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ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/oabm20

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To cite this article: Khalid Mady, Muhammad Abi Sofian Abdul Halim, Khatijah Omar, Reda Shaker Abdelkareem & Mohamed Battour | (2022) Institutional pressure and eco-innovation: The mediating role of green absorptive capacity and strategically environmental orientation among manufacturing SMEs in Egypt, Cogent Business & Management, 9:1, 2064259, DOI: 10.1080/23311975.2022.2064259

To link to this article: https://doi.org/10.1080/23311975.2022.2064259

Published online: 22 Apr 2022.

Mady et al., *Cogent Business & Management* (2022), 9: 2064259
https://doi.org/10.1080/23311975.2022.2064259

cogent business & management

Received: 07 July 2021
Accepted: 26 March 2022

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Reviewing editor:
Yen-Chun Jim Wu, National Taiwan Normal University, Taipei, Taiwan, Province of China

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MANAGEMENT | RESEARCH ARTICLE

Institutional pressure and eco-innovation: The mediating role of green absorptive capacity and strategically environmental orientation among manufacturing SMEs in Egypt

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Abstract: With the growing concern about climate change, businesses have been under increasing pressure from regulatory agencies and customers to implement proactive environmental practices such as eco-innovation. While environmental pressures have been extensively discussed in the literature as drivers of eco-

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PUBLIC INTEREST STATEMENT

Adopting eco-innovation practices has become a matter of interest to governments and customers alike. Hence, this research provides an in-depth understanding of how businesses, in particular small and medium enterprises (SMEs), respond to the pressures exerted by governments, customers, and other competitors. Our findings show that these pressures can push to adopt eco-innovation practices only when SMEs have certain internal characteristics. For example, SMEs that have managers who are highly environmentally aware are highly responsive to the pressures exerted by regulatory agencies and competitors by adopting eco-innovation practices. In addition, SMEs with high green absorptive capacity highly respond to the pressures exerted by consumers and competitors.

innovation, empirical evidence on the influence of these pressures on eco-innovation behaviour remains inconsistent. Therefore, the current study essentially aims to investigate the direct effect of institutional pressures, namely, regulation, eco-friendly product demand, and competitive pressure on eco-innovation, coupled with the indirect effect of these pressures by mediating internal drivers of eco-innovation including green absorptive capacity and strategically environmental orientation among manufacturing SMEs in Egypt. Based on a sample of 176 managers and owners of these enterprises, a cross-sectional survey is conducted to collect data related to research constructs. The results of data analysis using Smart-PLS show that all external pressures are not directly associated with eco-innovation. Of the six indirect hypothesized effects, only four indirect effects are supported. The results illustrate that green absorptive capacity mediates the relationship between institutional pressure (eco-friendly product demand and competitive pressure) and eco-innovation. The results also show that strategically environmental orientation mediates the relationship between institutional pressure (regulation and competitive pressure) and eco-innovation. This study provides an in-depth understanding of firms' responses to institutional pressures as well as the notable implications for SMEs managers, policymakers and future researchers.

Subjects: Environmental Economics; Business, Management and Accounting; Industry & Industrial Studies

Keywords: eco-innovation; institutional pressure; green absorptive capacity; strategically environmental orientation

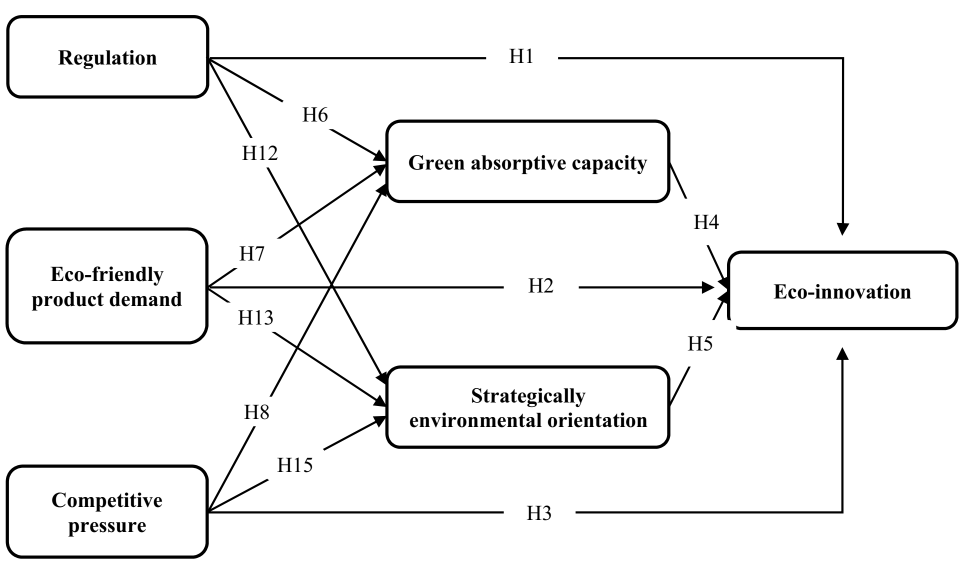
1. Introduction

Growing concerns about climate change have driven various parties (e.g., governments, NGOs and customers) to pay considerable attention to environmental issues, raising pressures on businesses to adopt environmental initiatives (Betts et al., 2018; F. Wang et al., 2019). Among the various proactive environmental initiatives, a strong emphasis has been placed on the adoption of eco-innovation strategy to create win-win solutions that foster both economic and environmental benefits (Yu et al., 2017). On a positive note, adopting eco-innovation has been part of value creation and a source of competitive advantage for large companies (García-Granero et al., 2018). Meanwhile, SMEs are currently contributing further damage to the environment and produce more waste compared to large companies (Hamann et al., 2017; Johnson, 2017; Mitchell et al., 2020). Therefore, customers and regulatory agencies have placed greater pressure on SMEs to adopt a greener supply chain that enhances environmental performance (Pacheco et al., 2017; Talbot, 2005). Moreover, building capacity that proactively responds to environmental requirements has become essential in supporting SMEs' competitive position (Oxborrow & Brindley, 2013). That is why SMEs need to become greener. Consequently, a great deal of research has increasingly focused on investigating the factors prompting SMEs to adopt eco-innovation practices (Albort-Morant, Henseler et al., 2018; Pacheco, Caten, et al., 2018; Triguero et al., 2013).

