    Kurtosis   SE_kurt
Env_regulation      -0.52652566 0.1830894  0.02140451 0.3641971
Green_Demand        -0.07398475 0.1830894 -0.61257775 0.3641971
Competitive_Pressure -0.30695200 0.1830894 -0.48332810 0.3641971
Env_capabilities    -0.76116277 0.1830894  0.16022796 0.3641971
Eco_Innovation      -1.07840752 0.1830894  1.88645843 0.3641971

Mardia's multivariate skewness and kurtosis
                 b          z      p-value
Skewness  6.767378 198.50976 0.000000e+00
Kurtosis 40.155261   4.08722 4.365732e-05
```

https://webpower.psychstat.org/models/kurtosis/results.php?url=7479218c241455dd91a1247bbfecea96

Appendix B: structural model assessment