

Explicating the microfoundation of SME pro-environmental operations: The role of top-managers

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Abstract

Purpose – By recognizing the decisive role of top-managers (TMs) of small and medium-sized enterprises (SMEs), this study attempts to explicate the microfoundation of pro-environmental operations of SMEs by examining the influence of institutional pressure on managerial cognition and subsequent SME pro-environmental operations. This study highlights the personal ethics of TMs, so as to examine the moderating effect of TMs' place attachment on SMEs' pro-environmental operations.

Design/methodology/approach – Empirical data is collected from a questionnaire survey of 509 SMEs in China. Hierarchical regression results are subject to cross-validation using secondary public data.

Findings – This study demonstrates that coercive and mimetic pressures have inverted U-shaped effects, whilst normative pressure has a U-shaped effect on the threat cognition of TMs. The results also show that TMs' threat cognition (as opposed to opportunity cognition) positively influence SMEs' pro-environmental operations. Moreover, both the emotional (place identity) and functional (place dependence) dimensions of place attachment have positive moderating effects on the relationship between threat cognition and SMEs' pro-environmental operations.

Practical implications – Findings of this study lead to important implications for

practitioners such as regulators, policy makers and trade associations. Enabling better understanding of the nature of SMEs' pro-environmental operations, they allow for more targeted development and the provision of optimal institutional tools to promote such operations.

Originality/value – This study allows some important factors that differentiate SMEs from large firms to surface. These factors (i.e., institutional pressures, managerial cognition and place attachment) and the interactions between them form important constituents of the microfoundations of SMEs' pro-environmental operations.

Keywords: Institutional pressure; managerial cognition; place attachment; SME; pro-environmental operations

Paper type: Research paper

1. Introduction

Corporate engagement with environmental operations has gained great attention over the past couple of decades. Whilst rich research findings about larger firms have been generated, the understanding of small and medium-sized enterprises (SMEs) is still emerging in operations management (OM) literature (e.g., Wong *et al.*, 2020; Yang *et al.*, 2020). One of the reasons for the underdeveloped research about SMEs is the lack of understanding of behavioural characteristics of SMEs. Most of the previous studies tend to borrow theoretical lenses originating from studies of large firms to examine SMEs, despite the growing call for research recognizing the distinctive characteristics of SMEs (e.g., Handrito *et al.*, 2021; Wong *et al.*, 2020).

One of the main differences between SMEs and large firms is that individual top managers (TMs) of SMEs play decisive roles in both daily operations and strategic orientations (Lubatkin *et al.*, 2006). For this reason, TMs' behavioural characteristics have the potential to affect SMEs' engagement with environmental operations significantly. Only recently have researchers started to pay closer attention to the role of managerial cognition as a micro factor driving corporate environmental operations (e.g., Li *et al.*, 2019; Shou *et al.*, 2020; Todaro *et al.*, 2019). Thus, further empirical research is needed to unpeel the microfoundations (Barney & Felin, 2013) of cognitive variations of the TMs and SMEs' pro-environmental operations. Given that the decision making of firms is more likely to be influenced by external pressures, including those from regulations, competitors and sector norms, previous research has attempted to explain a firm's pro-environmental engagement from an institutional perspective (e.g., Campbell, 2007; Phan & Baird, 2015). However, there is a paucity of research attempting to explicate the microfoundations of SMEs' pro-environmental operations by linking the institutional theory and the managerial cognition perspective.

Thus, this paper attempts to fill this gap.

Environmental and social psychology scholars point out that it is very difficult to interpret and understand one's environmental behavior if the specific place setting is ignored (Stedman, 2002). A place may carry one's life experience, social relations and emotion, so it is the center of meaning for many. A large number of studies show that there is a significant relationship between place attachment and environmental protection behaviour (e.g., Halpenny, 2010; Ramkissoon, *et al.*, 2013). Unlike large firms, SMEs are more likely to be locally based (La Rocca *et al.*, 2010). Arguably, TMs' attachment to local areas may affect their personal ethics and their intentions to engage with environmental operations, and hence the microfoundations of SMEs' environmental decisions. Therefore, inspired by the place attachment perspective (Stedman, 2002), we incorporate the TMs' place attachment—which is an emotional and functional connection between people and place (Williams and Vaske, 2003)—as an important moderator of SME's pro-environmental operations.

This study aims to address the research question of how institutional pressures influence TMs' managerial cognition and the subsequent SME pro-environmental operations. By answering this question, this study attempts to explicate the microfoundations of SMEs' pro-environmental operations.

In the following sections, we review the role of TMs in SMEs' environmental engagement. We then discuss potential links between institutional pressures, managerial cognition and place attachment of TMs. This will lead to the development of research hypotheses, which will be followed by the discussion of research methods and results. Finally, this paper will generate implications for practice and future research.

2. Literature review

2.1 TMs and microfoundations of SME pro-environmental operations

Microfoundations constitute the important micro-macro links of firms' activities (Barney and Felin, 2013). Extant literature highlights the role of individuals, their social aggregations and interactions within the organizational structural environment, as the important basis of microfoundations of strategic decisions. Hence, previous studies examined the influences of top-level operation leadership (Bendoly *et al.*, 2021), CEO characteristics (e.g., education, gender, and tenure) (Lewis, Walls, & Dowell, 2014), the value, attitude and perception of top managers (Papagiannakis and Lioukas, 2012), and the level of independence and diversity of the board of directors (Cucari, De Falco, & Orlando, 2018) as factors of microfoundations influencing corporate pro-environmental operations.

In the same vein, SMEs' pro-environmental operations can be formed on the basis of micro level factors that accumulate and drive the firm level environmental engagement. However, unlike large firms, in which decision making usually lies in the board of executives, ownership and control are usually mingled in SMEs, so that TMs normally have the full control to decide how to use company resources in areas,

such as R&D, operations, and marketing, as well as environmental practices. Thus, TMs will form one of the most important micro elements of SMEs, and SMEs' environmental responsible operations are more likely to link with behavioural characteristics of TMs (Jenkins, 2006).

The characteristics of TMs can be shaped by external forces, such as regulatory structures, competitors and stakeholders (Hillary, 2000; Williamson *et al.*, 2006), and personal factors, such as personal values of TMs (Papagiannakis and Lioukas, 2012; Potocan *et al.*, 2016) and sense of responsibility (Battisti and Perry, 2011). However, previous research tends to treat those external forces and micro level factors in isolation. What is currently limited in the OM literature is the attempt to build the linkage between those factors, so as to understand microfoundations of SMEs' pro-environmental operations. Therefore, in this paper, we intend to link between external factors and micro factors to explicate microfoundations of SMEs' pro-environmental operations.

2.2 Institutional pressures

SMEs, usually with limited resources, are more exposed to pressures from sources beyond the market competition, such as regulators and various stakeholders. According to the institutional theory, firms typically operate within a social framework of norms, values, and assumptions about what constitutes appropriate activities (Scott, 1995). Firms, thus, are more likely to make decisions not only according to technical or economic criteria, but also on the basis of what is acceptable and legitimate within a particular environment or "organization field". Such "organization field" typically moves toward common structures and processes due to coercive, imitative, and normative expectations (DiMaggio and Powell, 1983). DiMaggio and Powell (1983) hence put forward three kinds of institutional pressures: *coercive pressure*—stems from the pressures exerted on organizations by other organizations which they are dependent upon, or by cultural expectations in the society in which organizations function; *mimetic pressure*—comes from imitation which occurs when one or more organizations' adoption of some practice increases the likelihood of that practice being adopted by other organizations; *normative pressure*—stems from professionalization, which is a "collective struggle of members of an occupation to define the conditions and methods of their work, to control the production of producers".