The decision to adopt eco-innovation is driven by two main groups of factors: external drivers (e.g., regulatory pressure, customer pressure and competitive pressure) and internal drivers (e.g., environmental orientation, absorptive capacity; Bonzanini et al., 2016; Maldonado-Guzmán & Garza-Reyes, 2020; Naruetharadhol et al., 2021; Salim et al., 2019). Prior studies examining the effect of external or institutional pressures have yielded inconsistent results (R. Wang et al., 2018). Some studies have showed that institutional pressure acts as a catalyst for adopting eco-innovation (Wugan Doran & Ryan, 2012; Hojnik & Ruzzier, 2016b; Wugan Cai & Li, 2018). By contrast, other studies emphasize that institutional pressure does not have a significant impact on the adoption of eco-innovation (Eiadat et al., 2008; H. H. Lin et al., 2014; Mady et al., 2022; Zhu & Geng, 2013). As mentioned by X. Chen et al. (2018), the reason for such inconsistency may be that investigations into the effect of institutional pressure on eco-innovation were carried out without simultaneously taking internal drivers of eco-innovation into account. Therefore, Keshminder and Del Río (2019) concluded that examining the integration among different eco-innovation drivers is considered a topical and complex issue which has not been adequately covered in the eco-innovation literature. To fill this gap, the impact of these drivers (internal and external) on the adoption of eco-innovation will be tested simultaneously. Furthermore, only a handful of studies have focused on the mediating role of the internal characteristics of the firm in explaining the relationship between institutional pressures and environmental practices (Majid et al., 2019; Shubham et al., 2018). To help fill this gap, the internal drivers are suggested as mediators between institutional pressure and eco-innovation as one of the current study's contributions.

Institutional pressures are critical but do not always lead to the adoption of environmentally-friendly innovation practices (X. Chen et al., 2018; Kalyar et al., 2019). Previous studies have stated that the internal mechanism should be involved to increase the explanatory power of the relationship between such pressures and eco-innovation (Majid et al., 2019; Pacheco, Alves, et al., 2018). Therefore, this study has contended that both green absorptive capacity and strategically environmental orientation could be used as mediators in this relationship. Eco-innovation practices are dependent on environmental knowledge much of which is derived from institutional actors (Aboelmaged & Hashem, 2019; Dieu Thu et al., 2018). In addition, institutional pressures act as catalysts to enable firms to develop new knowledge and knowledge-related capabilities such as green absorptive capacity (Pacheco, Alves, et al., 2018). Alongside this, institutional pressures also play a leading role in enhancing SMEs' environmental orientation (Segarra-Oña et al., 2013; R. Y. K. Chan & Ma, 2016). The current study sets out to answer the following question: Do both green absorptive capacity and strategically environmental orientation mediate the relationship between institutional pressures, including regulatory pressure, eco-friendly demand pressure, and competitive pressure and eco-innovation? The answer to this question will provide an in-depth

Figure 1. Theoretical framework.



understanding of firms' responses to institutional pressures as well as the serious implications for SME managers, policymakers and future researchers.

2. Theoretical background and hypotheses development

2.1. Institutional pressures of eco-innovation

According to institutional theory, firms operate their own businesses under a range of external pressures that affect their choices and practices (DiMaggio & Powell, 2000; Suddaby et al., 2013). Organizational efficiency is not the only incentive for firms to adopt or adapt their actions or practices; firms also need to gain legitimacy from institutional actors (e.g., regulatory actors, customers or competitors; C. Chan & Ananthram, 2018). Firms seeking legitimacy which is known as social acceptance and approval of firm's actions, are subject to three different types of pressure: coercive, mimetic and normative pressures (DiMaggio & Powell, 2000; Oliver, 1997). Based on the institutional theoretical context, many prior studies have explored the pressures exerted on firms to adopt eco-innovation practices which are based on the three institutional pressures (Li, 2014).

Firstly, coercive pressure has been exerted by entities on which firms rely such as resources-dominated and governmental agencies (Martínez-Ferrero & García-Sánchez, 2017). Previous studies argue that regulatory techniques, either through command and control or economic-based instruments, has extensively pressured firms to adopt eco-innovation practices (Hojnik & Ruzzier, 2016b; Qi et al., 2021; Yalabik & Fairchild, 2011). Environmental regulation in some countries has not only imposed liabilities on firms but also on directors and executives, forcing them to mitigate the environmental effects of their firms (Phan & Baird, 2015). Environmental regulation can be a driver to eco-innovation by highlighting resource inefficiencies and potential innovative opportunities and by increasing firms' environmental awareness (Zhang et al., 2020; Zhao et al., 2015). Hence, environmental regulations should be well-designed to encourage firms to adopt eco-innovation practices (Daddi et al., 2020). However, Wugan Cai and Li (2018) conclude that the impact of environmental regulation on eco-innovation is not always apparent. Also, Eiadat et al. (2008) suggest that firms facing strict environmental regulation often seek to avoid this regulation rather than adopting eco-innovation strategy, thus environmental regulation is not likely to be sufficient to foster eco-innovation practices. Similarly, Mady et al. (2022) also found an insignificant effect of environmental regulations on fostering eco-innovation practices. As a result of such inconsistency between earlier studies on the impact of environmental regulation in spurring eco-innovation behaviour, the current study will test the following hypothesis (see, figure 1):

H1: Environmental regulation positively influences eco-innovation

Secondly, normative pressure comes from the values or standards upheld by professional entities or social structures (J. Lin et al., 2019). Normative pressure can be exerted on firms by a variety of external sources such as customers, the media and society (Phan & Baird, 2015). With growing "green consumerism," customer pressure is conceived as a vital driver that can compel firms to rethink their priorities concerning environmental practices (Zhu et al., 2013). Amending customer preferences to purchase eco-friendly products can motivate firms to adopt eco-innovation to make their products and processes more eco-friendly which, in turn, helps differentiate themselves from their competitors (Doran & Ryan, 2012; Horbach, 2008; Sanni, 2018). Therefore, firms that are under pressure from customers to meet their demands for eco-friendly products are more likely to implement eco-innovative practices to relieve such pressure (Wugan Wugan Cai & Li, 2018; Zhu & Geng, 2013). On the contrary, several studies have argued that customer demand is not among the most influential factors contributing to fostering eco-innovation practices. For example, Li (2014) and Mady et al. (2022) who have concluded that eco-innovations, such as eco-product and eco-process, are not influenced by customer demand, especially in emerging markets, because the price of green products is higher than conventional alternatives. This leads to the development of the following hypothesis (see, Figure 1):

