

**Institutional Forces and Environmental Management Strategy: Moderating Effects of Environmental Orientation and Innovation Capability**

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**ABSTRACT** We examine the mechanisms through which firm capabilities moderate the impact of institutional forces upon firms' adoption of environmental management strategy (EMS). Viewing the limitation of institutional perspective in explaining the heterogeneity in firms' EMS, we suggest that an important source of variation is the idiosyncratic capabilities of the firm in acquiring and allocating resources. Based on the strategic response theme of institutional theory and resource-based view, we argue that the influence of institutional forces on EMS is contingent on the presence of environmental orientation and innovation capability. Using data collected from China, we test these notions. Our empirical results suggest that both environmental orientation and innovation capability positively moderate the effect of institutional forces on firm's EMS. By demonstrating how institutional forces and firm capabilities interact with each other, we enhance understanding of how firms succeed in developing EMS.

**KEYWORDS** China, environmental management strategy, environmental orientation, innovation capability, institutional theory, resource-based view

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## INTRODUCTION

Given the widespread consciousness to environmentalism and sustainable development, firms in emerging markets, like their counterparts in developed economies, nowadays more or less put environment management in agenda and develop environmental management strategy (EMS) accordingly. EMS is a firm's policy and efforts to reduce its negative impact on the natural environment (Bansal, 2005; Fraj, Matute, & Melero, 2015; Sharma, 2000). An interesting question is how firms actually react to external institutional forces to develop such strategy, and what make their reactions different.

Literature has documented how firms' environmental strategies are shaped by institutionalized pressure of various stakeholders in terms of environmentalism (Alt, Díez-de-Castro, & Lloréns-Montes, 2015; Blome & Paulraj, 2013; Liu, Tang, Lo, & Zhan, 2016; Liu, Feng, & Li, 2015; Ye, Zhao, Prahinski, & Li, 2013). For example, following an institutional approach, research emphasizes an isomorphic process for convergence of firm strategy and practices through the concept of legitimacy, and suggests adoption of a similar strategy when firms face the same environment (Cordeiro & Tewari, 2015; Meyer, Estrin, Bhaumik, & Peng, 2009; Wei & Lau, 2008). It is also clear that firms tend to develop and implement different types of environmental strategy, ranging from passive, reactive, to proactive (Banerjee, Iyer, & Kashyap, 2003; Flammer, 2013; Glavas & Mish, 2015).

Despite these theoretical advancements, this line of research still experiences serious shortcomings. First, prior research has not adequately examined the underlying mechanisms through which firm resources/capabilities influence individual firms' strategic responses towards institutional forces of environmentalism, treating the mechanisms as a black box (Aguinis & Glavas, 2012; Pedersen & Gwozdz, 2014; Shu, Zhou, Xiao, & Gao, 2016). More specifically, institutional theory has proven to be inadequate in explaining the heterogeneity

found in firm's responses when confronting similar institutional forces (Delmas & Toffel, 2008; Greenwood, Raynard, Kodeih, Micelotta, 2011), as the institutional view of environmental management emphasizes the tendency towards a homogenization process through which firms assumedly conform to the institutional forces of environmentalism. As a result, the knowledge remains incomplete on what the driving forces of EMS are and how they interact. Therefore, it is important to examine how firm characteristics, such as environmental orientation, and innovation capability, influence firms' response to institutional forces when developing their EMS (Matten & Moon, 2008).

Second, the inadequacy in overlooking the mechanisms for interactions between factors internal and external to a firm in determining EMS is particularly conspicuous in research on EMS in the emerging market settings, as most EMS research has occurred largely in the context of developed Western economies (Shu et al., 2016; Wei, Shen, Zhou, & Li, 2017). Thus, it is unclear whether the conventional EMS frameworks are applicable to the emerging market settings given the significant differences both in institutional framework and in firm resource base between developed and emerging economies. As a result, it remains unknown what contingencies, especially in the emerging market context, will lead firms to reduce isomorphism in their EMS in reacting to institutional challenges.

Using the strategic response theme of institutional theory (Gabler, Richey, & Rapp, 2015; Greenwood et al., 2011; He et al., 2013; Oliver, 1997; Peng, 2003; Raaijmakers, Vermeulen, Meeus, & Zietsma, 2015), we address these weaknesses by combining the institutional thinking and the resource-based perspective for a more comprehensive understanding, and by examining the contingency conditions regarding firm-specific capabilities for the link between institutional forces and EMS.

Our research emphasizes two different aspects in an effort to enrich the literature. First, in contrast to most existing EMS frameworks developed and tested dominantly in the context

of developed Western economies, our study focuses on issues related to EMS in China as a leading emerging market. Thus, we consider and incorporate the impact of non-Western local institutional forces on the conventional EMS framework, and provide empirical evidence for the conceptual model we construct. A major issue in emerging markets is the institutional landscapes that are significantly different from those in developed Western economies. In the latter, the institutional arrangements are strong and work smoothly, so that their role becomes almost invisible and is faded away as ‘background’ conditions for firm’s strategy (Meyer et al., 2009). When institutional arrangements have been malfunctioned in emerging markets, their deficiency becomes conspicuous (Peng, Wang, & Jiang, 2008). Therefore, our study extends the established research on EMS by putting the effect of institutional forces on firms’ EMS in emerging markets represented by China under investigation.

Second, we propose that the institutional forces-EMS relationship should be examined beyond the loop of direct influence. We explore how institutional forces in an emerging market setting are translated into different types of firm strategy by taking environmental orientation and innovation capability into consideration as two firm characteristics. The heterogeneity of firm resources creates divergence in strategic decisions even when firms confront the same institutional conditions (Tost, 2011; Volberda, van der Weerd, Verwaal, Stienstra, & Verdu, 2012). Research has long conceptualized strategic orientation as a valuable firm-specific intangible capability (Chan, 2010; Gatignon & Xuereb, 1997; Morgan, Vorhies, & Mason, 2009). Our focus on environmental orientation pushes knowledge forward because, unlike their Western counterparts, emerging market firms are yet to establish a full awareness and implementation of environmental orientation (Chan, He, Chan, & Wang, 2012; Child & Tsai, 2005). Local firms lag behind foreign invested firms, especially those from developed countries (Chan, 2010; Chan et al., 2012). This orientation should create variance in how local firms react to institutional forces.

It is also clear that innovation capability is an effective tool to address institutional pressures in environmental sustainability by providing new product offerings and introducing new production processes (Lai et al., 2015; Nidumolu et al., 2009; Orsato, 2006; Varadarajan, 2017). However, a lack of innovation capability among Chinese firms causes ineffective dealing with environmental problems like greenhouse gas emissions (Chan et al., 2016). Expanding this line of research, we examine how environmental orientation and innovation capability as two important organizational capabilities interact with institutional forces to influence a firm's EMS. Our focus on China as an emerging market provides a favorable research setting to examine how differences in firm capabilities lead to variations in firm's response to institutional forces. Studying both multinational enterprises (MNE) subsidiaries and local firms operating in China, we examine variations in capabilities and EMS between firms that go beyond the direct link between institutional forces and EMS that has been the focus of many previous studies.

## **THEORETICAL BACKGROUND AND HYPOTHESES**

### **Institutional Forces, Firm Capabilities, and EMS in China**

Corporate environmental management refers to a firm's policy and efforts to reduce the size of negative externalities from its business activities to the natural environment (Bansal, 2005), and EMS is the pattern of policies and actions intended to manage the interface between business and the natural environment (Fraj et al., 2015; Sharma, 2000). Scholars place firms' EMS along a continuum ranging from passive, reactive to proactive, from pollution control to pollution prevention, and from compliance to voluntary (Aragon-Correa & Sharma, 2003; Bansal, 2005), which can be viewed as different positioning at the strategy continuum (Buysse & Verbeke, 2003; Pedersen & Gwozdz, 2014).