Institutional theory is widely used to explain corporate environmental behaviours (e.g., Berrone *et al.*, 2013; Wu *et al.*, 2012; Zhu *et al.*, 2013). Evidences were gained on the relationship between institutional pressures and corporate environmental behaviours, such as environmental innovation (Berrone *et al.*, 2013), green supply chain management (Wu *et al.*, 2012), and environmental management system (Zhu *et al.*, 2013).

However, two limitations in the application of institutional theory have been highlighted. Firstly, previous research lacks the understanding of the personal role of

the top management, which has the potential to explain the varied corporate environmental behaviour under similar institutional conditions. Hence researchers are calling for investigation of the role of top management in firm decision-making (Li *et al.* 2019; Zhang *et al.*, 2020). Secondly, more sufficient discussion of SMEs through the lens of institutional theory is still needed (Sánchez-Medina *et al.*, 2015; Yang *et al.* 2019). Therefore, given that TMs play critical roles in SMEs' decision making, without unpeeling the mechanism through which institutional pressures influence TMs' behaviours will limit the understanding of SMEs' engagement with pro-environmental operations. In this paper we argue that TMs' cognitive responses to institutional pressures will form important microfoundations of SME pro-environmental operations.

2.3 Managerial cognition

Managerial cognition is highlighted as a factor that will determine managers' strategic decisions (e.g., Menon, 2018). Managerial cognition is normally the result of making sense of, learning from, and addressing the unique cognitive challenges embedded in firms' operating environments (Nadkarni and Barr, 2008). In this vein, managerial cognition is a bridging factor between the business environment and managers' strategic responses to environment changes (e.g., Bundy *et al.*, 2013; Nadkarni and Barr, 2008).

The extant literature suggests that it is rather recently, managerial cognition is examined in the context of corporate environmental practices (e.g., Hahn *et al.*, 2014; Todaro *et al.*, 2019). The exploration of SMEs' pro-environmental operations from the managerial cognition perspective is still limited, which deserves immediate attention from researchers.

Two relevant cognitive categories are suggested by Sharma (2000) in the analysis of corporate environmental strategy: threat interpretation and opportunity interpretation. Depends on aspects of factors—negative/positive emotional associations, loss/gain considerations, and locus of control of strategic issues—managerial cognition can be interpreted as a spectrum between threat and opportunity. It is argued that opportunity interpretation can relate to proactive voluntary pro-environmental strategies; conversely, threat interpretation can predict reactive conformance environmental strategies (Sharma, 2000). In the same vein, we attempt to establish the link between external institutional pressures and managerial cognition of TMs.

2.4 Place attachment

Another important micro factor which potentially influence behavioural characteristics of TMs is *place attachment*, which is overlooked by the OM literature. Place attachment is a core concept in the literature of people-place relationship. It refers to emotional and functional connections formed between a person and a place (Hidalgo and Hernandez, 2001). There are two dimensions in this concept: *place*

identity (emotional attachment)—reflects the symbolic importance of a place as a repository for emotions and relationships that give meaning and purpose to life (Williams and Vaske, 2003); and *place dependence* (functional attachment)—represents the importance of a place in providing features and conditions which provide supports to people's goals or desired things (Williams and Vaske, 2003).

Albeit limited in the OM research, the concept of place attachment is used to explain entrepreneurial location of SMEs (e.g., Sorenson, 2018), and is also increasingly discussed in the environmental psychology and tourism management literature to examine its impact on individuals' pro-environment behaviours (e.g., Halpenny, 2010; Yu *et al.*, 2019; Zhang *et al.*, 2014). The general consensus is that place attachment has potential influences on the cognitive status of individuals towards pro-environmental behaviours.

Therefore, it is reasonable to argue that due to the important personal role of TMs, their personal attachment to local areas can be an important factor to determine their willingness to engage with pro-environmental operations in their SMEs. Nevertheless, limited previous research has attempted to examine the influence of place attachment of TMs on their managerial cognition and the subsequent SME pro-environmental operations. Therefore, this paper attempts to address this gap.

3. Research hypothesis

3.1 Institutional pressures and TM managerial cognition

Causal reasoning is the primary logical basis for strategic decision making. Typically, top managers look for identifying environmental demands and then develop strategies in response to them (Nadkarni and Barr, 2008). Bundy *et al.* (2013) emphasize the important influence of environmental contexts on managerial cognition and call for more contextual factors to understand the formation of managerial cognition. In this vein, we argue that institutional pressures (coercive, mimetic and normative) will act as important contexts of TMs' managerial cognition as per pro-environmental decision-making.

Coercive pressure, which often stem from sources like environmental regulations, impose administrative sanctions by means of penalties (Almer and Goeschl, 2010). Environmental penalties can be a painful experience which would cause negative emotional association by TMs. Moreover, most of the environmental regulations sets the bottom line of non-compliance without offering direct rewarding for pro-environmental activities (Long *et al.*, 2015). This may result in loss cognitions in relation to environmental operations especially for SMEs which normally lack resources. Furthermore, the common "free rider" problem perceived by companies may make TMs to believe that improving environment is uncontrollable by a single firm (Blanco *et al.*, 2009). This is especially the case when environmental benefits are mainly perceived as public interests. In this sense, a positive relationship between coercive pressure and TMs' threat cognition will be expected. Therefore,

H1a: There is a positive relationship between coercive pressure and the threat

cognition (as opposed to opportunity cognition) of TMs on SME pro-environmental operations.

Previous research found that smaller firms are more likely to become imitators, where competitive pressure is excessive, product is homogeneous, and chances of knowledge spill-over is high (Slivko and Theilen, 2014). Imitations can help SMEs to reduce risks and to improve effectiveness of adopting new practices. However, imitation can be a double-edged sword, because SMEs copy from others can also be copied by others. Limited resources of SMEs also mean they need to work harder to balance between environmental investments and the risk of being imitated. Therefore, higher mimetic pressure in relation to pro-environmental operations can result in threat cognition of TMs. Therefore,

H1b: There is a positive relationship between the mimetic pressure and the threat cognition (as oppose to opportunity cognition) of TMs on SME pro-environmental operations.

Normative pressure, which stems from industrial self-regulation (e.g., trade associations, industry societies, and management standards), often has more limited effects on SMEs than on large firms (Long *et al.*, 2015). This is because when normative pressure is low, SMEs usually have fewer incentives to invest in environmental operations, given their limited resources. Doing what others are doing is an extra burden, hence there are likely to be higher threat cognition. Take certified management standards (e.g., ISO14001), for example, when only a few firms are adopting it in the market, the cost burden perception will exceed the opportunity perception (King *et al.*, 2005). On the other hand, when environmental operations become the industry norm, TMs will perceive lower levels of threat, because such operations will become a necessity. Therefore,

H1c: There is a negative relationship between normative pressure and the threat cognition (as opposed to opportunity cognition) of TMs on SMEs' pro-environmental operations.

3.2 Managerial cognition and SME pro-environmental operations

Extant literature generally supports the view that managerial cognition of environmental behaviours varies. According to Sharma (2000) opportunity cognition is more likely to link with voluntary environmental strategies of firms, while threat cognition is more likely to link with conformance environmental strategies. Similarly, Battisti and Perry (2011) advocate that small business owners vary between those viewing environmental operations as a burden (only as required by regulations), as an opportunity to gain competitive advantage, as a priority over financial performance, or as a duty alongside other responsibilities.