H2: Eco-friendly product demand is positively influencing eco-innovation

Mimetic pressure is the third kind of pressure and is exerted by rivals (DiMaggio & Powell, 2000). As a result of uncertainty, firms tend to copy or emulate the best practices of their competitors (Qi et al., 2021). Dai et al. (2015) present the empirical evidence that competitors' success in managing environmental activities pushes firms to make their products and processes be more environmentally friendly. As hypothesized by Phan and Baird (2015), firms facing stiff competitive pressure are more likely to strive to adopt proactive environmental practices in order to remain competitive. This implies that, in the increasingly competitive global environment, providing eco-friendly products through eco-innovation has become a critical strategy for firms seeking to boost market share, promote a green image, and achieve long-term success (Li, 2014). Competitive pressure is more likely to play a critical role in the adoption of environmental practices that help SMEs gain a competitive edge over their rivals (Wugan Wugan Cai & Li, 2018). Thus, competitive pressure is perceived as the most influential driver for eco-innovation (Wugan Hojnik & Ruzzier, 2016a; Lee et al., 2021; Wugan Cai & Li, 2018). However, Tyler et al. (2018) find empirical evidence that when facing stronger competitive pressure, SMEs are not inclined to adopt environmentally friendly practices. In the same vein, Mady et al. (2022) have concluded that eco-innovation practices in SMEs are not driven by competitive pressure. Since the empirical results related to the impact competitive pressure on adopting eco-innovation are still disputed, the current study will test the following hypothesis (see, Figure 1):

H3: Competitive pressure positively influences eco-innovation

2.2. Internal drivers of eco-innovation

Eco-innovation practices are not only triggered by external or institutional pressures but also internal factors. Internal drivers refer to the internal characteristics and capabilities required to adopt eco-innovation (Salim et al., 2019). Alongside institutional pressures, a large body of literature has explored the internal drivers of eco-innovation such as green absorptive capacity and environmental orientation (Aboelmaged, 2018b; Dieu Thu et al., 2018; Mady et al., 2022). Using a knowledge-based view, environmental knowledge is conceived of as a strategic resource required to orient towards eco-innovation (De Marchi, 2012; Sanni, 2018). Firms can receive environmental knowledge from multiple sources that exist beyond their boundaries such as customers, regulators and non-governmental organizations (Shubham et al., 2018). Hence, Aboelmaged and Hashem (2019) posit that adopting eco-innovation necessitates an absorptive capacity that can enable manufacturing SMEs to identify, assimilate, integrate and exploit both internal and external environmental knowledge.

Absorptive capacity is considered a dynamic capability that helps firms exploit the combination of absorbed knowledge and existing knowledge to develop new organizational capabilities that can approach environmental issues (Pinkse et al., 2010). As noted by Sanni (2018), the ability to absorb external knowledge can compensate SMEs for their lack of R&D capabilities. Absorptive capacity serves as a catalyst in driving SMEs to implement eco-innovation, especially where the environment is marked by extreme business uncertainty and technical instability (De Marchi, 2012). Based on the previous discussion, the following hypothesis is proposed (see, Figure 1):

H4: Green absorptive capacity positively influences eco-innovation

Environmental orientation is receiving growing attention from the environmental management discipline as a strategic factor acting as a catalyst for proactive environmental practices such as eco-innovation (Chan et al., 2012; Gabler et al., 2015). Environmental orientation was conceptualized by Banerjee (2002) as the managerial recognition of the relevance of environmental issues and the perception by managers of the impact a firm has on the environment. According to Gefen and Straub (2005, p. 431), environmental orientation being a higher order construct comprises three capabilities: "entrepreneurship, corporate social responsibility (CSR), and commitment to the natural environment." Such an orientation constitutes a strategic direction aiming to manage environmental issues by incorporating environmental concerns into a firm's operations and decision-making processes (Bu et al., 2020; Zhang & Walton, 2017a). Therefore, the presence of environmental orientation within firms is an identified factor for the successful implementation of proactive environmental practices (Shubham et al., 2018).

Green-oriented firms, particularly those in industries lacking widely accepted standards, face technological uncertainties and complexities either related to technological solutions or measures used to evaluate the potential environmental impact of firms (Cainelli et al., 2015). Given that greater environmental orientation provides firms with more knowledge and a better understanding of environmental issues, it could enable green-oriented firms to minimize such technological uncertainty of proactive environmental practices (Peng & Liu, 2016; Zhang & Walton, 2017b). As indicated by Yang et al. (2020), the greater a firm's environmental orientation, the more responsive that firm will be to environmental issues. In addition, firms with greater environmental orientation can develop products and processes that aim to minimize environmental impacts, maximize resource efficiency or meet regulatory requirements (Sáez-Martínez et al., 2014). This view is in accord with Sumrin et al. (2021) who found that the environmental awareness for firms' managers drives firms to espouse eco-innovation practices. As such, the following hypothesis will be tested (see, Figure 1):

H5: Environmental orientation positively influences eco-innovation

2.3. Mediating effect of green absorptive capacity and environmental orientation

While the literature on eco-innovation has extensively explored the influence of external factors as antecedents of eco-innovation such as customer pressure and regulatory pressure, inconsistent results have been reported (X. X. Chen et al., 2018; Eiadat et al., 2008; Frondel et al., 2008; Mady et al., 2022). As some eco-innovation scholars mentioned, such an inconsistency is a result of the lack of a clear internal mechanism through which studies explain how external pressures drive eco-innovations (X. X. Kang & He, 2018; X. X. Huang et al., 2016). Majid et al. (2019) contend that the linkages of external and internal factors can provide an effective understanding of the role of institutional pressure in espousing eco-innovation practices. Only a handful of studies stress the importance of the integration of external pressures and internal factors in driving proactive environmental practices (Keshminder & Del Río, 2019; Majid et al., 2019; X. X. Huang et al., 2016) and accentuate that the impact of institutional pressure to adopt environmental practices cannot be understood in isolation of intra-organizational mechanisms. In addition, Keshminder and Del Río (2019) argue that both internal and external drivers are likely to interact, eventually affecting the adoption of eco-innovation practices. Therefore, it is assumed that the role of institutional pressure in adopting eco-innovation practices may be strongly contingent on the existence of mediating factors such as green absorptive capacity and environmental orientation.

In response to external pressure, firms strive to invest in the development of their green absorptive capacity to acquire and utilize the necessary external knowledge, enabling them to successfully implement proactive environmental practices (Shubham et al., 2018). It requires not only knowledge of emerging environmental issues and new technologies to deal with these issues but also an understanding of local concerns regarding the environment and the perceived suitability of technological solutions presented in the relevant local context (Pinkse et al., 2010). Therefore, when institutional pressures are exerted on firms, their absorptive capacity enables them to recognise and assimilate the regulatory requirements, market trends and rivals' strategy knowledge and subsequently adapt their operations and businesses for value creation (Delmas et al., 2011; Liao, 2018; Qi et al., 2021).