From an institutional perspective, a firm's EMS is resulted from its response to the institutional forces of environmentalism, as regulative, normative, and cognitive institutions impose pressure on organizations for conformity, convergence, and isomorphism (Greenwood et al., 2011; Scott, 2011). A critical issue regarding environmental sustainability in China is the urgency of environmental challenges and the impact of institutional forces on the efficacy of firms' EMS (Marquis et al., 2015). Increasingly, emerging markets are replacing developed economies as the new global manufacturing centers, experiencing phenomenal economic growth but also suffering from severe environmental problems. In particular, China has replaced the US as the largest emitter of sulphur dioxide since 2005 and of carbon dioxide since 2007 respectively (World Bank, 2007), and hosts 16 of the 20 most polluted cities in the world (Chan, 2010). As a result, firms operating in China are facing the daunting challenge of how to effectively deal with the interface between their business activities and environmental externalities.

Another important issue is how the institutional forces in China regulate the firm's behaviors. The institutional environment facing firms operating in China is strikingly different to that in developed economies (Sheng et al., 2011). China as an emerging market is often characterized by underdeveloped formal institutions, resulting in an unstable institutional environment and creating an institutional void (Puffer et al., 2010). More specifically, regarding institutional forces of environmentalism, the stringency level of environmental regulations and public participation of environmental issues in China are significantly lower than those in Western countries, and capabilities in implementing, monitoring, and enforcing environmental regulations are also relatively more inferior (Chan, 2010; Child & Tsai, 2005; Majumdar & Marcus, 2001; Wei et al., 2017).

From the resource-based view (RBV), a firm's environmental strategy is dependent on its resource/capability base as measured by levels of resource commitment towards

environmental management. As RBV suggests, firm strategy will lead to sustainable competitive advantage when supported by firm-level capabilities (Slater et al., 2006). These two perspectives form a strategic response theme of institutional theory (Greenwood et al., 2011; He et al., 2013; Peng, 2003; Raaijmakers et al., 2015), which maintains that firms can develop and use resources and strategies to address institutional challenges. The ability in making ongoing resource allocation, including activities for resource acquisition, integration, and reconfiguration, refers to the capabilities that enable firms to create competitive advantage over their rivals by enhancing the productivity of firm resources (Barney, 1995; Lu et al., 2010; Sarkis et al., 2010). Following RBV, not all firms are able to formulate and implement a proactive EMS (Aragon-Correa et al., 2008; Longoni et al., 2014), because such strategy requires accumulation, allocation and complex coordination of firm resources (Martin-Tapia et al., 2010; Nath & Ramanathan, 2016).

This study focuses on environmental orientation and innovation capability as two internal capabilities because of their prominent role in shaping the firms' EMS. As a type of strategic orientation, environmental orientation represents a firm's capability to generate, disseminate, and respond to knowledge regarding the natural environmental, and thus plays a vital role in guiding the overall direction of the firm's EMS (Banerjee et al., 2003; Gabler et al., 2015). Research demonstrates differences in their environmentalism pursuit between Western MNE subsidiaries operating in China and local firms, as the former tend to act at the global level, rather than the local level in China, driven by their higher level of environmental orientation (Chan et al., 2012; Child & Tsai, 2005; Christmann & Taylor, 2001; Kim et al., 2016). Research has also emphasized importance of innovation capability as a source of competitive advantage by the strategy to meet the external expectations (Hansen et al., 2009; Varadarajan, 2017). With the ability to provide new product offering and to introduce new production process, innovation capability is an effective tool to addressing environmental sustainability

issues (Nidumolu et al., 2009; Orsato, 2006). Firm capabilities define the firm's competitiveness and distinguish firms of emerging markets from their counterpart in Western developed economies. Firms in emerging markets like China tend to possess less cutting-edge technology and less sophisticated resources compared with their counterparts in more developed countries (Cuevo-Cazurra & Genc, 2008), which provide the resource base for innovation capability.

Deteriorating environmental conditions in emerging markets like China have prompted rise of institutional forces of environmentalism, thus posing pressures on firms operating there to respond. Depending on the differences in their resource/capability base, individual firms have different strategic responses to the external institutional forces when developing their EMS. By integrating these two perspectives, we developed a conceptual framework to guide the study, which is summarized in Figure 1. This framework depicts EMS as the firm's direct response to the institutional forces of environmentalism (H1), with firm-specific capabilities of environmental orientation (H2) and innovation capability (H3) moderating the direct link between institutional forces and EMS. The theoretical construct and the rationale for each hypothesized relationship are developed below.

(Insert Figure 1 around here)

### **Institutional Forces and EMS in China**

Institutions in an emerging market are often underdeveloped and less well enforced (Peng et al., 2008). Research has demonstrated that institutional deficiency is conspicuous in China when it is in the transition from a centrally planned economy into a market economy (Peng, 2003). Institutional theory suggests that a firm gains legitimacy by conforming to the rules, norms and social expectations of institutions, assuming that institutions are established and functional (Scott, 2011). However, the prevailing situation of dysfunctional institutional



environment in an emerging market raises challenges to this assumption, as institutional establishments there feature incompleteness and institutional enforcement is often ineffective and/or inefficient (Sheng et al., 2011).

Contradictions were observed in the institutional regimes governing environmentalism in China. On the one hand, the dysfunctional institutional environment in emerging markets would reduce the efficacy of institutional forces in providing legitimacy to the compliance behaviour (Connelly et al., 2011). More specifically, the environmental laws and regulations in China were worded vaguely while the environmental standards seemed ‘impossibly high’, leaving considerable scope for arbitrary interpretation and implementation (Yee et al., 2016); Enforcement and compliance of institutional forces for environmental protection are shaped by many contextual factors, such as weak government capacity, and arbitrary enforcement practices (Beyer, 2006). When an institutional regime is incomplete, the observability of firms’ EMS decreases as various stakeholders would be difficult to interpret the information on environmental management and thereby obtain the public criteria useful for making legitimacy judgement (Wei et al., 2017). For example, law enforcement officials from Chinese local governments could collude with companies, encouraging them to ignore relevant regulations in their request for high local GDP growth (Economy & Lieberthal, 2007). Inefficiency of institutional enforcement would influence a firms’ commitment of resources to the EMS. Under a fully functioning institutional regime, when a firm underinvests in EMS, it is perceived as illegitimate; when it adopts a strong EMS, it is perceived as normal (Flammer, 2013). As most of the current literature regarding compliance to institutional forces is based on the research setting of Western countries, it remains questionable that to what extent the findings in this literature are applicable to emerging-economy settings (Yee et al., 2016).

On the other hand, regulative, public, and industrial forces towards environmentalism functioning as regulative, normative, and cognitive institutions, increasingly impose pressures on firms in emerging markets to attend to the environmental issues in their business activities, given the daunting challenges of environmental problems (Child & Tsai, 2005; Kim et al., 2016). More specific with institutional forces influencing environmentalism in China, the regulative regimes have been in the process of strengthening with increasing stringency of environmental regulations (Wang et al., 2011; Wei et al., 2017; Zhang et al., 2014). Moreover, the governments in emerging economies can be very coercive, along with vagueness and arbitrariness in the regulative regimes, which force firms to pay much more attention than the case for firms in developed economies (Liu et al., 2015; Wang et al., 2012). Public pressure of environmentalism is becoming an influential institutionalized force in China, acting as normative regimes (Shu et al., 2016), as environmental protection has become widely accepted social value and public awareness regarding the sense of civil society in general and regarding environmental issues in particular in the process of ongoing development (Child & Tsai, 2005; Liu et al., 2015; Qi et al., 2011; Sun et al., 2015). Moreover, imitation of other firms in the industry to reduce cognitive uncertainty functions as mimetic isomorphism. Champion firms in China, such as subsidiaries of MNEs from developed economies, have developed certain ‘best practices’ of environmental management as a means to formulate a proactive EMS at the firm level (Liu et al., 2016), serving as an industrial force of environmentalism and other firms are under a pressure to mimic these well-defined bench-marking practices in order to conform to the cognitive institutions (Christmann, 2004; Hart & Dowell, 2011).