The potential influence of TMs' managerial cognition on SME operations can be explained as follows. Firstly, compared with large firms, SMEs are generally more vulnerable to external pressures. The lack of market power or lobbying opportunities means compliance will be the most convenient strategy to follow. Unlike large firms,

which have resources to generate green investments and even pre-emptive environmental strategies to turn environmental requirements into opportunities (Ramanathan *et al.*, 2017; Wong *et al.*, 2020), TMs are more likely to show reactive (as opposed to proactive) compliances with environmental expectations when threat cognition is high.

Secondly, from the perspective of loss-gain consideration, when threat interpretation dominates, the focus of TMs' attention is on how to reduce potential 'losses' (Haney, 2017). If the lack of legitimacy due to non-compliance with environmental expectations would put direct threat to the survival of SMEs, TMs would pay more attention to legitimacy issues. Therefore, with higher levels of threat cognition, TMs would display more compliance intentions to avoid legitimacy losses.

Thirdly, from the negative/positive emotional associations perspective, as threat cognition increases, TMs tend to be more sensitive to negative information (Mittal and Ross, 1998). In this sense, the higher the degree of threat cognition, the more likely TMs would elaborate more on loss rather than gain from non-compliance with environmental expectations. Therefore,

H2: The threat cognition (as opposed to opportunity cognition) of TMs is negatively related to SME pro-environmental operations.

3.3 Moderating effect of place attachment

Previous researchers contend that it is difficult to understand one's environmental behaviour if the specific environmental setting is ignored (Stedman, 2002). Therefore, it is important that TMs' managerial cognition should be interpreted in the context of places where SMEs operate. In this paper, we argue that there is a moderating role of two dimensions of TMs' place attachment (i.e., *place identity* and *place dependence*).

Place identity, as a kind of self-identity, may function as anxiety and defence mechanisms which predict one's response tendency to protect oneself against the threat in physical settings (Proshansky *et al.*, 1983). Previous studies of environmental psychology generally support the positive relationship between place identity and pro-environmental attitude (e.g., Ateş, 2020; Hernandez *et al.*, 2010). In this vein, TMs with higher place identity will behave more environmentally locally. This is because, with higher levels of place identity, TMs are more likely to obtain knowledge about the local environment (Spence *et al.*, 2018), be more sensitive to place changes (Peng *et al.*, 2020), and show more empathy with the local environment (Brown *et al.*, 2019). These characteristics of personal ethics help TMs to form an eco-friendly attitude to local areas.

Although threat cognition makes TMs focus more on the "loss" perception of non-compliance with environmental expectations, the possession of place identity will reduce such loss perception. As such, TMs with threat cognition who exhibit higher-levels of place identity will be more likely to make proactive environmental decisions. Therefore,

H3a: The place identity of TMs negatively moderates the (negative) relationship between the threat cognition (as opposed to opportunity cognition) of TMs and SME pro-environmental operations.

Williams and Vaske (2003) contend that place dependence represents the degree one depends on a place which supports ones' specific goals. For TMs, place dependence often represents individuals' economic dependence (Cross *et al.*, 2011) or path dependence (Cheung and Kwong, 2017). Cheung and Kwong (2017) suggest that entrepreneurial individuals search for opportunities to obtain resources which are often place-dependent, hence the acquisition of resources depend on considerable local knowledge and local social networks. SMEs tend to rely on such local social networks (e.g., with local government, financial services, suppliers, and clients) for resources and hence give priority to those local entities during decision-making (Bundy *et al.*, 2013). Thus, the higher the degree of place dependence of TMs, the more likely TMs may magnify their threat cognition and develop the sense of urgency to conformance environmental strategy. Therefore,

H3b: The place dependence of TMs positively moderates the (negative) relationship between the threat cognition (as opposed to opportunity cognition) of TMs and SME pro-environmental operations.

These research hypotheses are presented in the theoretical framework in Figure 1.

[[Figure 1 near here]]

4. Methodology

4.1 Data collection

To test the research hypotheses, this study takes a random sample of 2,000 SMEs from China. A compiled mailing list of TMs was obtained from four official sources: Shanghai Pudong New District Industry and Commerce Federation, Shanghai Chamber of Commerce, Sichuan Chamber of Commerce, and Xinjiang Chamber of Commerce.

The questionnaire was developed following the tailored design method to ensure a better response rate (Dillman *et al.*, 2014). In addition to basic demographical questions, the questionnaire covered the following areas: 1) respondents' perceptions of place attachment to where their companies are registered; 2) perceived institutional pressures; 3) managerial cognition; and 4) SME pro-environmental operations.

An online survey questionnaire was developed and e-mailed to TMs of sample SMEs. After three rounds of survey, 509 completed questionnaires were received which gives a response rate of 25.5%. 72.1% of the respondents are owner-managers, and 27.9% are top-managers. Table I shows the regions and sectors of the responding firms, which are consistent with the regional economic development conditions of Chinese provinces and also the general sectoral distribution of SMEs in China.

[[Table I near here]]

4.2 Measurement

All survey items (see Appendix 1) were adopted from previous studies and adjusted to fit the research context. Specifically, three items of coercive pressure, three items of mimetic pressure, and three items of normative pressure were adopted from Colwell and Joshi (2013). Two items of managerial cognition were adopted from Sharma (2000)¹. Seven items of place attachment of TMs were adopted from Williams and Vaske (2003). Six items for SME pro-environmental operations were developed based on the summative measures of Russo and Fouts (1997).

Two sets of control variables—demographics (age, education, management experience, and industrial experience) and SME characteristics (firm age, employee number, ownership, annual-income, and stage of development)—were included. 7-point Likert-type scales were used in items of main constructs, with 1 equals completely disagree and 7 equals completely agree. In particular, as in Sharma (2000), large values in managerial cognition items represent threat cognition and small values represent opportunity cognition. Prior to questionnaire administration in China, a translation-back-translation process was undertaken to ensure consistency in meanings. 10 bilingual field experts from the UK and China were asked to examine the face validity of the items. A pilot test was conducted in 50 Chinese SMEs. Any ambiguous or inconsistent items were removed or adjusted in wordings.

4.3 Data quality, validity and reliability

In order to check the non-response bias, a multivariate t-test was conducted to compare early and late responses (Lehman *et al.*, 2013). The non-significant result suggests that non-response bias was not an issue. Moreover, given that the survey data was collected based on key informant method, to ensure common method bias was not a threat, a combination of procedural and statistical remedies were adopted (see also Podsakoff *et al.*, 2003): 1) items of the main constructs were randomized and separated by demographic questions; 2) the questionnaire was kept anonymous; 3) Harman's single-factor test was employed to check items of main constructs, and the result revealed four distinct factors with eigenvalues greater than 1 which account for 65.2% of the variance, and the first factor accounted for 42.6% of variance; 4) a single-method-factor approach was adopted by controlling the effect of a single unmeasured latent common method factor, and the result showed the model fit indices was not significantly improved. All these methods ensured the common method bias was minimized and did not place a major threat in this study.

¹ A third item from Sharma (2000) was excluded because this item was irrelevant to the study and caused confusion among pilot study respondents.

Confirmatory factor analysis (CFA) (based on maximum likelihood method) was carried out using AMOS17.0 to examine the measurement model of survey items and to confirm reliability and validity of main constructs (see Table II).