Firms experiencing regulatory pressure are more likely to continually boost their absorptive capacity because environmental regulations provide firms with a certain way to implement environmental strategies (Song et al., 2020). Given that customer knowledge is of crucial importance in environmental innovation (Hong et al., 2019), it is necessary for a firm to value, acquire and exploit knowledge to understand green market needs (Delmas et al., 2011). Thus, Albort-Morant, Henseler et al. (2018) illustrate that firms should focus on absorbing and assimilating external customer knowledge in order to satisfy environmentally conscious consumers by designing greener products and improving existing ones. Therefore, customer requirements play a critical role in motivating firms to utilize the knowledge that enhances green absorptive capacity (song et al., 2020). Drawing on the above argument, the following hypotheses have been formulated (see, figure 1):

H6: Environmental regulation positively influences green absorptive capacity

H7: Eco-friendly product demand positively influences green absorptive capacity

H8: Competitive pressure positively influences green absorptive capacity

Institutional pressures are critical for adopting proactive environmental actions (Daddi et al., 2020). However, these pressures seem to be most influential only when firms have the capabilities and environmental orientation needed to implement proactive environmental practices (Simpson, 2012). In addition, seeking legitimacy by adopting environmental practices makes firms rethink their resources and strategic orientation towards environmental matters (Zhu et al., 2013). Hence, institutional pressures stimulate firms to build and develop resources and capabilities that are the underpinning of eco-innovation practices (Majid et al., 2019; Shubham et al., 2018). Although Shubham et al. (2018) contend that absorptive capacity mediates the relationship between institutional pressure and proactive environmental practices, the evidence that absorptive capacity is involved in the relationship between external pressures including regulations, eco-friendly product demand and competitive pressure and eco-innovation practices is still not conclusive. Hence, the study will test the following hypotheses (see, figure 1):

H9: The relationship between regulations and eco-innovation is mediated by green absorptive capacity.

H10: The relationship between eco-friendly product demand and eco-innovation is mediated by green absorptive capacity.

H11: The relationship between competitive pressure and eco-innovation is mediated by green absorptive capacity

Recently, growing pressures from several stakeholders and society have compelled firms to adopt environmental orientation (Bu et al., 2020). Regulatory pressure in the form of strict environmental regulations and standards, customer demand, and competitive pressure could play a leading role in the implementation of environmental orientation (Liu et al., 2020; Sarkar et al., 2021). Meanwhile, high orientation towards environmental issues makes a firm more sensitive to external opportunities or risks (Ben Amara & Chen, 2020; S. Z. Huang et al., 2020) and more likely to adopt eco-innovation practices (Sumrin et al., 2021; S. Z. Huang et al., 2020). Environmental orientation is not a single construct but rather twofold: internal environmental orientation and external environmental orientation (Banerjee, 2002). The former reflects a firm's internal values, moral norms and responsibility for environmental protection. The latter refers to a firm's perception of exogenous stakeholders and the need to satisfy the environmental expectations of exogenous stakeholders such as customers and the community. Firms have many choices that can be adopted to respond to external pressures (Hansen & Klewitz, 2012). These choices range from reactive actions to proactive actions and innovation-based action (Simpson, 2012; Zhu et al., 2013). The choice adopted by firms increasingly depends on their environmental orientation (Hansen & Klewitz, 2012). Put another way, when firms adopt proactive environmental practices as a response to institutional pressure, it is based on their environmental orientation (Simpson, 2012; R. Y. K. Chan & Ma, 2016). Therefore, the following hypotheses will be tested:

H12: Environmental regulation positively influences environmental orientation.

H13: Eco-friendly product demand positively influences environmental orientation.

H14: Competitive pressure positively influences environmental orientation.

Despite the aforementioned argument, what is not yet clear is the mediating effect of environmental orientation on the relationship between regulation, eco-friendly product demand, competitive pressure and eco-innovation. To fill this gap in the literature, the following hypotheses will be tested (see, figure 1):

H15: The relationship between regulations and eco-innovation is mediated by environmental orientation.

H16: The relationship between eco-friendly product demand and eco-innovation is mediated by environmental orientation.

H17: The relationship between competitive pressure and eco-innovation is mediated by environmental orientation.

3. Research methods

3.1. Sample and data collection

The study took a sample of SMEs operating in the manufacturing sector in Egypt. Sampling targets were the owners or managers of SMEs. The study used a database of manufacturing SMEs provided by the Industrial Development Authority (IDA) which is responsible for awarding licenses to manufacturing businesses. Due to the large size and dispersion of this sector in Egypt, this study was limited to industrial enterprises in four significant cities in Greater Cairo characterised as industrial zones. The three governorates (Cairo, Giza, and Qalyubia) and Alexandria accounted cumulatively for more than 35% of SMEs in Egypt (Aboelmaged, 2018a). The population size of SMEs was estimated at 6102 manufacturing firms. An analytical and self-completion questionnaire was developed to measure the research constructs. The questionnaire was prepared in English and translated into Arabic. To avoid the bias of translation, a parallel-translation technique was applied by three academic researchers in the management discipline (Saunders et al., 2009). In addition, the questionnaire items were amended based on comments by three experts in manufacturing to remove any possible misunderstanding or obscurity. Finally, the questionnaire was divided into two sections: the first section contained items relating to the respondent's basic information (e.g., age, years of experience, and education level) and firms' information (e.g., size and type of industry). The second section involved the questions regarding the research constructs using a 5-point Likert scale.

Table 1. Sample profile

Respondents' profile			Industry profile		
Gender	**n**	**%**	**Industry**	**n**	**%**
Female	19	10.80	Textiles, wearing apparel and leather	28	15.91
Male	157	89.20	Food and beverages	26	14.77
Education level			Chemicals and allied products	25	14.20
School (primary/ secondary)	9	5.11	Furniture, wood and upholstering	24	13.64
Bachelor's degree	124	70.54	Basic metal products	16	9.09
Post-graduate	43	24.43	Trailers, machinery and repairs	12	6.82
Years of experience			Building materials and refractories	12	6.82
Less than 5	19	10.80	Rubber and plastics	9	5.11
5–10	29	16.48	Paper and printing	9	5.11
More than 20	128	72.73	Electronics and optics	9	5.11
Position			Basic pharmaceutical products	6	3.41
Owner	90	51.14	Size		
Manager—CEO	86	48.86	Small	107	60.80
			Medium	69	39.20

A total of 550 questionnaires were distributed and 190 questionnaires were returned, giving a response rate of 34.55 %. However, only 176 of the questionnaires were valid for the purpose of data analysis after excluding 14 invalid questionnaires. As suggested by Hair et al. (2017), the minimum sample size must be a function of the power of analysis which is dependent on the number of predictors. Using Green's (1991) table, the minimum sample size is 76 respondents, at a power of (0.80), medium effect size, and 3 predictors contained in the research model. Hence, the study exceeded the minimum sample size required to test the hypothesized framework.