In summary, although China as an emerging market features a dysfunctional institutional environment, firms there are facing mounting societal pressures regarding their role in environmental protection. Acting as external forces, these increasingly institutionalized

pressures impose upon the firm in limiting the strategic choices that the firm can exercise on issues of environmental sustainability. In responding to these pressures, firms tend to adopt an EMS by engaging and collaborating with external institutional forces to find solutions for the negative externalities of business activities. Thus, we have:

*Hypothesis 1: A firm's EMS is positively associated with institutional forces of environmentalism.*

### **Moderating Role of Environmental Orientation and Innovation Capability**

Scholars have integrated RBV with institutional theory in explaining strategy formulation and outcome (Barney et al., 2011; Greenwood et al., 2011; Meyer et al., 2009; Peng et al., 2008; Raaijmakers et al., 2015). From the institutional perspective, adoption of EMS is an outcome of the firm's response to institutionalized external forces of environmentalism. However, individual firms have very different responses to the similar or the same external forces when formulating their EMS, ranging from passive, reactive to proactive (Aragon-Correa & Sharma, 2003; Garce's-Ayerbe et al., 2013; Orsato, 2006). From RBV, differences in firms' strategy are the result of differences in possessing and allocating resources/capabilities by firms (Barney et al., 2011). The barrier for firms to develop an EMS mainly lies in how their allocation and coordination of resources/capabilities is aligned to environmental management (Mittal et al., 2014). A proactive EMS represents a choice of actions by being more innovative in order to transform environmental investments into sources of competitive advantage and eventually to profit from such investments (Porter & Kramer, 2006).

Environmental orientation, as a firm capability in a firm's resource base, motivates a firm to respond to the institutional forces towards environmentalism, while innovation capability as another firm capability provides the required ability condition that enables a firm to do so. These two firm-level capabilities are complementary with each other in determining the firm's strategic response to institutional forces of environmentalism. On the one hand, a

strategic response is more likely to be effective when it is aligned with the appropriate corresponding orientation (Slater et al., 2006). On the other hand, organizational innovativeness enhances the effectiveness of a firm's strategic orientation (Menguc & Auh, 2006). We expect that these two resource factors are likely to moderate the relationship between institutional forces and EMS.

### **Environmental Orientation**

Environmental orientation is the managerial perception of the importance of environmental issues facing firms (Banerjee, et al., 2003). Embedded in a firm, it is determined by the pro-environmental organizational culture and managerial perception of the need to respond to the environmental demands of external institutional forces (Chan, 2010). Motivated by its environment orientation, a firm will pay closer attention to natural environmental issues (Gabler et al., 2015). Development and influence of environmental orientation is an integration process of cultural values/norms of environmentalism at institutional and firm levels (Blome & Paulraj, 2013). Prior research suggests that environmental orientation for Chinese firms is still at an early stage of developmental process, in reflecting the development stage of environmentalism in China (Chan et al., 2012; Child & Tsai, 2005). In comparison with foreign firms operating in China, especially those from western developed countries, local Chinese firms see a lower level of environmental orientation (Chan, 2010; Chan et al., 2012). Among them, exporting firms, especially those targeting markets in developed economies, tend to have a higher level of environmental orientation (Chan & Ma, 2016).

Environmental orientation is likely to moderate the relationship between institutional forces and a firm's EMS, because firms with different levels of environmental orientation tend to have heterogeneous responses to institutional forces when managing the interface

between business activities and the natural environment (Mittal et al., 2014). The logic underlying this predicted moderation effect is two-fold. First, a firm's environmental orientation shapes a firm's strategic vision and motivates employees to engage in environmental issues (Gupta & Kumar, 2013). It influences how the firm interacts with external institutional forces in terms of corporate environmental sustainability (Linnenluecke & Griffiths, 2010; Marshall et al., 2015). Institutional forces impose pressure on a firm to go green, but it is a firm's environmental orientation that influences the ways in which the firm responds to the institutional forces by rendering its commitment to environmental sustainability (Gupta & Kumar, 2013). With a low level of environmental orientation, a firm is less likely to proactively respond to external environmentalism, and its EMS is more likely to be reactive, or even passive, serving as a greenwashing (Bowen & Aragon-Correa, 2014). Inspired by a strong environmental orientation, a firm would broaden its scope in monitoring the dynamic evolution of institutional forces of environmentalism and in internalizing this information via inter-functional coordination (Dibrell et al., 2011). For instance, guided by the environmental culture of headquarters management, Western MNE subsidiaries operating in emerging markets (e.g. China) tend to proactively respond to institutional pressures, acting at the global level, rather than the local host country level (Chan et al., 2012; Child & Tsai, 2005; Christmann, 2004; Kim et al., 2016).

Second, a firm's environmental orientation would influence the firm's assessment of consequences associated with adoption of EMS (Banerjee et al., 2003; Chan, 2010). This in turn tends to affect the relationship between institutional forces and EMS. A firm may view the resource commitment to environmental management and associated higher level of operational complexity as either a risk/threat or as a new source for competitive advantage, depending on the level of environmental orientation (Gupta & Kumar, 2013). With a low level of environmental orientation, a firm tends to perceive the resource commitment and

resulted operational complexity as a risk or threat, so that the firm is more likely to respond to the institutional forces in a passive or reactive way by doing no more than conformance. On the other hand, with a high level of environmental orientation, a firm tends to view environmental investments in reflecting the prevailing environmentalism as a better utilization of resources leading to competitive advantage, so that the firm is more likely to proactively respond to the institutional forces (Lannelongue et al., 2014). For example, greening practices such as green product development and ISO14001 certification become a more effective way for market competition.

Thus, we propose:

*Hypothesis 2: The firm's environmental orientation strengthens the positive relationship between institutional forces in environmentalism and its EMS.*

### **Innovation Capability**

The concept of innovation capability captures a firm's ability in creating innovative ideas to produce new products and/or to improve a firm's processes in order to facilitate business results (Taherparvar et al., 2014). A firm is considered as possessing innovation capability when it is able to generate something new to the industry and/or the customer by consistently developing new products and improving its current processes (Gebauer, 2011; Spring & Araujo, 2013). As a dynamic capability, innovation capability is able to influence a firm's strategic behavior such as collaboration, technological development, and organizational learning (Berghman et al., 2012; Menguc & Auh, 2006; Spring & Araujo, 2013).

Environmental issues in China are notoriously severe and institutional forces of environmentalism are also in the process strengthening (McGuire, 2014), but the EMS developed by firms in China is far from effective (Bai et al., 2015). One of the key causes for this ineffectiveness is the low level of innovation capability for the Chinese firms (Chan et al., 2016). Following this logic, we predict that innovation capability influences a firm's

strategic response to institutional forces by moderating the relationship between institutional forces and EMS in the Chinese context. First, the level of innovation capability determines the extent in which a firm responds to the external institutional forces (Cai et al., 2016). Institutional forces in the form of institutionalized stakeholder pressure convey the message of taking natural environmental protection as a priority in a firm's business activities (Wu & Pagell, 2011). However, firms in China tend to develop different coping approaches to this institutional demand (Liu et al., 2016). Being armed with a high level of innovation capabilities, a firm is able to match the environmental priority with adoption of a proactive EMS (Chan et al., 2016). On the other hand, when possessing a low level of innovation capability, a firm is more likely to respond to the institutional forces reactively or even passively.

Second, innovation capability enables a firm to transform the institutional forces from a type of risk/threat in the external environment to an opportunity for establishing competitive advantage. Institutional pressures, such as government regulations as regulative force, impose penalty on those who do not conform. However, emerging market firms with strong innovation capability are able to turn a threat into an opportunity of building competitive advantage by taking proactive initiatives such as going beyond the regulations (Li & Liu, 2014). Thus, possessing and effectively applying innovation capability provide a firm with a potential avenue of differentiation by being proactive in environmental management.

