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Mediating effect of managers' environmental concern: Bridge between external pressures and firms' practices of energy conservation in China

Bin Zhang [a, b, c], Zhaohua Wang [a, c, *], Kee-hung Lai [b]

[a] School of Management and Economics, Beijing Institute of Technology, Beijing 100081, China
[b] Department of Logistics and Maritime Studies, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong
[c] Center for Energy & Environmental Policy Research, Beijing Institute of Technology, Beijing 100081, China

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ABSTRACT

This paper extends previous literature of corporate environmental practices by empirically exploring the relationship between external pressures and firm's energy conservation practices with considering the mediating effect of its senior managers' environmental concerns. A questionnaire survey is used to collect data from 187 industrial firms located in the Circum-Bohai Sea Economic Zone of China. Partial least squares structural equation modeling is employed to analyze the survey data collected and test the research hypotheses in the model. The results show that a senior manager's environmental concerns play a significant role in the connection between firms' energy saving practices and the external pressures such as normative and mimetic pressures. However, the environmental concern of senior managers is only positively related to the energy conservation strategy — it shows no direct association with the concrete operations of energy conservation.

1. Introduction

With the increasing concern surrounding global climate change, energy conservation and carbon emission reduction have become a critical focus in industrial activities. There are various sources of pressure calling for low-carbon production, e.g. environmental regulation, and community and customer demand (Yen & Yen, 2012). In order to balance economic and environmental performance in response to these external pressures, many industrial firms have recognized the importance of being low-carbon and environmentally-proactive by developing and implementing so-called 'green' strategies (Fisher-Vanden & Thorburn, 2011; Gale, 2006). According to Porter's hypothesis, strict environmental regulation triggers the discovery and introduction of cleaner technologies and environmental improvements. Strict environmental regulation brings efficiency improvement and cost savings that are sufficient to overcompensate for both the compliance for new regulations and innovation (Wagner, 2003). Particularly in energy conservation, environmental regulation pushes the firms to reduce their energy consumption, which could bring both cost-saving and environmental benefits. The industrial practices used for energy conservation and carbon footprints reduction, as a result, are increasingly highlighted in purchasing, manufacturing, and marketing of products and services for many firms.

There is a rich body of environmental management literature investigating the external pressure on industrial practice with regard to environmental sustainability (see, for example, Ji, Gunasekaran, & Yang, 2014; Zhu, Sarkis, & Lai, 2013). The external pressures that are often considered as motivation for firms to adopt environmental management practices include meeting customer demands (Gualandris & Kalchschmidt, 2014), complying with regulatory requirements (Jones, 2010), and facing competitiveness (Mihalič, 2000). Prajogo, Tang, and Lai (2012) further employed institutional theory as a complementary theoretical lens to classify the external pressures that motivate industrial environmental management practices into three different institutional isomorphic categories: coercive, mimetic, and normative. As with other environmental management practices, energy conservation and low-carbon activities are also influenced by the external pressures mentioned above (Liu, Niu, Bao, Suk, & Shishime, 2012; Suk, Liu, & Sudo, 2013). In particular, pursuing alternative economic benefits, such as reducing energy expenditure and carbon trading (Zhang, Wang, Yin, & Su, 2012), is frequently considered as

* Corresponding author. School of Management and Economics, Beijing Institute of Technology, Beijing 100081, China.
E-mail address: wangzh1018@hotmail.com (Z. Wang).

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an external motive for industrial practice of energy conservation. Extant studies are confined to the effect of external pressures such as regulation and stakeholders' requirements, neglecting the environmental concerns by managers. Indeed their concerns should be critical for industrial practices relating to energy conservation, because perceived value of environment is an important part motivating managers to conduct environmental strategy such as energy conservation. It would be interesting to explore whether there is a potential relationship between environmental concerns of managers and energy conservation with empirical evidence.