Table 1 illustrates that small enterprises accounted for 60.80% of the sample. Of the 11 industrial sectors, 4 sectors including textiles, wearing apparel and leather; food and beverages; chemicals and allied products; and furniture, wood and upholstering accounted for only 58.52%. It is therefore apparent that no particular sector dominated the sample. In terms of the respondents' profiles, male respondents were in the majority (89.20%). A significant proportion of the respondents had more than 20 years of experience (72.73%) and held at least a bachelor's degree (70.54%). The respondents were well-educated and had sufficient experience to respond to the questionnaire.

As the data was collected using a cross-sectional survey through which the data for all of the research variables was simultaneously obtained from the same respondents, the findings might be subject to common method variance (CMV) which is considered a source of systematic error. As suggested by Podsakoff et al. (2003), Harman's one-factor test was conducted to ensure that there is no common method variance (CMV). Based on un-rotated factor analysis, the results indicate that the first factor explained only 37.82% of the total variance (less than 0.50), suggesting that CMV is not likely to be significant in the current study.

3.2. Measures

Six latent variables were measured by questionnaire items adapted from prior studies: eco-innovation, regulation, eco-friendly product demand, competitive pressure, green absorptive capacity, and strategically environmental orientation. The measurement of eco-innovation was adapted from Peng and Liu (2016) and Tumelero et al. (2018). 17 items were used to measure eco-innovation which reflected the extent to which firms adopt eco-products, eco-processes and eco-organization innovation practices targeting both improved environmental performance and sustained competitive advantage (Peng & Liu, 2016).

In terms of independent variables, regulation was measured by three items adapted from Hojnik and Ruzzier (2016b) and Wugan Wugan Cai and Li (2018) to reflect command and control instruments prompting firms to implement eco-innovation practices. Eco-friendly product demand was measured by four items adapted from Agan et al. (2013) and Hojnik and Ruzzier (2016b) to reflect customers' consciousness and willingness to purchase ecologically friendly products. Competitive pressure was measured using three items elaborated by Hojnik and Ruzzier (2016b) to assess these pressures imposed by competitors which drive firms to improve their eco-innovation capabilities.

With regards to mediating variables, a five-item measurement of green absorptive capacity was adapted from Y.-S. Chen et al. (2015) and J. Zhang et al. (2020) which reflects the extent to which firms can absorb external environmental knowledge, integrate it with their existing knowledge and utilize it for commercial purposes. Finally, strategically environmental orientation is presented as six items adapted from Agan et al. (2013) and Gabler et al. (2015) to reflect the extent to which firms take responsibility for the environment and recognize the importance of minimizing firms' impact on the environment.

4. Data analysis and results

The current study has investigated the mediating role of two research constructs in several hypothesized relationships. Hence, the current study adopted SEM-PLS (Structural Equation Modelling-Partial Least Square) to ensure the validation of the measurements and test the research model. SEM-PLS is deemed a suitable technique for testing complex models seeking to predict relationships between research variables (Memon et al., 2017). Moreover, this technique can adequately be applied with a relatively small sample size, coupled with non-normally distributed data (Hair, Hult, al., 2014). Using WebPower software, the results of Mardia's multivariate normality test illustrate that the dataset does not follow a normal distribution: Mardia's multivariate skewness ($\beta = 8.569$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 53.847$, $p < 0.01$) (see Appendix A). Therefore, SEM-PLS is a suitable choice for the study. Data analysis was performed using Smart-PLS in two sequential stages: measurement model evaluation and structure model evaluation.

4.1. Measurement model

Using Smart-PLS, the measurement model was evaluated to verify the relationships between the constructs and their indicators (see Appendix B). All research constructs were addressed as reflective and first order constructs. The study used three statistical tests to validate the measurement of the research constructs: 1) factor loadings; 2) composite reliability and average variance extracted (AVE) to evaluate convergent validity; and 3) discriminant validity by Fornell–Larcker Criterion (Henseler et al., 2016). As recommended by Gefen and Straub (2005), the loadings for items should be at least a value of 0.6. Thus, three items including Eco-ORG2, Eco-ORG3 and Eco-ORG5 were dropped from the eco-innovation items (see, Table 2). In terms of composite reliability, all constructs have values ranging from 0.890 to 0.951 which exceed the

Table 2. Construct reliability and validity

Construct	Items	Loading	CR	AVE
Competitive pressure (CP)	Com_Pre1	0.888	0.941	0.842
	Com_Pre2	0.946		
	Com_Pre3	0.918		
Eco-innovation (EI)	ECO-Proc1	0.850	0.951	0.582
	ECO-Proc2	0.873		
	ECO-Proc3	0.819		
	ECO-Proc4	0.799		
	Eco-ORG1	0.777		
	Eco-ORG4	0.650		
	Eco-ORG6	0.610		
	Eco-prod1	0.698		
	Eco-prod2	0.803		
	Eco-prod3	0.707		
	Eco-prod4	0.756		
	Eco-prod5	0.759		
	Eco-prod6	0.813		
	Eco-prod7	0.715		
Eco-friendly product demand (EPD)	Eco_D1	0.810	0.893	0.677
	Eco_D2	0.812		
	Eco_D3	0.854		
	Eco_D4	0.815		
Strategically environmental orientation (SEO)	Env_Orien1	0.699	0.915	0.642
	Env_Orien2	0.778		
	Env_Orien3	0.868		
	Env_Orien4	0.880		
	Env_Orien5	0.746		
	Env_Orien6	0.823		
Green absorptive capacity (GAC)	Gre_Abs1	0.776	0.890	0.618
	Gre_Abs2	0.820		
	Gre_Abs3	0.832		
	Gre_Abs4	0.773		
	Gre_Abs5	0.725		
Regulation (R)	R1	0.800	0.899	0.748
	R2	0.898		
	R3	0.892		

Note: CR: Composite reliability, AVE: Average Variance Extracted.

recommended value of 0.7, providing evidence that the internal consistency of research constructs was confirmed (Hair et al., 2017). All values of AVE are above the minimum threshold value of 0.5 recommended by Henseler et al. (2016), thereby indicating that convergent validity is high. With regards to discriminant validity, Fornell and Larcker's (1981) method was utilized as a conservative approach which is based on comparing the value of the square root of AVE with the correlation coefficients of constructs. The discriminant validity for constructs was