Third, innovation capability may help a firm to convey a genuine concern to the stakeholders in its response to the institutional forces. By adopting a proactive EMS, an innovative firm is more likely to actively develop green innovations and can be seen as going above and beyond the standards articulated by institutional forces (Marshall et al., 2015). When a firm's green image is supported with green innovations, such image would be authentic as it is more deeply embedded in the firm's dynamic capability and more difficult

for competitors to imitate; On the contrary, with a poor innovation capability, a firm's response to the institutional forces can only be reactive or even passive, serving as a greenwashing (Bowen & Aragon-Correa, 2014). Thus, we have:

*Hypothesis 3: The firm's innovation capability strengthens the positive relationship between institutional forces in environmentalism and its EMS.*

## **RESEARCH METHODS**

### **Sampling and Data Collection**

We tested the hypotheses with data collected from manufacturing firms operating in China. As a large country with highly uneven economic development levels across regions, China sees that pollution levels vary significantly among firms and that provinces differ in levels of environmental damage, environmental regulation and enforcement (Dean et al., 2009; Wei et al., 2017). To ensure comparability among respondents and facilitate interpretation of research findings, we collected data from Dongguan, a major city in the highly industrialized Pearl River Delta in Guangdong Province. With a near 10-million population (including migratory labor forces) (Dongguan Statistical Bureau, 2010), it is among the wealthiest cities and characterized with the highest manufacturing density in China as foreign and domestic firms packed into this area, taking advantage of the well-established infrastructure and supply chains. Previous management studies suggest that manufacturing firms in Dongguan provide a good presentation of firm population in Guangdong Province in general and the Pearl River Delta region in particular (e.g. Fu et al., 2013). We believe that sampling manufacturing firms operating in Dongguan with a high-level industrialization and manufacturing concentration is able to facilitate a more accurate grasp of the evolutionary trend and dynamic nature of environmental management in China.



We collected both survey- and archive-based data of manufacturing firms operating in Dongguan from a population of about 3,100 firms during October – December 2010. We randomly selected 650 companies from the *Directory of Dongguan Manufacturing Enterprises*. We surveyed senior management executives with titles including managing director, general manager, vice-general manager of production/health and safety/environmental protection, who are supposed to have discretion over and/or are knowledgeable about decision-making on the strategic management issues. Before the survey delivery, we sought help from Dongguan Bureau for Production Safety Supervision (a governmental agency of production safety watchdog) and its branches at district level for contact details of the senior executives. Research information and institutional endorsement were presented to the potential survey participants via facsimile. Telephone pre-screening was conducted to identify the senior executive who was cognizant and influential in environmental management, to explain our survey objectives, and to seek initial consents to participate the survey. We received 153 returned questionnaires, representing a response rate of 23.5%, comparable with the typical rate for mail surveys. We excluded 21 incomplete questionnaires and finally had 132 useful responses for the study. In order to complement the survey based data, we also collected archive-based objective data for our sample firms' status in accreditation of ISO9001 and ISO14001 from the official website of China's Certification and Accreditation Administration.

Table 1 summarizes the sample firms' size, ownership type, and industry.

(Insert Table 1 around here)

## **Variables and Measures**

*Dependent variable.* The dependent variable (DV) was the firm's adoption of an *EMS*. This study adopted two different measures for this DV. First, we measured the DV by

self-reported subjective measurement in terms of the firm's systematic actions in managing the interface between the natural environment and the firms' business activities as the measure of *EMS* (Chan, 2010; Molina-Azorín et al., 2015; Wei et al., 2017; Wu et al., 2014). A seminal study by Hart (1995) suggests that simultaneous investments in several linked resource domains are required to move one stage of the environmental strategy to the next. It further posits that a distinction of different strategies lies in various levels of resource commitment to environmentalism as measured by investments in firm's competencies. This logic was adopted by other studies, which suggest that investment commitments of a firm towards organizational competencies in the 'resource domains' of physical assets, organizational knowledge and expertise, and employee skills for adoption of EMS represent the firm's purposive actions to become 'greener' (Buisse & Verbeke, 2003; Wu et al., 2014). Following this logic, we adapted three survey items from the literature to measure the firm's organizational competencies in environmental management in terms of its resource commitments on: (1) capital investment in machinery and equipment, (2) investment in organizational knowledge and expertise, and (3) investment in employee training and education (see Table 2 for details). We adopted the first item from Bansal (2005) and Sharma (2000), the second from Aragon-Correa et al. (2008), and the third from Branzei et al. (2004) and Aragon-Correa et al. (2008) to form the dependent variable (Cronbach  $\alpha = 0.724$ ). Mean scores of the dimensional items are used as the measure of dependent variable for hypothesis testing.

Following Buisse & Verbeke (2003), the three measurement items were subjected to a cluster analysis, using the SPSS Quick cluster routine. A three-cluster solution of the analysis yielded a clear separation of our sample firms into three groups, as shown in Table 2.

(Insert Table 2 around here)

A relatively small group of firms were characterized with low organizational competencies in environmental management; another smaller group of firms were featured by high organizational competencies, representing the industrial leaders. There was a large group of firms with intermediate organizational competencies. The three groups of firms represent firms with different types of EMS (passive, reactive and proactive). Our grouping of firm EMS is compatible with the categorization of resistance, conformance, and opportunity-seeking in firms' strategic responses to environmentalism (e.g. Pedersen & Gwozdz, 2014). The robustness of a three-cluster solution was tested. First, as shown in Table 2, results from one-way analysis of variance demonstrate ANOVA F-statistics of the cluster means for three measurement items are highly significant for all clusters, indicating that the three-cluster classification of sample firms along the level of resources committed to environmental strategies is statistically justified (Hair et al., 2006). Second, a cluster analysis was repeated on randomly selected subsamples of our samples, the classification made within these subsamples presented similar grouping result (around 90%). The results can be considered as being independent of other sample characteristics (Buysse & Verbeke, 2003).

In addition, we included *ISO14001 certification* as an objective measure to capture a firm's EMS<sup>[1]</sup>. Certification of ISO14001 represents a major characteristic of a firm in relation to its environmental management, and gaining this certification has been widely regarded as a firm's significant voluntary initiative in adopting proactive EMS (Christmann & Taylor, 2001; Gavronski et al., 2013; McGuire, 2014; Su et al., 2015; To & Tang, 2014; Zhu, Cordeiro, & Sarkis, 2013). Thus, in our empirical modelling we have two different measures of EMS of: (1) a firm's perception of its systematic action in terms of EMS as the subjective measurement, and (2) certification of ISO14001 as the objective measure of EMS.

These two measures of EMS are complementary and thus address possible limitation of the subjective measure.

*Independent variables.* We gauged the main variable of *institutional forces* on the respondent's perception in terms of environmentalism on the firm's operations along eight measurement items, which represent the three dimensions of institutionalized forces in terms of regulative pressure, public pressure, and industrial pressure. Two items of (1) government standards, and (2) environmental regulations, were taken to represent regulative pressure and these two items were taken from Branzel et al. (2004); three items of (1) media attention, (2) constraint from NGOs, and (3) local community concern, were used to measure public pressure, and these three items were taken from Bansal (2005) and Child and Tsai (2005); finally, in following Hoffman (1999) and King and Lenox (2000), three items of (1) industrial initiatives/association, (2) competitors in the industry, and (3) trade association, were used to measure industrial pressure. Mean scores of these eight-dimensional items are used to operate institutional forces.