[[Table II near here]]

Table II shows that there is a good model fit (Hair *et al.*, 2013). According to Fornell and Larcker (1981) to verify convergent validity, the constructs must demonstrate properties as follows: (1) all factor loadings are greater than 0.70; (2) construct reliabilities are greater than 0.70; (3) AVEs (Average Variance Extracted) are greater than 0.5. All of these conditions are met. The Cronbach's alpha value was also calculated for each construct and they were all greater than 0.7 as recommended by Nunnally (1978).

To verify discriminant validity, the AVE for each construct should exceed the squared factor correlations between that construct and other constructs. Table II shows that all AVEs are greater than the corresponding squared factor correlations, except for two (normative pressure, AVE=0.582; place identity, AVE=0.565), which are slightly smaller than the corresponding squared factor correlations. These constructs were evaluated more closely.

For normative pressure, which has higher correlation with pro-environmental operations (correlation=0.784), the indicators are based on established substantive theories and matured scales from previous studies. Moreover, previous studies have gained evidence of the positive relationship between normative pressure and pro-environmental operations of firms, albeit in different contexts (e.g., Zhu and Sarkis, 2007; Zhu *et al.*, 2013). Therefore, it is not surprising to see a higher correlation between these constructs. Similarly, it is not surprising to see a higher correlation (0.757) between place identity and place dependence. Previous literature suggests two ways of operationalizing place attachment (Daryanto and Song, 2021), either as a unidimensional construct by using one global measure (Prayag and Ryan, 2012) or as a bidimensional construct consisting of two first-order factors—place identity and place dependence (Williams and Vaske, 2003). The bidimensional construct is generally preferred in previous research, because it takes better account of potential differences between an individual's subjective/emotional and objective/functional attachments to places (Williams and Vaske, 2003). Therefore, it is arbitrary to aggregate these correlated yet distinct constructs. According to Moore and Benbasat (1991), conceptual dimensionality should be distinguished from empirical dimensionality in that constructs are conceptually different, although they tend to be viewed identically by the respondents. Moreover, high or perfect correlation is not a sufficient condition to claim that a concept is unidimensional rather than bidimensional (Bollen and Hoyle, 1990). Therefore, in this research, these constructs remained separate in the following analysis.

5. Results

To examine the possible presence of multicollinearity, variance inflation factor (VIF) was examined. The maximum value of VIF is 2.82 is smaller than the suggested threshold of 10 (Myers, 1990), hence multicollinearity was not an issue. Hierarchical multiple regression was conducted to test the hypotheses (Table III). To examine the relationship between institutional pressures and managerial cognition, in model 1 all control variables were entered (adjusted $R^2=0.060$). Four control variables (age, industrial experience, employee number, and ownership) have significant but relatively weak positive relationships with managerial cognition, as indicated by small regression coefficients.

[[Table III near here]]

Model 2 includes institutional pressures as independent variables. The significant change in adjusted R^2 from 0.060 to 0.117 implied an important relationship between independent variables and the dependent variable. The significant regression coefficient of coercive pressure ($b=0.148$, $p<0.01$) and mimetic pressure ($b=0.166$, $p<0.01$) indicate significant positive relationships between coercive pressure and threat cognition and between mimetic pressure and threat cognition. *H1a* and *H1b* are supported. However, the regression coefficient of normative pressure ($b=-0.017$) is not significant. Hence, *H1c* is not supported.

Given that the regression coefficients for institutional pressures are either insignificant or relatively small, there is the possibility that the effect of institutional pressures can go beyond simple linear relationships (see also Haans, Pieters, & He, 2016). Previous researchers suggested that more accurate relationships between variables can be obtained by comparing linear models with nonlinear models (e.g., Le, Nguyen, & Cheng, 2021). After incorporating quadratic terms of institutional pressures into model 3, we found that the regression coefficients of these quadratic terms are all significant, implying U-shaped relationships between institutional pressures and managerial cognition. The R^2 difference between model 2 and model 3 was 0.05 ($p < 0.001$), hence the quadratic effects of model 3 explained the dependent variable better than model 2.

Suppose that the regression equation between institutional pressure (x) and managerial cognition (y) is as follows:

$$Y = \beta_0 + \beta_1 X + \beta_2 X^2$$

The curve slope equation is as follows:

$$S = \beta_1 + 2\beta_2 X$$

Following Haans et al. (2016), the test of inverted U-shaped relationships includes the following three conditions: 1) the coefficient of quadratic term is significant and

the sign is negative; 2) at both ends of the data range, the slope of the curve must be steep enough, that is, the slope of the curve is positive when independent variable (x) is having the lowest value in the data range, whilst the slope of the curve is negative when independent variable (x) is at the highest value in the data range; 3) the inflection point of the curve must be within the data range.

As shown in model 3, the quadratic coefficient of coercive pressure on managerial cognition is significant ($b=-0.228$, $p<0.001$) (condition 1 is met). Moreover, the centralized coercive pressure ranges from -13.37 to 4.63. When coercive pressure equals -13.37, the slope is 6.118; when coercive pressure equals 4.63, the slope is -2.088. Thus condition 2 is met. The inflection point of the curve is 0.05, which is within the value range of coercive pressure. Thus, condition 3 is met. Therefore, the relationship between coercive pressure and managerial cognition is considered as inverted U-shaped.

Similarly, the quadratic coefficient of mimetic pressure is significant ($b = -0.247$, $p<0.001$) (condition 1 is met). The mimetic pressure ranges from -13.03 to 4.97. When mimetic pressure equals -13.03, the slope is 4.756. The slope is -1.831 when mimetic pressure equals 4.97. Thus, condition 2 is met. The inflection point of the curve is -0.032, which is within the value range of mimetic pressure, thus condition (3) is met. Therefore, the relationship between mimetic pressure and managerial cognition is also considered as inverted U-shaped.

The test of U-shaped relationship between normative pressure and threat cognition followed three conditions (Haans *et al.*, 2016): 1) the coefficient of quadratic term is significant and the sign is positive; 2) at both ends of the data range, the slope of the curve must be steep enough, that is, when (x) takes the lowest value of the data range, the slope of the curve is negative; when (x) takes the highest value of the data range, the slope of the curve is positive; 3) the inflection point of the curve must be within the data range.

Result shows that the quadratic coefficient of normative pressure and threat cognition is significant ($b=0.182$, $p<0.05$), which meets condition 1. The value of normative pressure ranges from -13.52 to 4.48. When normative pressure equals -13.52, the slope is -4.398. When normative pressure equals 4.48, the slope is 1.758, thus condition 2 is met. The inflection point of the curve is -0.661, which is within the value range of normative pressure, thus condition 3 is met. Therefore, the relationship between normative pressure and managerial cognition is U-shaped.

To examine the relationship between managerial cognition and SME pro-environmental operations, in model 4 all control variables were entered first (adjusted $R^2=0.121$). Three control variables (education, management experience, employee number) have significant but rather weak positive relationships with SME pro-environmental operations, as indicated by small regression coefficients. Model 5 then

included managerial cognition as an independent variable. The significant adjusted R^2 change from 0.121 to 0.141 implied the important relationship between managerial cognition and SME pro-environmental operations. Nevertheless, the regression coefficient of managerial cognition on SME pro-environmental operations is positive and significant ($b=0.151$, $p<0.001$), contrary to $H2$. Hence, $H2$ is not supported. The result suggests that SME pro-environmental operations are driven by the threat cognition rather than by the opportunity cognition of TMs.