Table 3. Discriminant validity (Fornell–Larcker Criterion)

	CP	EPD	EI	GAC	R	SEO
(1) CP	0.918					
(1) EPD	0.575	0.823				
(1) EI	0.588	0.546	0.763			
(1) GAC	0.538	0.552	0.673	0.786		
(1) R	0.402	0.423	0.451	0.43	0.865	
(1) SEO	0.581	0.480	0.709	0.585	0.571	0.801

Abbreviations: CP → Competitive pressure, EPD →Eco-friendly product demand, EI → Eco-innovation, GAC→ Green absorptive capacity, R→ Regulation, strategically environmental orientation. Note: The values on the diagonal line (in bold) indicate the square root of the AVE of research constructs

Table 4. Results of lateral collinearity

	EI-VIF	GAC-VIF	SEO-VIF
R	1.558	1.277	1.277
EPD	1.76	1.598	1.598
CP	1.875	1.564	1.564
GAC	1.838		
SEO	2.111		

confirmed because the values for the square root of the AVE exceed the correlation coefficients for each construct (see, Table 3).

4.2. Assessing the structural model: direct effects

Prior to assessing the structural model in terms of the significance of paths and coefficients of determination (R^2), the multi-collinearity issue was tested using the variance inflation factor (VIF) for predictor constructs. Table 4 illustrates that all of the values of VIF are below the threshold value of 5, indicating no major multi-collinearity issue (Hair, Hult, et al., 2014). Table 5 presents the results of testing the direct hypothesized relationships between the research constructs using the significance of paths (also see Appendix C). The results show that eco-innovation was not significantly driven by institutional pressures including regulation (R) ($\beta = -0.013$, $t = 0.130$, $p > 0.05$), eco-friendly product demand (EPD) ($\beta = 0.112$, $t = 1.353$, $p > 0.05$), and competitive pressure (CP) ($\beta = 0.125$, $t = 1.080$, $p > 0.05$). Therefore, H1, H2 and H3 were not supported. However, both green absorptive capacity (GAC) and strategically environmental orientation (SEO) significantly influenced eco-innovation (EI) ($\beta = 0.312$, $t = 3.630$, $p < 0.005$ and $\beta = 0.407$, $t = 4.877$, $p < 0.005$ respectively), thus supporting H4 and H5. Regulation (R), eco-friendly product demand (EPD) and competitive pressure (CP) positively influenced green absorptive capacity (GAC) ($\beta = 0.184$, $t = 1.985$, $p < 0.05$, $\beta = 0.309$, $t = 2.755$, $p < 0.005$, and $\beta = 0.286$, $t = 2.341$, $p < 0.05$ respectively), thus confirming H6, H7 and H8. Both regulation (R) and competitive pressure (CP) had a significant impact on strategically environmental orientation (SEO) ($\beta = 0.377$, $t = 5.016$, $p < 0.005$ and $\beta = 0.366$, $t = 3.746$, $p < 0.005$ respectively), where eco-friendly product demand (EPD) has no significant impact on strategically environmental orientation (SEO) ($\beta = 0.110$, $t = 1.099$, $p > 0.05$). Therefore, H12, and H14 were supported but H13 was not supported.

Table 5. Results of structural model analysis (direct effects)

F	Std. Beta	Std. Error	T Value	P Values	Decision
H1: R -> EI	−0.013	0.097	0.130	0.448	Not supported
H2: EPD -> EI	0.112	0.083	1.353	0.088	Not supported
H3: CP -> EI	0.125	0.115	1.080	0.140	Not supported
H4: GAC -> EI	0.312	0.086	3.630	0.000	Supported
H5: SEO -> EI	0.407	0.084	4.877	0.000	supported
H6: R -> GAC	0.184	0.093	1.985	0.024	Supported
H7: EPD -> GAC	0.309	0.112	2.755	0.003	Supported
H8: CP -> GAC	0.286	0.122	2.341	0.010	Supported
H12: R -> SEO	0.377	0.075	5.016	0.000	Supported
H13: EPD -> SEO	0.110	0.100	1.099	0.136	Not supported
H14: CP -> SEO	0.366	0.098	3.746	0.000	Supported

Table 6. Coefficient of determination (R2) and effect size (f2)

Construct		f^2	R^2	Q^2
GAC	R	0.044	0.404	0.235
	EPD	0.100		
	CP	0.088		
SEO	R	0.214	0.481	0.301
	EPD	0.015		
	CP	0.165		
EI	R	0.000	0.627	0.348
	EPD	0.019		
	CP	0.022		
	GAC	0.142		
	SEO	0.211		

Table 6 shows the coefficient of the determination of exogenous variables (R^2). EI presented a significant result of R^2 = 0.627, indicating that almost 63% of the variance in eco-innovation can be explained by both external pressures and internal drivers. Furthermore, the results also revealed that the determining coefficient of GAC was 0.404 which indicates that all external pressures, R, EPD and CP contributes to almost 40% of the variance in green absorptive capacity. The R^2 value for SEO was 0.481, suggesting that about 48% of variance in strategically environmental orientation can be explained by external pressures, R, EPD and CP. Using the cut-off value recommended by Cohen (1988), these findings indicate that the coefficients of determination were suitable for validating the model. The effect size (f^2) reflected the change in the R2 value if a certain predictor construct was excluded from the model (Hair, Sarstedt, et al., 2014). Based on the work of Cohen (1988), the effect size was classified into three levels: substantial, medium and small based on the values of 0.35, 0.15 and 0.02, respectively. The results in Table 6 indicate that SEO had a medium effect (f^2 = 0.211) on EI, while GAC had a small effect (f^2 = 0.142) on EI. This finding ascertained that SEO was more important for adopting eco-innovation than GAC. For GAC, all external pressure of eco-innovation, R, EPD and CP had a small effect on GAC (f^2 = 0.044, 0.100 and 0.088, respectively). Additionally, both R and CP had a medium effect (f^2 = 0.214 and 0.165, respectively) on SEO.

Table 7. Results of the mediation analysis

	Indirect effect (β)	Std. error	T value	P Values	95% Confidence interval		Decision
					Lower	Upper	
H9: R -> GAC -> EI	0.057	0.036	1.602	0.055	−0.002	0.116	Not significant
H10: EPD -> GAC -> EI	0.097	0.051	1.889	0.030	0.012	0.181	Significant
H11: CP -> GAC -> EI	0.089	0.041	2.156	0.016	0.021	0.157	Significant
H15: R -> SEO -> EI	0.153	0.052	2.979	0.001	0.069	0.238	Significant
H16: EPD -> SEO -> EI	0.045	0.047	0.950	0.171	−0.033	0.123	Not significant
H17: CP -> SEO -> EI	0.149	0.042	3.540	0.000	0.080	0.218	Significant

Finally, the blindfolding procedure in the Smart-PLS software was used to test the predictive relevance of the model. Assessing predictive relevance was based on the statistic (Q^2) for reflective endogenous variables which should be greater than zero. From Table 6, all the statistic values (Q^2) were observed to be above zero. Thus, the model in the current study had acceptable predictive relevance.