Additionally, there seems to be a 'black-box' between external pressure and industrial environmental practice (Prajogo et al., 2012). How are the external pressures converted to positive forces driving the implementation of environmental practices? Are there any other factors playing an intermediate role in the relationship between the external pressure and industrial environmental practices? As senior managers are the major decision-makers in industrial firms, their commitment to environmental sustainability has a strong influence on the firm's strategies and activities associated with energy conservation. The effect top or senior management influencing environmental management practice in each business decision, process/product development activity, and strategic plan has thus emerged as an important topic (Gholami, Sulaiman, Ramayah, & Molla, 2013). There is a view that resource allocation for environmental management practice relies on top management commitment (D'Amato & Roome, 2009). Management support is also considered to be the first resource for Chinese manufacturers to achieve their energy saving and emission reduction goals (Zhu & Geng, 2013). Environmental concern is one of the most important motives for individual intention with regard to environmental behavior (Wang, Zhang, Yin, & Zhang, 2011), which is also influenced by the external environmental climate (Liu, Vedlitz, & Shi, 2014). External pressures (such as environmental regulations and a pro-environment climate) may incentivize the environmental concern of senior managers promoting their positive decisions in relation to the energy conservation practices of the industrial firm. From this perspective, the environmental concern of senior managers could be one of the key factors bridging the link between external pro-environment pressure and energy conservation practice in organizations. However, few empirical evidences, to the best of our knowledge, exist to verify the mediation effect of a senior manager's environmental concern on the pressure-practice link. This provides an opportunity to further enrich the literature by examining the link.

The environmental management practices of industrial firms need to be subdivided into environmental strategies and concrete environmental activities. Environmental strategies are mainly determined by the senior managers, and form the backdrop for implementation of the concrete environmental activities of the firm. However, a striking gap sometimes exists between the firms' environmental awareness and the actual environmental behavior (Liu & Bai, 2014). This results in a disjointed transformation from strategic planning to actual environmental activities. The reason for this is somewhat related to the fact that the senior managers (strategy makers) are often physically separated from the actual operational production, and so operational staff are usually isolated from decision making (Liu, 2014). Therefore, the effect from senior managers' environmental concerns on environmental strategy will be quite different from their effect on concrete environmental activity. However, this difference does not seem to have been addressed in the literature using analytical modeling.

In sum, there seems to be a theoretical gap to explain how environmental concern of managers bridge between external pressures and firms' environmental practices. This paper aims to explore whether the environmental concern of senior managers has a mediating effect on the relationship between external pressure and energy conservation practice in industrial firms. Institutional theory (INT) is employed to identify the external pressures urging for implementation of energy conservation practices, following the example set by Prajogo et al. (2012). During this process, we classify the energy conservation practices into energy-saving strategies and concrete operations. We then compare different effects on them by adding an estimate of the relationship between the strategies and practices. Structural equation modeling (SEM) is used to analyze the links between external pressures and energy conservation in industrial firms incorporating senior managers' environmental concerns. To verify the hypotheses made in using SEM, a questionnaire-based survey was conducted to collect empirical data from 187 industrial firms in China. Partial least squares (PLS) regression was then used as our estimation method to test the hypotheses.

The rest of this paper is organized as follows. Section 2 provides a description of the conceptual model and the hypotheses arising from it based on INT. The methodology and data collection are outlined in Section 3. This is followed by a presentation of the results in Section 4 and a discussion of them and their implications in Section 5. Section 6 gives the conclusions.