Given that managerial cognition is now a middle factor between institutional pressures and pro-environmental operations, we further examined whether managerial cognition is a mediator. Firstly, model 10 tested the direct effect of institutional pressures on SME pro-environmental operations ($R^2=0.704$). Significant direct effects were found, confirming some previous studies (e.g., Campbell, 2007; Phan & Baird, 2015). Secondly, model 11 included managerial cognition as an independent variable together with the direct effects of institutional pressures. The effects of institutional pressures remained significant and were even stronger. However, the effect of managerial cognition was insignificant. Therefore, no obvious mediation effects of managerial cognition could be found. A possible explanation is that institutional pressures have non-linear relationships with managerial cognition (as discussed above). Hence, the indirect effects of institutional pressures (coercive, mimetic, normative) on managerial cognition cancel each other out when the direct effects of institutional pressure and managerial cognition on pro-environmental operations are considered simultaneously.

Models 6 and 7 examine the moderating effects of place identity (emotional dimension) on the relationship between managerial cognition and SME pro-environmental operations. The significant coefficient of the interaction term managerial cognition \times place identity ($b=0.171$, $p<0.001$) and the significant R^2 change (0.021, $p<0.001$) in model 7 indicate a positive moderating effect of place identity on the positive relationship between threat cognition and pro-environmental operations. Although $H3a$ is not directly supported, the result means that a higher level of the place identity of TMs will amplify the positive effects of threat cognition on SME pro-environmental operations. Models 8 and 9 examine the moderating effects of place dependence (functional dimension) on the relationship between managerial cognition and SME pro-environmental operations. Although $H3b$ is not supported, the significant coefficient of the interaction term managerial cognition \times place dependence ($b=0.148$, $p<0.001$) and the significant R^2 change (0.017, $p<0.01$) in model 9 still indicate the positive moderating effects of place dependence on the positive relationship between threat cognition and SME pro-environmental operations. The slope plots of moderating effects are shown in Figure 2 and Figure 3.

[[Figure 2 and Figure 3 near here]]

6. Cross-validation

In the main hypothesis testing, institutional pressures were measured by perceptions of TMs. Hence, to examine the stability of results, we conducted a further hierarchical regression analysis by replacing measures of institutional pressures with publicly available secondary data to cross-validate the findings (Podsakoff *et al.*, 2003) (Table IV). Comparison of results offers important implications on how subjective perceptions and objective institutional pressures in the business environment would affect managerial cognition of TMs and SME pro-environmental operations.

Firstly, the measurement of coercive pressure was replaced by the Pollution Information Transparency Index of China published by the Institute of Public and Environmental Affairs in 2017, which reflects the intensity of environmental regulations. Secondly, following Haunschild and Miner (1997), the measurement of mimetic pressure was replaced by the number of enterprises that adopted ISO14001 certification with the same SIC code in the past two years. Thirdly, following Foster (2002), we used the number of trade associations in each province to replace the measurement of normative pressure.

Considering that some of these variables are provincial level indicators, previous studies suggested that Hierarchical Linear Modeling (HLM) or the Ordinary Least Square method can be used for the regression analysis (Kozlowski and Klein, 2000). After assessing the secondary data carefully, we found that the measurements of institutional pressures are a mixture of provincial and sectoral level indicators, hence HLM is not feasible. Therefore, the OLS method was followed (see Table IV). All the new measures were normalized before the analysis. The result suggests that although mimetic pressure and normative pressure do not show significant inverted U-shaped/U-shaped relationship with managerial cognition anymore, the inverted U-shaped relationship between coercive pressure and managerial cognition is still significant ($b=-0.132$, $p<0.01$) (Table IV). Therefore, the influence of coercive pressure, whether perceived by OMTMs or being objective, will influence managerial cognition in the similar way. On the other hand, the influence of mimetic pressure and normative pressure is weakened when objective measures are used.

[[Table IV near here]]

7. Discussion

Analysis results support some of our hypotheses. However, there have been interesting new findings, even though some of the results deviate from the original hypotheses. Firstly, TMs' cognitive interpretation of environmental requirements as

threats (as opposed to opportunities) forms an important driver of SME pro-environmental operations. The more TMs regard environmental requirements as threats, the more likely they will adopt pro-environmental operations. This finding echoes Sharma (2000), in that threat interpretation will cause conformance to environmental strategy by firms. Given that SMEs have limited resources, they will adopt environmental operations when TMs realise the risk of further losses to SMEs without taking proper action. This can be a major difference between SMEs and large firms' responses to environmental expectations. Abundant resources mean larger firms can turn environmental requirements into business opportunities more easily, for example, by taking pre-emptive measures and making green investments (Ramanathan *et al.*, 2017; Wong *et al.*, 2020), whilst SMEs will normally take a reactive approach. This also helps to explain why the environmental behaviour of large firms and SMEs can be very different under similar institutional conditions (c.f., Lepoutre and Heene, 2006).

Secondly, the results generally support the significant effects of institutional pressures (coercive and mimetic) on TMs' managerial cognition and establish an important link between external institutional pressures and the intrinsic managerial cognition of TMs. This fills the gap of OM literature, which lacks micro level explanations of how institutional pressures will transfer into the environmental operations of SMEs.

Thirdly, the results suggest that the relationships between institutional pressures and managerial cognition are actually non-linear, so that coercive and mimetic pressures have inverted U-shaped relationships, whilst normative pressure has a U-shaped relationship with the managerial cognition of TMs. Specifically, the greater the coercive pressure in the market, the more likely the TMs will develop threat cognition. However, as environmental regulations become more embedded in SMEs' operations, the coercive pressure stemming from regulations becomes less prevalent. The diversification of environmental regulations, such as voluntary initiatives (Peters and Turner, 2004), will gradually reduce firms' concerns over administrative sanctions. Therefore, as coercive pressure reaches a certain level, the original threat cognition of TMs will gradually turn into opportunity cognition. Similarly, the greater the mimetic pressure in the market, the more likely the TMs will develop threat cognition. However, with a growing level of mimetic pressure, firms increasingly behave the same way as each other (Liang *et al.*, 2007). Environmental legitimacy will outweigh the cost consideration of TMs. Hence, less threat will be perceived by TMs and the original threat cognition will gradually turn into opportunity cognition. Therefore, excessive coercive or mimetic pressures may not necessarily increase TMs' threat cognition, which is an important driver of SME pro-environmental operations.

On the other hand, the U-shaped relationship between normative pressure and managerial cognition suggests that industrial norms may not increase the threat

cognition of TMs until such normative pressure has reached a certain level. Without direct enforcement from the government and authorities, action often fails when left to self-regulation (Jones, 2010). SMEs with limited resources may have limited incentives to adopt substantive responses to normative pressures (Walker and Wan, 2012), hence limited threat cognition will be developed by TMs. However, with the growing normative pressure, industrial self-regulation would be gradually integrated as part of business life. Various stakeholders would join the force to monitor the effectiveness of industrial self-regulation and the responsible performance of firms (Campbell, 2007). It is thus more difficult for SMEs to adopt opportunistic symbolic operations. As a result, TMs may develop more threat cognition due to normative pressure being more embedded into the sector norm.

The cross-validation indicates that the inverted U-shaped relationship between coercive pressure and managerial cognition appears to be consistent whether coercive pressure is measured by subjective or objective indicators. Hence, coercive pressure appears to be a stable factor to predict managerial cognition of OMTMs and subsequent SME pro-environmental operations. On the other hand, normative and mimetic pressures have shown limited effect on managerial cognition when objective measures are used. One possible explanation is that normative and mimetic pressures are much more embedded in social industrial contexts and are difficult to be measured by objective indicators. This is also the reason why previous studies largely used subjective perceptions (e.g., Liu *et al.*, 2010; Teo *et al.*, 2003). In this sense, it is not surprising that variations in results are witnessed when objective measures are employed.