We measured *environmental orientation* with four items. The first three items, top manager's involvement, personal responsibility, and individual's role, were from Branzel et al. (2004) and Chan (2010) to capture a firm's organizational culture/ethical standards towards environmental protection. A fourth item, helpfulness for competitive advantage, was adapted from Chan (2010) and Orsato (2006) to capture managerial perception of the need to respond to the environmental demands of external institutional pressures. We measured *innovation capability* by two items of product innovation and process innovation from Christmann (2000).

*Control variables.* We controlled for several factors that may influence a firm's adoption of EMS. *Ownership type* was devised as a dichotomous variable distinguishing ownership types of foreign invested and domestic owned companies (Christmann & Taylor, 2001). *Firm size* is gauged by the natural logarithm of the number of employees (Darnall & Edwards, 2006). Our study also controlled for *industry effect* measured by pollution index for involved industries, as the environmental impact of firms may be associated with difference in industries. Following Chan (2010), three percentages representing the respective shares of waste water, waste gas, and solid wastes produced by each industry in China were computed, based on data from the *China Statistical Year book* (2010). The pollution index of each industry was derived by multiplying the average of three percentages by 100. *ISO9001 certification* was included as a control variable for model testing by using ISO14001 certification as DV, as both are standards-based management practices and ISO14001 certification would be easier for firms that have already implemented ISO9001 (Christmann & Taylor, 2001).

(Insert Table 3 around here)

We asked the respondents to rate the survey items on five-point Likert scales except for the three control variables in survey-based data. Table 3 provides a description of dependent and independent variables, the survey items in measuring these variables, and results of scale reliability tests.

*Data validity.* We conducted several preliminary tests to check data quality. We performed wave analysis to investigate whether a nonresponse bias existed in our data (Fowler, 1993). We split the completed survey questionnaires into early respondents and late respondents, and then ran independent sample *t*-test. There were no significant differences in *t* values for dependent and independent variables for the two groups, indicating no nonresponse bias for

the data. To control for respondents' social desirability bias (SDB), we 'triangulated' the self-reported survey data (Nederhof, 1985) for several variable measures between our sample and the base population, including ownership type, firm size, certification of ISO9001, certification of ISO14001. Statistical data about the population for these variables were obtained from Dongguan Statistical Bureau. A comparison of the distribution regarding these variable measures suggests that our data were largely consistent with population, which increased our confidence in the validity of the self-reported data.

The confirmatory factor analysis (CFA) results suggest that both convergent and divergent validities are achieved. We assessed the reliability of individual items by inspecting their internal consistency values and the loadings of the items on their corresponding construct. As in Table 3, the internal consistency values for all latent constructs are satisfactory, ranging from .724 to .821. The individual item loadings are statistically significant ( $p < 0.001$ ) on their respective latent constructs, with the completely standardized factor loadings ranging from .50 to .95. This result is indicative of convergent validity of construct measurement (Gerbing & Anderson, 1988). We used the resulting mean scores of each respective multiple-item latent construct for hypothesis testing. The descriptive statistics, correlation matrix, and VIF values are shown in Table 4. We assessed the divergent validity of the measures by calculating the shared variance between all possible pairs of the constructs to determine whether they were lower than the average variance extracted (AVE) for the individual constructs (Hair et al., 2006). As in Table 5, the squared correlations between constructs are below the AVE for each construct and the AVEs for all variables are significantly above the recommended threshold of .50, demonstrating the achievement of discriminant validity (Lindell & Whitney, 2001).

We employed design and statistical control approaches to prevent common method variance (CMV) (Podsakoff et al., 2003). We carefully designed the survey instrument to

minimize the occurrence of CMV. First, we mixed and spread measurement constructs all over the questionnaire to diminish commonality bias (Chang et al., 2010). Second, we provided verbal labels for the middle-points of the measurement items to eliminate any acquiescence bias (Tourangeau et al., 2000). Third, the questionnaire used different scale types for survey measurements, e.g. Likert scales for *EMS* and *institutional forces*, direct selection for ownership and industry type.

Moreover, we assessed the potential CMV by applying two statistical control approaches. First, we conducted Harmon's single factor test using CFA (Podsakoff et al., 2003). We tested a series of sequential chi-square models including the single-factor baseline model and the unconstrained four-factor model (i.e. *EMS*, *institutional forces*, *environmental orientation*, and *innovation capability*). Our four-factor model fits the data well ( $\chi^2=189.30$ ,  $df=80$ ,  $CFI=0.92$ ,  $\Delta\chi^2=0.92$ ,  $RMESA=0.063$ ). The fit for the single-factor model was considerably worse than the four-factor model. Based on examination of results from the chi-square difference test ( $\Delta\chi^2=137.82$ ,  $df=80$ ,  $p<0.05$ ) between the two models, the four-factor model is significantly better than the single-factor model. Second, we adopted a marker variable (MV) method. We selected a MV to proxy CMV (Lindell & Whitney, 2001). A four-item variable was used to measure the firm's practices regarding social equity (Bansal, 2005) as the MV (Cronbach's  $\alpha = 0.701$ ), as it is theoretically unrelated to at least one of our variables. We selected the lowest positive correlation ( $r = .07$ ) between MV marker and other variables to adjust the variable correlations and statistical significance. As in Table 5, all significant correlations remained significant after adjustment. Thus, the MV analysis suggests that CMV would not be a major threat to our tests.

(Insert Table 4 around here)

(Insert Table 5 around here)

Table 4 presents the descriptive statistics, correlations, and AVE. An examination of variance inflation factor (VIF) indicated that multicollinearity was not a problem for regression analysis.

### **Regression Analysis**

Our conceptual framework might have best been tested with a structural equations approach. However, the relatively small sample size and number of variables to be tested were apt to lead to unstable estimation results. It is also not appropriate to use the ordinary least square (OLS) model, given the potential endogeneity problem of firm characteristics affecting the moderators in the study and potential reverse causality between the moderators and dependent variable. We performed Durbin and Wu-Hausman tests of endogeneity for *environmental orientation* and *innovation capability* in our estimation model and found that these two variables are endogenous. The underlying assumption of OLS model is that predictor variables are uncorrelated with the error term of a dependent variable. Inclusion of endogenous variables as predictors of other endogenous variable meant that the assumption of OLS was not tenable. Thus, 2-stage least square (2SLS) model was adopted as the method for empirical analysis. This model has been increasingly recommended for business strategy research because of its ability to address the endogeneity problem (e.g. Nadkarni et al., 2011; Yuan et al., 2016). An additional benefit of the 2SLS regression method is its ability to partial out the confounding effects of potential reverse-causality (proactive EMS might strengthen a firm's *environmental orientation* and *innovation capability*), so that the moderating effects of firm capabilities on the relationship between institutional forces and EMS can be accurately tested.

To operate the 2SLS model, in the first stage regression, we predicted values for the endogenous regressors of *environmental orientation* and *innovation capability* by using



additional instrumental variables (IVs) (Bae & Lawler, 2000). Two IVs are required to render the system identifiable, as we have two endogenous regressors (Yuan et al., 2016). Good IVs need to meet some key conditions: they must be correlated with the endogenous variables and values of the IVs should be unrelated to the error values of the structural model. These two IVs were selected from our original survey data, and both variables were objective measures of firm-specific characteristics, including the number of years a company had been in operation in China, and the number of years since a company had started exporting.

For the first stage of the regression, *environmental orientation* and *innovation capability* were modelled as a function of instrumental variables of *number of years of operation in China* and *number of years since first exporting*, and remaining control variables. In the second stage, the predicted values from first stage estimation were included to test moderation effects by adding the moderation terms in the regression. We mean centered the independent and moderating variables to avoid potential multicollinearity and to ease the interpretation of non-product terms (Cohen et al., 2003).

(Insert Table 6 around here)

To assess the robustness of our empirical results, we also estimated the EMS conceptual model by using the OLS and Tobit models. Tobit analysis was chosen because this maximum likelihood technique is able to accommodate the possibility of censoring in the data (Russo & Harrison, 2005), given our dependent variables was measured based on a finite scale.