4.3. Assessing the structural model: indirect effects

This study adopted the 95% confidence interval to assess mediating effects. Of six hypothesized mediating effects, only four mediating effects were significant. First, the results showed that the relationship between eco-friendly product demand (EPD) and eco-innovation (EI) was fully mediated by green absorptive capacity (GAC); indirect effect = 0.097, t = 1.889, $p < 0.05$, 95% confidence interval ranging from 0.012 to 0.181. Second, competitive pressure (CP) had an indirect effect on eco-innovation by mediating green absorptive capacity (GAC), indirect effect = 0.089, t = 2.156, $p < 0.05$, 95% confidence interval ranging from 0.021 to 0.157. Third, strategically environmental orientation (SEO) was found to fully mediate the relationship between regulation (R) and eco-innovation (EI); indirect effect (β) = 0.153, t = 2.979, $p < 0.05$, 95% confidence interval ranging from 0.069 to 0.238. Fourth, the relationship between competitive pressure (CP) and eco-innovation (EI) was also found to fully be mediated by strategically environmental orientation (SEO); indirect effect (β) = 0.149, t = 3.540, $p < 0.005$, at 95% confidence interval between 0.080 and 0.218. Table 7 shows that hypotheses H10, H11, H15 and H17 were supported, whereas both H9 and H16 were not supported.

5. Discussion

Based on the empirical literature, four main relationships have been hypothesized in this study. First, this study has suggested that external pressures including regulatory pressure, eco-friendly demand pressure and competitive pressure can motivate manufacturing SMEs to adopt eco-innovation practices. Second, green absorptive capacity and strategically environmental orientation can also be internal enablers for adopting eco-innovation practices. Third, this study has explored how external pressures affect both green absorptive capacity and strategically environmental orientation. Fourth, this study has investigated the mediating effect of internal drivers of eco-innovation on the relationship between external pressures and eco-innovation adoption among manufacturing SMEs.

This study illustrates that all of the suggested external pressures have significantly no direct effect on eco-innovation adoption. This result is not consistent with some prior studies. For example, Wu-gan Wu-gan Cai and Zhou (2014) and Wugan Wugan Cai and Li (2018) concluded that regulatory pressure, customer demand and competitor pressure act as strong external drivers of eco-innovation adoption. In the same vein, Hojnik and Ruzzier (2016b) accentuate that these pressures play a significant role in implementing particular eco-innovation practices such as eco-process innovation. In contrast, the results of the current study are in accordance with the findings of other prior studies by Eiadat et al. (2008) and Mady et al. (2022) which found that environmental innovation is not influenced by external forces such as regulatory pressure and customer pressure. X. Chen et al. (2018) and X. X. Huang et al. (2016) suggest that these inconsistent results among previous studies may be due to the lack of an internal mechanism explaining the relationship between external pressure and eco-innovation which is considered a research gap that the current study has tried to fill.

In terms of the effects of internal drivers, the findings of the study also reveal that green absorptive capacity displays a high correlation with eco-innovation adoption. This supports the findings of Aboelmaged and Hashem (2019) who indicate that absorptive capacity as one of the required capabilities for SMEs and actively plays an influential role in promoting green innovation. Similarly, Albort-Morant, Leal-Rodríguez, et al. (2018) emphasise that absorptive capacity is deemed a strategic tool enabling firms to foster eco-innovation by generating and exploiting new and existing environmental knowledge. In addition, this study provides evidence that environmental orientation has a significant effect on the adoption of eco-innovation. As indicated by Aboelmaged (2018b), adopting eco-innovation practices increasingly depends on the extent to which firms incorporate environmental orientation as a strategic direction into their policies and strategies. The explanation for this result can be that implementing eco-innovation practices reflects a firm's responsibility towards the environment and the desire of managers to avoid environmental problems (Eiadat et al., 2008).

Likewise, the results demonstrate that environmental regulation, eco-friendly product demand and competitive pressure have important impacts on green absorptive capacity. This indicates that these factors can be seen as "activation triggers," encouraging firms to develop their green absorptive capacity (Shubham et al., 2018). Faced with environmental pressure exerted by regulators, customers and competitors, firms are more likely to assimilate external environmental knowledge and, in turn, to reinforce their green absorptive capacity (Liao, 2018; Zhang et al., 2020). In addition, only environmental regulation and competitive pressure were found to have strategically influenced environmental orientation, whereas eco-friendly product demand did not exhibit a significant impact on strategic environmental orientation. This indicates that the transition in a firm's environmental orientation from "passive" to "active" is highly reliant on strict environmental regulation and a fiercely competitive environment, as corroborated by Zhou et al. (2021).

Of the six mediating paths hypothesized, four hypotheses were supported. The current study provides evidence that green absorptive capacity mediates the relationship between external environmental pressures (only exerted by customers and competitors) and adopting eco-innovation, thereby concurring with previous studies (e.g., Qi et al., 2021; Shubham et al., 2018), demonstrating that absorptive capacity as a dynamic capability is crucial for adopting eco-innovation strategies in response to external pressures. However, Liao (2018) and Zhang et al. (2020) conclude that knowledge acquisition as an element of absorptive capacity is a significant mediator between regulatory pressure and eco-innovation. Moreover, consistent with the findings of Zhou et al. (2021), the results showed that strategically environmental orientation is also a significant mediator that affects the relationship between institutional pressure (only regulatory pressure and competitive pressure) and eco-innovation. This means that firms are more likely to be able to translate environmental requirements imposed from regulatory and competitive pressure into eco-innovation practices when they have a highly environmental orientation.

6. Conclusion and implications

This study set out to understand how both the institutional pressures, namely, regulation, eco-friendly product demand, and competitive pressure and internal characteristics, namely, green absorptive capacity and strategically environmental orientation can be interacted to drive SMEs to adopt eco-innovation practices. Of 190 collected questionnaires, 176 valid questionnaires were analysed using Smart-PLS to test the hypothesised research model. The results of this study support the idea that manufacturing SMEs that have high green absorptive capacity can highly respond to the pressures exerted by consumers and competitors by adopting eco-innovation practices. In addition, both regulatory pressure and competitive pressure can mostly pay off in fostering eco-innovation among SMEs only when managers of these enterprises are highly environmentally aware.