Fourthly, two dimensions of place attachment—place identity (emotional attachment) and place dependence (functional attachment)—have shown important moderating effects on the relationship between managerial cognition and SME pro-environmental operations. Scholars of environmental psychology believe that people's environmental protection behaviour is usually specific to the place they are linked with, such as their hometown or permanent place of residence (Hu *et al.*, 2017; Stedman, 2002). Our findings support this view. Specifically, the higher the level of TMs' place identity (i.e., with better sense of belonging to their local areas), the more likely TMs with threat cognition will engage with pro-environmental operations in their SMEs (see also, Brown *et al.*, 2019; Ateş, 2020). Similarly, the higher the level of place dependence of TMs (i.e., with better awareness of dependence on local areas), the more likely TMs with threat cognition will engage their SMEs with pro-environmental operations. The results, therefore, reveal the important effect of place attachment on the pathway between threat cognition and SME pro-environmental operations, given that SMEs are usually locally based.

Overall, the results of this study explicate microfoundations of SME pro-environmental operations by linking contextual factors (institutional pressures), intrinsic factors (managerial cognition and place attachment) and SMEs' environmental operations. This is in line with Barney and Felin's (2013) call for theory of behaviour both *in* and *of* organizations, so that firms' behaviour (pro-environmental operations) is not explained in isolation from the individuals' behaviour (TMs' managerial cognition and place attachment).

8. Conclusion

Drawing on institutional theory and perspectives of managerial cognition and place attachment, this study established a relationship between institutional pressures, TMs' managerial cognition and SME pro-environmental operations. We emphasize the important personal role of TMs as key decision makers and the importance of their managerial cognition and place attachment, and thus bring to light some important factors that differentiate SMEs from large firms. These factors (institutional pressures, managerial cognition and place attachment) and their interactions form important microfoundations for SMEs' pro-environmental operations.

This study contributes to the application of institutional theory in explaining why different firms behave differently even under similar institutional contexts. This study suggests that the effects of institutional pressures are not static, but rather dynamic and non-linear. Hence, institutional pressures (coercive, mimetic, or normative) at different levels exhibit different effects on the managerial cognition of TMs and result in different levels of SME pro-environmental operations. In this vein, this study also bridges the conceptual gap between institutional theory and the perspective of managerial cognition.

Some previous studies pointed out the difference between symbolic and substantive environmental behaviour (Walker and Wan, 2012). Our research can be used to explain such differences as it recognizes the TMs' threat cognition as an important driver of more substantive pro-environmental operations of SMEs.

By highlighting that SMEs are usually locally based, so that TMs have potential place attachment to local areas (either emotional or functional), we established the moderating effects of TMs' place attachment. We found that the presence of strong place attachment for TMs will sharpen the effect of managerial cognition on SME pro-environmental operations. In this sense, this study enriches the application of the place attachment perspective in understanding SME pro-environmental operations.

8.1 Practical implications

Findings of this study can lead to important implications for practitioners, such as regulators, policy makers and trade associations, to better understand the nature of SMEs' pro-environmental operations and to develop more targeted and optimal

institutional tools to promote such operations. First of all, we suggest that the development of TMs' threat cognition can promote SMEs' pro-environmental engagement. Such threat cognition is more likely to originate from TMs' awareness of potential losses from SMEs' non-response to institutional pressures. Unlike large firms, that have resources to proactively convert environmental requirements into opportunities, SMEs tend to take more reactive approaches. Therefore, policy makers and regulators should enhance the risk perceptions for non-compliance of SMEs, especially for their TMs.

Secondly, since different institutional pressures (coercive, mimetic, and normative) have non-linear effects on TMs' threat cognition and the subsequent SME pro-environmental operations, a smart combination of institutional mechanisms rather than conflicting use of institutional logics (Gou *et al.*, 2019) should be deployed to maximize the intention of substantive environmental engagement by SMEs. For example, over-regulation should be avoided, as it does not necessarily create more intention for pro-environmental engagement. Similarly, creation of mimetic pressure, for example, by setting industrial examples, can benefit SMEs' environmental engagement. However, over-employment of industrial examples and benchmarking will have diminished impact and lead to a laid-back TMs attitude. Moreover, although industrial norms may not initially generate enough influence on SMEs' pro-environmental operations, continued diffusion of industrial norms will show better results.

Thirdly, since coercive pressure shows more consistent effect on OMTMs' threat cognition, adequate rather than excessive environmental regulations, tax levies or penalties should be kept as the most important instruments to facilitate SMEs' pro-environmental operations.

Finally, we highlight the importance of the place attachment of TMs to facilitate SMEs' pro-environmental operations. We suggest that the SMEs' propensity for environmental engagement could benefit from TMs' enhanced place attachment. This provides a new perspective for policy makers, regulators and trade associations developing more targeted policy tools for locally based SMEs.

8.2 Limitations and future research

There are a few limitations which need to be addressed by future researchers. First, this study employed subjective perceptions of SMEs' pro-environmental operations due to the lack of appropriate publicly available objective measurement focusing on SMEs. Although this is a commonly adopted approach (e.g., Russo and Fouts, 1997; Sarkis *et al.*, 2010), there is an urgent need for reliable indices on SMEs which resemble environmental performance indices for large firms, such as the FTSE4Good Index, the Dow Jones Sustainability Index (DJSI), and Bloomberg's proprietary ESG

scores. The development of such objective measurement will significantly benefit policy makers and future researchers.

Second, whilst the effect of coercive pressure is more consistent across subjective or objective measures, the effects of mimetic and normative pressures are less stable. This is partially due to the lack of precise measures of such institutional pressures. Future research, therefore, needs to develop better objective measures of mimetic and normative pressures to assimilate such embedded institutional factors.

Third, this study is an initial attempt to explicate the microfoundations of the pro-environmental operations of SMEs. We do not claim that institutional pressures, managerial cognition and place attachment will form the complete set of microfoundations of SMEs' pro-environmental operations, given that there are factors other than TMs in SMEs' operations. Hence, more sophisticated models, such as ones examining the implications of interactions between TMs and various internal/external stakeholders should be developed in the future.

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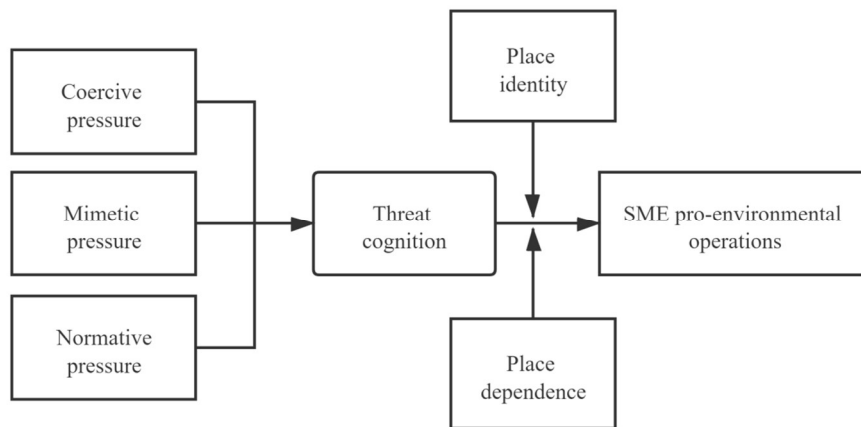