Table 6 presents estimation results for both subjective and objective measures of the DV. The parameter estimate for *institutional forces* is positive and significant in both OLS and 2SLS models, thus providing support for H1. It is interesting to note that results generated from these two regression models are somehow different in their coefficient values, although they are qualitatively the same. In comparison to the results from 2SLS regression, OLS regression tended to generate upwardly biased estimation coefficients for the independent

variable of *institutional forces*. This tendency was consistent for almost all control, independent, and moderating variables, suggesting the prudence of adopting 2SLS method to estimate the conceptual model.

The interaction term of environmental orientation and institutional force is positively and significantly related to EMS in both models, but the significance is at the .10 level, suggesting some marginal support to H2. Estimation results demonstrated that the interaction term of innovation capability and institutional force is positive and significant, suggesting a strong moderating effect of innovation capability on the link between institutional force and EMS, as in H3. The last column in Table 6 demonstrates the estimation results for the objective measure of the DV by using *ISO14001 certification*. The testing results from this modelling are qualitatively same with those from modelling by using the subjective measure of the DV, demonstrating a robustness of our modeling results.

(Insert Figure 2 around here)

To test the nature of the moderation effects, we conducted further regression analysis at low and high levels of perceived *institutional force* to interpret the moderating effects of *environmental orientation* and *innovation capability* respectively, calculated as mean value plus and minus one standard deviation (Jaccard et al., 1990). The additional regression analysis suggests that there is a linear and positive relationship between *institutional force* and EMS and that the two moderators attenuate the impact of *institutional forces* on EMS by strengthening the linear relationship when the moderators are at presence. We graphically illustrate these regression results in Figure 2. As in Figure 2a, a more positive regression slope of *institutional force* at a high level of *environmental orientation* suggests that the relationship between *institutional forces* and adoption of EMS is stronger at a high level of *environmental orientation*. As in Figure 2b, the regression slope for *institutional forces* is

more positive at a high level of *innovation capability*. Together, these results provide further support to both H2 and H3.

## **DISCUSSION AND CONCLUSIONS**

Motivated by research gaps in prior EMS studies that overlook the effect of organizational capabilities on firms' response to external institutional challenges, our study aims to gain a deeper understanding of the firm's EMS development. It theorizes and empirically demonstrates manufacturing firms in the emerging market of China responded differently to the institutional forces of environmentalism, depending on their environmental orientation and innovation capability. The EMS literature has long recognized that firms may develop different types of EMS, ranging from passive, reactive, and proactive (Buysse & Verbeke, 2003; Liu et al., 2016; Pedersen & Gwozdz, 2014). Using the strategic response theme of institutional theory and RBV, our study extends this stream of literature by emphasizing the implication of firm capabilities for a firm's strategic response to the external institutional forces. Overall, our study provides a number of theoretical implications, discussed below.

Modelling external institutional forces and internal capability factors that jointly impact a firm's EMS, our study contributes to the EMS literature by proposing and testing an interactive conceptual framework, going beyond institutional theory's conventional typology of isomorphic process that focuses on conformance and convergence. How firms equipped with heterogeneous resource bases respond to institutional challenges differently has longed for more research (Peng et al., 2008; Raaijmakers et al., 2015). Our study addresses this under-researched area by theorizing that firms with a better resource/capability base will be more effective and efficient in adapting to and going beyond the institutional requirements when developing their EMS. Our empirical results support this notion.

Our research also contributes to RBV by demonstrating how firm capabilities result in divergence in firm EMS when firms are embedded in the same institutional framework. Past integrative efforts (Lin et al., 2009; Meyer et al., 2009; Oliver, 1997) explore institutional background as conditions for influence of resources on firm strategies. Institutional considerations imply the similarity in firms' strategies when they share the same institutions. RBV posits that firms may vary in practices due to the resource heterogeneity even in the same institutional framework. Our findings confirm that environmental orientation and innovation capability facilitate firms' EMS in a more proactive manner to address the institutional challenges in environment protection, at least in the Chinese context.

Our research uses data from China, exemplifying many attributes of emerging markets, and extends our understanding of firms in emerging markets. Emerging markets, e.g. BRICs (Brazil, India, Russia, and China), have been undergoing rapid economic growth in recent years whose massive industrialization has relied on the extensive expansion of production, with a huge consumption of energy and natural resources, resulting in a rapid increase of waste and environmental pollution. EMS followed by firms operating in these areas has the potential to seriously affect the natural environment on a global scale. Our research provides an integrated approach exploring how firms in these economies can take up the institutional challenges.

### **Limitations and Future Research**

This study also has several limitations, which fellow researchers should beware. First, firms' EMS as a research topic has been addressed in the literature by applying various theoretical approaches, such as stakeholder approach, corporate social responsibility approach, and competitive advantage approach. Our empirical results could also be explained by adopting these alternative theoretical approaches. Moreover, our regression modelling has only

partially accounted for the likely variance for EMS. Other factors internal and external to firms could account for the variance unexplained in our regression models. These factors can include the institutionalized external forces from the stakeholders, which are not included in our measure of institutional forces, such as employee pressure, and consumer pressure, and pressure from supply chain partners; the factors internal to the firm, such as a firm's financial slack and financial performance, and a firm's internal capabilities (e.g., managerial capability, learning capability, and absorptive capability). Second, although it is a widely accepted approach in business strategy research, the cross-sectional design of this study does not allow tests inferring causal linkages in our model. Further research may adopt a longitudinal design to analyze the evolution of EMS and its causal linkages. Third, we did not include performance variable in our study. Firms with better financial performance will be more likely to develop and implement proactive EMS. Future research would consider including firm performance. Fourth, our measurement of EMS in terms of resource commitments does not clearly include acting beyond legal requirement standards, a significant feature of a proactive environmental strategy, although our measure is able to accommodate this feature by a comparison between firms' resource commitments. Future research could develop a more comprehensive measure.

## NOTES

[1] We thank a reviewer for this inclusion of objective data.

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Table 1. Sample firm description

| <b>Ownership</b> |            | <b>Primary Industry Affiliation (SIC 2)*</b>                             |            |
|------------------|------------|--|------------|
| State-owned      | 6          | Food and Kindred (SIC2)  | 4          |
| Private-owned    | 28         | Textile and Clothing (SIC 20)  | 16         |
| Joint-venture    | 23         | Furniture and fixture (SIC 25)   | 10         |
| Foreign-owned    | 75         | Paper and allied (SIC 26-27)   | 7          |
| <b>Total</b>     | <b>132</b> | Plastics processing (SIC 29-30)  | 14         |
|                  |            | Metal processing (SIC 33-34)   | 21         |
|                  |            | Machinery (SIC 35)   | 26         |
|                  |            | Electronics (SIC 36)   | 25         |
|                  |            | Transportation equipment (SIC 37)  | 6          |
|                  |            | Other manufacturing (SIC 39)   | 3          |
|                  |            | <b>Total</b>   | <b>132</b> |
|                  |            | *classified according to Standard Industrial Classification system (SIC) |            |
| <b>Firm Size</b> |            |  |            |
| <200             | 57         |  |            |
| 200-500          | 44         |  |            |
| 500-1000         | 15         |  |            |
| 1000-2000        | 8          |  |            |
| >2000            | 8          |  |            |
| <b>Total</b>     | <b>132</b> |  |            |

Table 2. Cluster means of measurement items for environmental management strategy

|                                 | Group 1<br>Passive strategy | Group 2<br>Reactive strategy | Group 3<br>Proactive strategy | ANOVA<br>F |
|---------------------------------|-----------------------------|------------------------------|-------------------------------|------------|
| Item 1: capital investment      | 2.70                        | 2.91                         | 4.33                          | 87.636     |
| Item 2: knowledge and expertise | 2.27                        | 4.0                          | 4.30                          | 114.747    |
| Item 3: training and education  | 2.52                        | 3.09                         | 4.15                          | 67.310     |
| Number of firms                 | 44                          | 61                           | 27                            |            |