6.1. Theoretical implications

The theoretical implications of this research are threefold. First, it has simultaneously investigated the external and internal drivers of eco-innovation. Prior research has focused on institutional pressure as the main driver of eco-innovation with less emphasis being placed on internal drivers which resulted in contradictory conclusions. According to X. Chen et al. (2018), more research needs to consider internal drivers when examining the effect external drivers on eco-innovation adoption. Therefore, the current study has sought to fill this gap and considers the internal drivers as a consequence of the external drivers. Second, the research model includes the mediating role of green absorptive capacity and environmental orientation. While the direct effect of institutional pressure on eco-innovation is examined, the indirect effect is explored as well. Third, the current research provides new empirical evidence in a new context which adds to the existing body of literature. We focus on Egyptian SMEs which operate in a very competitive environment in which SMEs account for more than 80% of Egyptian GDP.

6.2. Managerial implications

The results of the research provide some practical recommendations and policy implications. Firstly, encouraging firms to adopt eco-innovation practices is a joint responsibility for governments, customers and firms themselves. Regulations imposed by policymakers have had a significant positive indirect impact on firms' eco-innovation practices. That is why regulators are advised to implement such legislation that encourages firms to do so. Furthermore, customers' environmental awareness that conceptualizes demanding eco-friendly products significantly drives eco-innovation practices. Therefore, adopting eco-innovation practices becomes one of the competitive weapons that firms can use to differentiate themselves. Hence, policymakers, customers and managers are advised to utilize green practices. Secondly, the focus of managers should be on developing green absorptive capacity. According to the research findings in the current study, green absorptive capacity plays a mediating role in the relationship between institutional pressure and eco-innovation practices. Developing green absorptive capacity helps SMEs to identify, assimilate, integrate and exploit both internal and external environmental knowledge that results in eco-innovation practices. Third, managers are advised not only to foster environmental orientation but also to disseminate environmental culture between all of the organizational members. Adopting environmental orientation becomes compulsory for firms to survive in a very competitive environment, particularly when faced with external pressure from the firms' stakeholders.

7. Limitations and future research

There are a number of known limitations associated with the current research which open up new avenues for further research. The current research considered only two internal drivers of eco-innovation : green absorptive capacity and strategic environmental orientation. Future research, however, could investigate the intermediary role of other internal drivers such as organisational capabilities, organizational structure, resource availability, process flexibility, and risk perceptions (Pacheco et al., 2017). The current research considered only three external drivers of eco-innovation. Future studies need to examine more external drivers of eco-innovation such as interorganisational cooperation (Pereira et al., 2020). Furthermore, future research could replicate the current study in other geographical domains with different contexts. Additionally, this study has used cross-sectional data to test presited hypotheses but further examination could develop a longitudinal study to measure developments in eco-innovation practices over time.

Funding
The authors received no direct funding for this research.

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Disclosure statement
No potential conflict of interest was reported by the author(s).

Citation information
Cite this article as: Institutional pressure and eco-innovation: The mediating role of green absorptive capacity and strategically environmental orientation among manufacturing SMEs in Egypt, Khalid Mady, Muhammad Abi Sofian Abdul Halim, Khatijah Omar, Reda Shaker Abdelkareem & Mohamed Battour, *Cogent Business & Management* (2022), 9: 2064259.

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Appendix A: Outputs of multivariate normality test using WebPower software

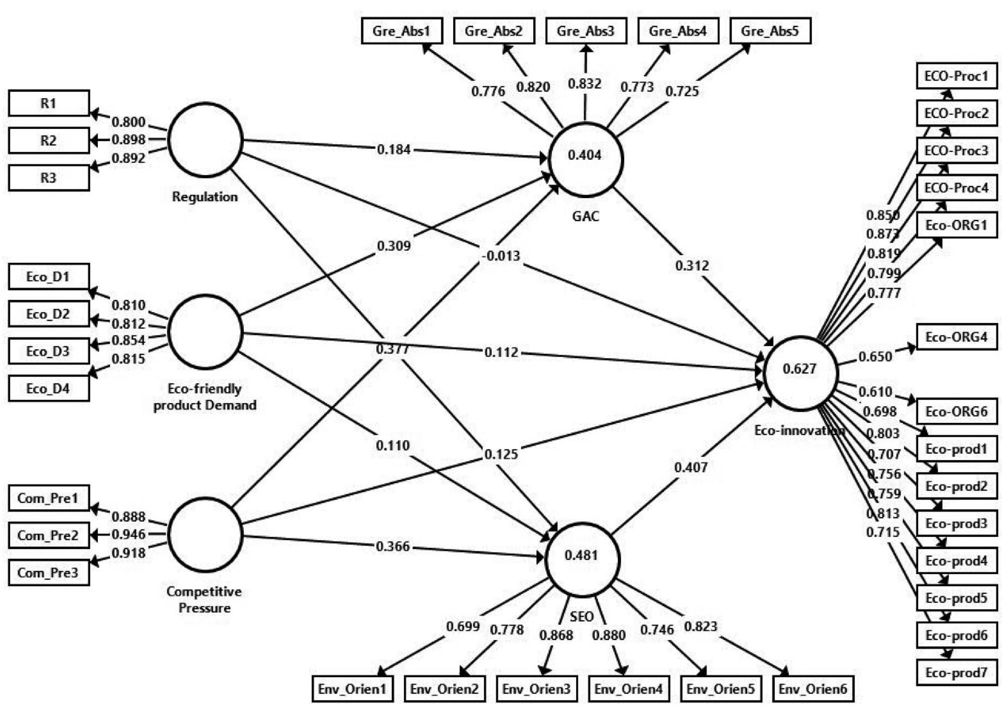
Output of skewness and kurtosis calculation

```
Sample size:  176
Number of variables:  6

Univariate skewness and kurtosis
              Skewness   SE_skew    Kurtosis   SE_kurt
AC         -0.75121656 0.1830894  0.86330180 0.3641971
SO         -0.78181622 0.1830894  0.03766462 0.3641971
EPD        -0.07398475 0.1830894 -0.61257775 0.3641971
Regulation  0.03976378 0.1830894 -0.37816715 0.3641971
CP         -0.30695200 0.1830894 -0.48332810 0.3641971
EI         -1.07840752 0.1830894  1.88645843 0.3641971

Mardia's multivariate skewness and kurtosis
                 b          z      p-value
Skewness  8.568502 251.342729 0.000000e+00
Kurtosis 53.846799   3.958301 7.548467e-05
```

Appendix B: Measurement model assessment



Appendix C: Structural model assessment