Figure 1. Theoretical framework

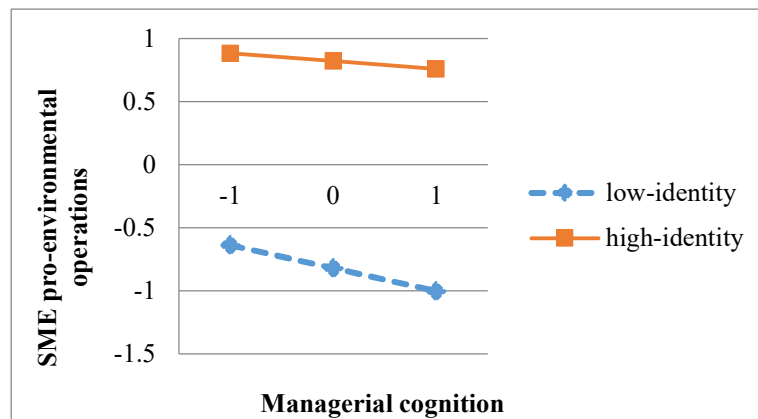


Figure 2. Moderating effect of place identity

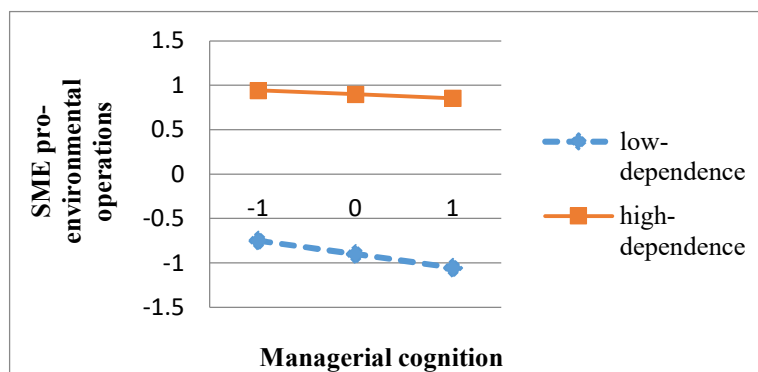


Figure 3. Moderating effect of place dependence

Table I. Regions and sectors of responding firms

Region	Frequency	%
Jiangsu	169	33.2
Shanghai	89	17.4
Guangdong	33	6.5
Beijing	32	6.3
Shandong	26	5.1
Tianjin	19	3.7
Henan	17	3.3
Hebei	17	3.1
Zhejiang	13	2.6
Jiangxi	13	2.6
Fujian	12	2.4
Shaanxi	9	1.8
Liaoning	8	1.6
Hunan	8	1.6
Hubei	7	1.4
Anhui	6	1.2
Guizhou	6	1.2
Xinjiang	5	1.0
Sichuan	5	1.0
Chongqing	4	
Shanxi	3	
Hainan	2	
Ningxia	2	
NeiMongol	1	
Jilin	1	
Yunan	1	
Heilongjiang	1	
Total	509	100
Sector	Frequency	%
Manufacturing	123	24.2
Construction	79	15.5
Wholesale and retail	74	14.5
Mining	50	9.8
Agriculture and aquaculture	39	7.7
Transportation, warehousing, and delivery	29	5.7
Business service	28	5.5
Hospitality and catering	21	4.1
Energy supply	17	3.3
Others	49	9.6
Total	509	100

Table II. Confirmatory factor analysis of survey instrument

	Coercive pressure	Mimetic pressure	Normative pressure	Managerial cognition	Place identity	Place dependence	Pro-environmental operations
CP1	0.825						
CP2	0.828						
CP3	0.825						
MP1		0.852					
MP2		0.765					
MP3		0.833					
NP1			0.757				
NP2			0.824				
NP3			0.780				
MC1				0.786			
MC2				0.713			
PI1					0.700		
PI2					0.804		
PI3					0.748		
PI4					0.759		
PD1						0.743	
PD2						0.730	
PD3						0.798	
EA1							0.748
EA2							0.730
EA3							0.805
EA4							0.725
EA5							0.711
EA6							0.751
Number of items	3	3	3	2	4	3	6
Cronbach's alpha	0.873	0.853	0.832	0.722	0.846	0.821	0.895
Construct reliability	0.865	0.807	0.806	0.739	0.840	0.796	0.882
AVE	0.682	0.593	0.582	0.587	0.565	0.565	0.578
Squared factor correlations							
Coercive pressure	1.000						
Mimetic pressure	0.261	1.000					
Normative pressure	0.383	0.536	1.000				
Managerial cognition	0.032	0.036	0.025	1.000			
Place identity	0.106	0.155	0.219	0.060	1.000		
Place dependence	0.087	0.141	0.176	0.071	0.573	1.000	
Pro-environmental operations	0.421	0.487	0.613	0.011	0.262	0.219	1.000

Notes: n=509. Loadings are completely standardised. All the factor loadings are significant. Goodness of fit indices: $\chi^2=673.295$, $df=236$, $\chi^2/df=2.853$; GFI=0.896; AGFI=0.868; CFI=0.941; RMSEA=0.060; RMR=0.168.

$$\text{Construct reliability} = (\Sigma\lambda)^2 / [(\Sigma\lambda)^2 + \Sigma\text{var}(\delta)]. \quad \text{AVE} = \Sigma\lambda^2 / [\Sigma\lambda^2 + \Sigma\text{var}(\delta)].$$

Table III. Regression analysis results

	Model										
	Managerial cognition			SME Pro-environmental operations							
	1	2	3	4	5	6	7	8	9	10	11
Age	0.156**	0.159***	0.14**	-0.025	-0.049	-0.05	-0.033	-0.049	-0.035	-0.015	-0.009
Education	0.021	0.069	0.05	-0.173***	-	-0.12**	-0.105**	-0.131***	-0.121**	0.008	0.01
Management experience	0.067	0.054	0.082	0.134*	0.124*	0.067	0.083	0.068	0.077	0.04	0.042
Industrial experience	-0.133*	-0.152**	-0.133*	0.073	0.093	0.064	0.07	0.067	0.081	0.036	0.03
Employee number	0.162**	0.218***	0.168**	-0.329***	-	-0.28***	-0.274***	-0.304***	-0.312***	-0.176***	-0.167***
Ownership	0.128**	0.13**	0.127**	0.081	0.062	0.052	0.064	0.05	0.053	0.08**	0.085***
Enterprise age	0.02	0.009	0.003	0.026	0.023	0.063	0.03	0.043	0.027	0.004	0.004
Annual-income	-0.049	-0.083	-0.109*	0.093	0.1	0.093*	0.102*	0.099*	0.103*	-0.005	-0.008
Stage of development	0.002	-0.03	-0.016	0.08	0.08	0.037	0.048	0.072	0.081	0	-0.001
Coercive pressure		0.148**	0.023							0.221***	0.227***
Mimetic pressure		0.166**	-0.007							0.235***	0.241***
Normative pressure		-0.017	0.138							0.453***	0.453***
Coercive pressure ²			-0.228***								
Mimetic pressure ²			-0.247***								
Normative pressure ²			0.182*								
Managerial cognition					0.151***	0.029	-0.016	0.033	-0.001		-0.037
Place identity						0.456***	0.529***				
Place dependence								0.416***	0.469***		
Managerial cognition × Place identity							0.171***				
Managerial cognition × Place dependence									0.148***		
Overall model F	4.601	6.602***	7.812***	8.776***	9.308***	23.295***	23.448***	20.348***	20.186***	101.684***	94.225***
Durbin-Watson	1.473	1.425	1.495	1.762	1.726	1.633	1.658	1.693	1.706	1.706	1.741
Adjusted R ²	0.060	0.117	0.167	0.121	0.141	0.326	0.347	0.295	0.312	0.704	0.705
Change in R ²		0.057	0.050		0.020	0.185	0.021	0.154	0.017	0.583	0.584
Standard error	33.085	2.99	2.903	6.072	6.004	5.319	5.236	5.437	5.372	3.523	3.520

Note: *** p < .001, ** p < .01, * p < .05.