Table 3. Measurement model

| Constructs  | Measurement Items  | Factor loading | t-value | R <sup>2</sup> |
|---|--|----------------|---------|----------------|
| <i>Environmental Management Strategy</i> ( $\alpha=0.724$ ) |  |                |         |                |
|   | Our firm increased investment in machinery and equipment to reduce environmental harmful impact in comparison to previous years or to our competitors.                   | 0.76           | Fixed   | 0.57           |
|   | Our firm increased resource commitment in specific knowledge and expertise related to environmental management in comparison to previous years or to our competitors.    | 0.50***        | 4.98    | 0.30           |
|   | Our firm increased resource commitment in training and education of employees related to environmental management in comparison to previous years or to our competitors. | 0.81***        | 6.87    | 0.57           |
| <i>Institutional forces</i> ( $\alpha=0.774$ )              |  |                |         |                |
| Regulative Pressure   | Government has set up pollution/production standards, so we have to make sure we do not violate them.  | 0.608          | Fixed   | 0.30           |
|   | My company is subject to a lot of environmental regulations regarding environmental matters.   | 0.499***       | 5.46    | 0.52           |
| Public Pressure   | Media attention has had a large impact on our implementation of environmental management as negative media exposure can seriously hurt business activities.              | 0.528***       | 6.73    | 0.34           |
|   | Pressure from NGOs, such as Friends of the Nature, plays a role in adoption of environmental management in our firm.   | 0.641***       | 6.62    | 0.66           |
|   | The rights and claims of local community concern played a role in adaption of environmental management.  | 0.519***       | 6.75    | 0.72           |
| Industrial Pressure   | Industrial initiatives/association advocated the implementation of environmental management.   | 0.797***       | 8.26    | 0.65           |
|   | Our major competitors have implemented environmental management strategy.  | 0.674***       | 8.10    | 0.53           |
|   | My company's trade with associations has influenced our environmental practices.   | 0.778***       | 8.40    | 0.58           |
| <i>Environmental Orientation</i> ( $\alpha=0.787$ )         |  |                |         |                |
|   | Many top level managers in our company are personally and actively involved in developing environmental management strategy and monitoring its implement.                | 0.67           | Fixed   | 0.54           |
|   | I feel it is my personal responsibility to ensure that my company improves its performance in environmental sustainability.  | 0.73***        | 7.01    | 0.43           |
|   | It is the role of each individual in our company, no matter his or her position, to see that our company's growth is environmental y sustainable.                        | 0.84***        | 7.66    | 0.72           |
|   | Our company implemented environmental management practices, as these practices are helpful in improving the competitive advantage.                                       | 0.71***        | 8.13    | 0.66           |
| <i>Innovation Capability</i> ( $\alpha=0.821$ )             |  |                |         |                |
|   | Relative to our major competitors that manufacture   | 0.95           | Fixed   | 0.62           |



in the China, our firm has been more capable in introduction of product innovations over the last three years.

|   |         |      |      |
|---|---------|------|------|
| Relative to our major competitors that manufacture in the China, our firm has been more capable in introduction of process innovations over the last three years. | 0.78*** | 12.4 | 0.60 |
|---|---------|------|------|

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*Note:* \*\*\* p<0.001

Table 4. Descriptive statistics, correlation matrix, and VIF value

| Constructs                  | Mean | SD   | VIF   | 1      | 2      | 3      | 4    | 5    |
|-----------------------------|------|------|-------|--------|--------|--------|------|------|
| 1 Firm Size                 | 6.46 | 0.85 | 1.085 | 1      |        |        |      |      |
| 2 Industry effect           | 3.33 | 1.01 | 1.014 | -0.127 | 1      |        |      |      |
| 3 Institutional forces      | 3.94 | .794 | 1.780 | 0.241* | -0.142 | 1      |      | .    |
| 4 Environmental orientation | 3.90 | .748 | 1.530 | 0.020  | -0.085 | -0.169 | 1    | .    |
| 5 Innovation capability     | 2.53 | 1.24 | 1.047 | -0.167 | -0.134 | 0.062  | .029 | 1    |
| 6 MV marker                 | 2.93 | .860 | 1.069 | 0.081  | -0.054 | .110   | .112 | .150 |

Notes: \*p<0.05 (two tailed); \*\*p<.01 (two tailed)

Table 5. Adjusted Correlation and **AVE** value

| Constructs                  | 1      | 2              | 3             | 4             | 5             |
|-----------------------------|--------|----------------|---------------|---------------|---------------|
| 1 Firm Size                 |        |                |               |               |               |
| 2 Industry effect           | -0.125 | <b>(0.841)</b> |               |               |               |
| 3 Institutional forces      | 0.239* | -0.138         | <b>(.695)</b> |               | .             |
| 4 Environmental orientation | 0.018  | -0.082         | -0.166        | <b>(.773)</b> |               |
| 5 Innovation capability     | -0.163 | -0.131         | 0.059         | .025          | <b>(.823)</b> |
| 6 MV marker                 | 0.078  | -0.050         | .107          | .109          | .147          |

*Notes:* values are adjusted for potential common method variance (CMV); values on the diagonal are the square root of the average variance extracted (AVE) for the variable

Table 6. Regression results for direct and moderation effects

| Variable   | Perceived EMS       |                     |                     | ISO14001             |
|--|---------------------|---------------------|---------------------|----------------------|
|  | OLS                 | Tobit               | 2SLS                | 2SLS                 |
| <b>Control</b>                                   |                     |                     |                     |                      |
| Firm size  | -0.187*<br>(0.065)  | -0.136*<br>(0.060)  | -0.129*<br>(0.090)  | -0.750**<br>(0.330)  |
| Industry effect                                  | 0.124<br>(0.012)    | 0.104<br>(0.010)    | 0.115<br>(0.015)    | 0.590<br>(0.380)     |
| Ownership  | -0.145<br>(0.061)   | -0.140<br>(0.072)   | -0.121<br>(0.054)   | -3.71**<br>(1.31)    |
| ISO9001  |                     |                     |                     | 2.59***<br>(0.822)   |
| <b>Main Effect</b>                               |                     |                     |                     |                      |
| Institutional forces (IF)                        | 0.506***<br>(0.104) | 0.516***<br>(0.096) | 0.501***<br>(0.121) | 3.29**<br>(1.103)    |
| <b>Moderating Variables</b>                      |                     |                     |                     |                      |
| Environmental orientation                        | 0.027<br>(0.005)    | 0.021<br>(0.005)    | 0.050<br>(0.003)    | 0.318<br>(0.129)     |
| Innovation capability                            | 0.250**<br>(0.058)  | 0.248**<br>(0.044)  | 0.238**<br>(0.032)  | 1.27***<br>(0.579)   |
| <b>Moderation</b>                                |                     |                     |                     |                      |
| Environmental orientation × Institutional forces | 0.157*<br>(0.008)   | 0.130*<br>(0.008)   | 0.127*<br>(0.007)   | 2.28*<br>(1.51)      |
| Innovation capability × Institutional forces     | 0.146**<br>(0.026)  | 0.145*<br>(0.050)   | 0.113**<br>(0.031)  | 1.02**<br>(0.581)    |
| F  | 7.412***            |                     | 7.351***            | 15.7**§§             |
| Adj. R <sup>2</sup>                              | 0.338               | 0.339 <sup>§</sup>  | 0.322               | 0.273 <sup>§§§</sup> |

Notes: \*p<0.10; \*\*p<0.05; \*\*\*p<0.01; <sup>§</sup>Sudo-R<sup>2</sup> reported for Tobit regression; <sup>§§</sup> Hosmer & Lemeshow Goodness of fit ( $\chi^2$ ); <sup>§§§</sup> Cox-Snell R<sup>2</sup>

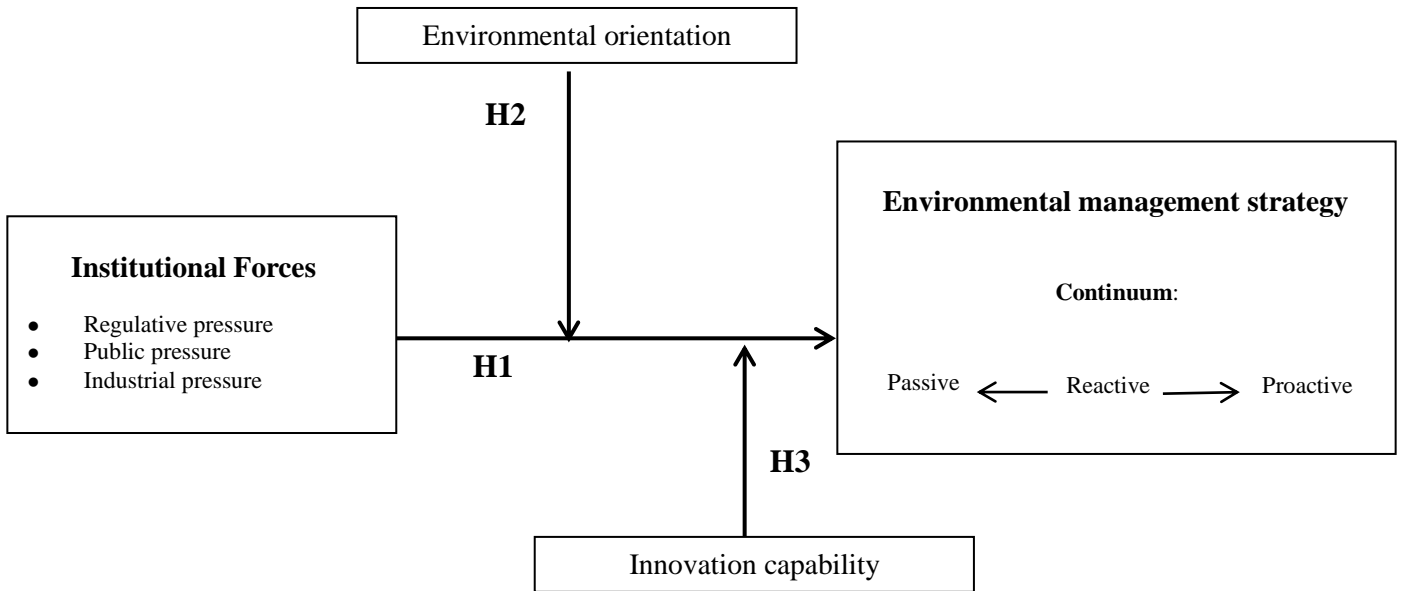


Figure 1. Contingency model of environmental management strategy

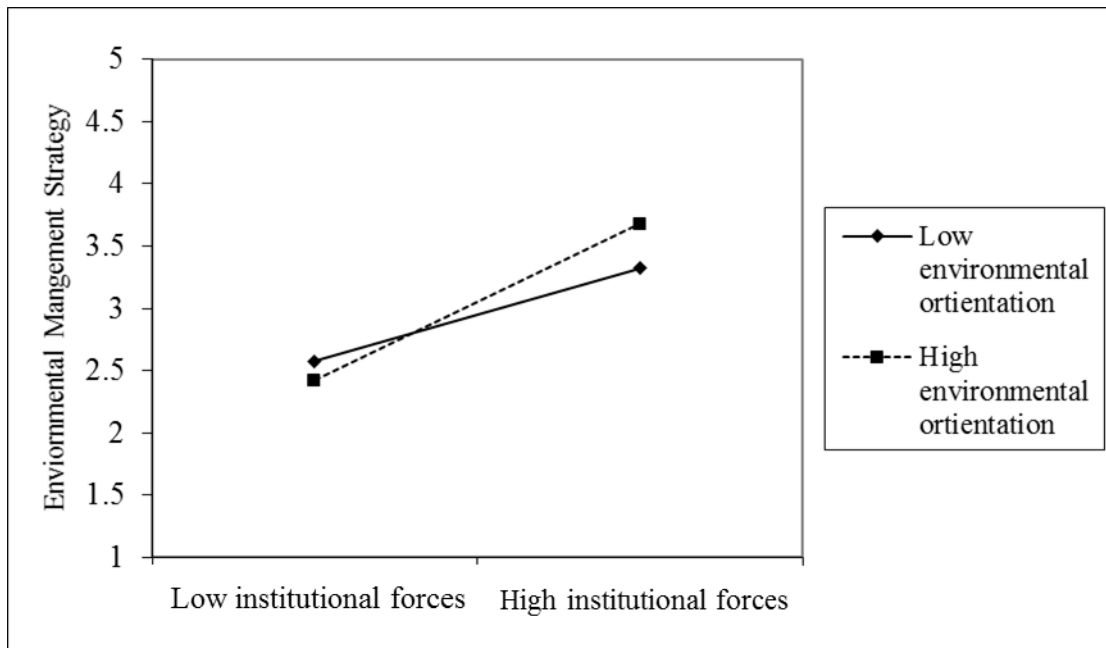


Figure 2. The moderating effect of environmental orientation on the relationship between institutional forces and environmental management strategy

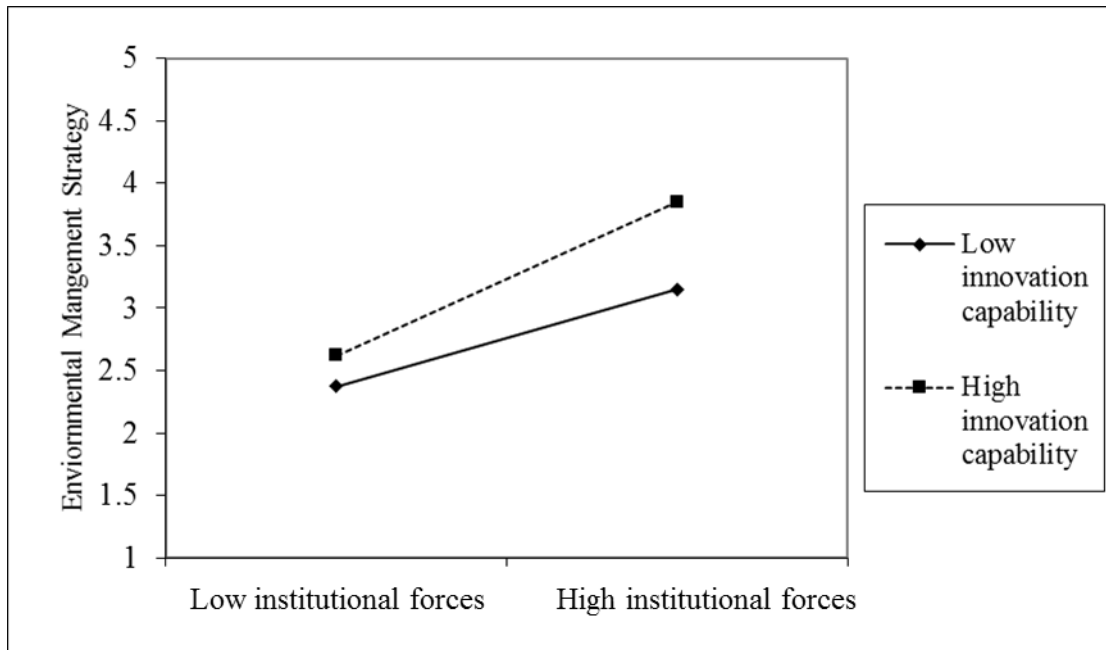


Figure 3. The moderating effect of innovation capability on the relationship between institutional forces and environmental management strategy

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