Table IV. Regression analysis results of cross-validation

	Model								
	Managerial cognition			SME Pro-environmental operations					
	1	2	3	4	5	6	7	8	9
Age	0.156**	0.157***	0.152**	-0.025	-0.049	-0.05	-0.033	-0.049	-0.035
Education	0.021	0.025	0.022	-0.173***	-0.176***	-0.12**	-0.105**	-0.131***	-0.121**
Management experience	0.067	0.058	0.067	0.134*	0.124*	0.067	0.083	0.068	0.077
Industrial experience	-0.133*	-0.127*	-0.119*	0.073	0.093	0.064	0.07	0.067	0.081
Employee number	0.162**	0.138**	0.127**	-0.329***	-0.353***	-0.28***	-0.274***	-0.304***	-0.312***
Ownership	0.128**	0.137**	0.134**	0.081	0.062	0.052	0.064	0.05	0.053
Enterprise age	0.02	0.016	0.015	0.026	0.023	0.063	0.03	0.043	0.027
Annual-income	-0.049	-0.045	-0.055	0.093	0.1	0.093*	0.102*	0.099*	0.103*
Stage of development	0.002	-0.001	0	0.08	0.08	0.037	0.048	0.072	0.081
Coercive pressure		-0.080	-0.152**						
Mimetic pressure		0.074	-0.054						
Normative pressure		-0.039	-0.035						
Coercive pressure ²			-0.132**						
Mimetic pressure ²			0.141						
Normative pressure ²			-0.057						
Managerial cognition					0.151***	0.029	-0.016	0.033	-0.001
Place identity						0.456***	0.529***		
Place dependence								0.416***	0.469***
Managerial cognition × Place identity							0.171***		
Managerial cognition × Place dependence									0.148***
Overall model F	4.601	3.956***	3.780***	8.776***	9.308***	23.295***	23.448***	20.348***	20.186***
Durbin-Watson	1.473	1.474	1.495	1.762	1.726	1.633	1.658	1.693	1.706
Adjusted R ²	0.060	0.065	0.076	0.121	0.141	0.326	0.347	0.295	0.312
Change in R ²		0.005	0.011		0.020	0.185	0.021	0.154	0.017
Standard error	33.085	3.076	3.059	6.072	6.004	5.319	5.236	5.437	5.372

Note: *** p < .001, ** p < .01, * p < .05.

Appendix 1. Survey items

Item label	Adopted items
Coercive pressure: adapted from Colwell and Joshi (2013)	
CP1	Firms in our industry were aware of the fines and penalties potentially associated with environmentally irresponsible behaviour.
CP2	If firms in our industry committed an environmental infraction, the consequence would likely have included negative reports by industry/market analysts.
CP3	There were negative consequences for companies that failed to comply with the provincial environmental laws.
Mimetic pressure: adapted from Colwell and Joshi (2013)	
MP1	The leading companies in our industry set an example for environmentally responsible conduct.
MP2	The leading companies in our industry were known for their practices that promoted environmental preservation.
MP3	The leading companies in our industry worked on ways to reduce their impact on the environment.
Normative pressure: adapted from Colwell and Joshi (2013)	
NP1	Our industry had trade associations (or professional associations) that encouraged organizations within the industry to become more environmentally responsible.
NP2	Our industry expected all firms in the industry to be environmentally responsible.
NP3	Being environmentally responsible was a requirement for firms to be part of this industry.
Managerial cognition: adapted from Sharma (2000)	
MC1	I am likely to lose rather than gain by actions to preserve the environment.
MC2	Any actions that I may take for environmental preservation are constrained by others in the organization.
Place identity: adapted from Williams and Vaske (2003)	
PI1	I feel "X" is a part of me.
PI2	I identify strongly with "X".
PI3	I am very attached to "X".
PI4	"X" means a lot to me.
Place dependence: adapted from Williams and Vaske (2003)	
PD1	"X" is the best place for what I like to do.
PD2	I get more satisfaction out of living in "X" than any other.
PD3	Doing what I do at "X" is more important to me than doing it in any other places.
SME pro-environmental operations: developed based on Russo and Fouts (1997)	
EA1	Compared with other enterprises in the industry, our company is significantly reducing its carbon dioxide emissions.
EA2	Compared with other enterprises in the industry, our company is significantly reducing the solid waste generated in the production process.
EA3	Compared with other enterprises in the industry, our company is significantly reducing the use of hazardous, toxic and hazardous materials.
EA4	Our company performed well in government environmental investigations.
EA5	Environmental departments highly praised our company's production/operations.
EA6	Compared with other enterprises in the industry, our company's energy efficiency during production/operations is significantly improving.

Supplementary File: Means, standard deviations, and correlations among variables

	Mean	Std	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	2.729	0.814	1															
2. Education	2.595	0.856	0.046	1														
3. Management experience	2.293	0.990	.441**	.147**	1													
4. Industrial experience	2.316	1.000	.391**	.108*	.614**	1												
5. Employee number	1.692	0.814	.093*	.233**	.230**	.229**	1											
6. Ownership	2.122	1.481	-0.007	.162**	0.075	.143**	.299**	1										
7. Enterprise age	2.574	1.262	.280**	.152**	.453**	.486**	.403**	.271**	1									
8. Annual-income	2.220	1.325	.123**	.278**	.298**	.262**	.499**	.315**	.445**	1								
9. Stage of development	2.022	0.727	.143**	.090*	.308**	.323**	.354**	.231**	.422**	.357**	1							
10. Coercive pressure	16.369	3.884	0.083	-.113*	.110*	.131**	-.119**	-0.018	0.081	0.068	0.082	1						
11. Mimetic pressure	16.030	4.018	0.019	-.180**	.088*	.087*	-0.066	0.008	0.08	0.049	.145**	.511**	1					
12. Normative pressure	16.517	3.610	0.067	-.206**	.154**	.109*	-0.084	-0.01	0.071	0.043	.091*	.619**	.732**	1				
13. Managerial cognition	8.784	3.182	.148**	0.072	.099*	0.024	.189**	.156**	.112*	.092*	0.082	.178**	.190**	.159**	1			
14. Place identity	21.305	4.677	.093*	-.111*	.132**	.093*	-0.081	0.018	0.001	-0.017	0.082	.325**	.394**	.468**	.245**	1		
15. Place dependence	15.434	3.744	.099*	-.088*	.144**	.100*	-0.047	0.031	0.028	-0.009	0.038	.295**	.376**	.420**	.267**	.757**	1	
16. SME pro-environmental operations	33.085	6.477	0.054	-.173**	.137**	.126**	-.215**	0.03	0.054	0.002	0.072	.649**	.698**	.784**	.106*	.512**	.467**	1

Notes: ** Significant at the 0.01 level (2-tailed). * Significant at the 0.05 level (2-tailed).