2. Conceptual model and hypotheses

The support from senior managers is critical for the success of pro-environmental activities in the individual firms (Daily & Huang, 2001). Previous studies suggest that the implementation of environmental management practice is associated with top management support, such as environmentally preferable purchasing (Carter, Ellram, & Kathryn, 1998) and green supply chain management (Liu et al., 2012). There are many incentives for senior managers to support environmentally friendly activities. A concern over threats to environmental legitimacy as well as perceived need to improve corporate image are driving forces for adopting environmental management practices, such as environment reporting (Belal & Owen, 2007). Another incentive is from the powerful stakeholders (Garcés-Ayerbe, Rivera-Torres, and Murillo-Luna, 2012). It is noted that an emphasis of senior managers is placed on managing the environmental issues if it is the expectations of powerful stakeholders, notably capital providers (Adams, 2002). Sometimes, the goal of shareholders on wealth maximization would lead managers to figure out how to get economic benefits from some environmental activities, such as energy conservation and carbon reduction (Zhang et al., 2012). Moreover, quest for environmental protection from international buyers and parent companies can also drive the environmental protection decision of managers forward (Belal & Owen, 2007). Although these previous studies were conducted with rigorous analyses, most of them explored the role of manager in corporate environmental management practices. Few studies focus on the effect of environmental concerns of managers, and how the external pressures are related to the environmental concerns of managers.

Different from owners or shareholders, managers take the responsibility of day-to-day management of company towards the agreed upon objectives delegated by owners or shareholders. There is a principle-agent relationship in which owners or shareholders have to find ways overcoming rigid communication structures, to avoid a situation that managers seek to maximize their own utility at their expense (Müller & Turner, 2005). Very often, managers have direct influence on corporate strategy and daily operations, whereas owners or stakeholders influence corporate decision via managers. Previous research also suggests moderating effect of managers on the relationship between environmental activity and the pressures from shareholders (Garcés-Ayerbe et al., 2012), if the shareholders have strong environmental concern. Additionally, managers care more

about business performance with respect to cost reductions and efficiency improvement, whereas owners or shareholders emphasize good practices such as environmental protection activities beneficial to their firms and attractive to stakeholders and society (Williamson, Lynch-Wood, & Ramsay, 2006). The environmental pressures from shareholders, as a result, are often discussed (e.g. Belal & Owen, 2007), but the discussions about environmental concern of managers are rare. It remains unclear how the environmental concern of managers are related to corporate strategies and activities.

Environmental concern has been treated as "an evaluation of or an attitude towards facts that individual behavior has consequences for environment" (Fransson & Gärling, 1999). It refers to the attitude and beliefs in environmental protection issues and the emphasis on environmental problems, which is categorized as concern for self (egoistic), concern for other people (social altruistic), and concern for plants and animals (biospheric), (Schultz, 2001). Egoistic environmental concern refers to the concern for people's own sake or self-interest. Environmentally responsible behavior would be taken if there are perceived personal threats caused by environmental deterioration (Baldassare & Katz, 1992). Social-altruistic environmental concerns are tied to anthropocentric altruism, which care about environmental problems and damages caused to people. As a degraded environment poses a threat to people's health, social-altruistic environmental concerns arise on the belief that it is a threat compromising the well-being of people (Hopper & Nielsen, 1991). Biospheric environmental concern is based on the underlying values of all living species (Schultz et al., 2005). No matter the environmental concern of managers is egoistic, social altruistic or biospheric, it is important to influence managers' decision on corporate practices.

There are also psychological attributes of senior managers that influence the adaption of environmental management practices in organizations. According to value-beliefs-norms (VBN) theory proposed by Stern and Dietz (1994), environmental attitudes and concern could derive from an awareness of the harmful consequences to valued object. Previous psychological research states that this individual value could influence environmental responsible behaviors at work, which may go beyond economic interests or self-fulfillment (Dief & Font, 2010). For managers, their self-environmental perception could impact on the daily operations of firms. Particularly in developing countries where external pressure and regulatory structures may not be fully developed, managerial beliefs, values and attitudes are critical for diffusion of environmental management practices (Rivera & de Leon, 2005). In the current study, a modified Ajzen's theory of planned behavior is applied to analyze the determinants for environmental behavioral preferences of managers (Cordano & Frieze, 2000). Environmental attitudes of managers combining with perceptions of norms for environmental regulation, perceived behavioral control, and the past emission reduction activity are taken as predictors of behavioral preferences for source reduction activity.

Environmental practices of the firm could be categorized as environmental strategy and concrete operations according to the different executors. Environmental strategy is an overall plan and identifiable processes of firm's environmental management practices (Eisenhardt & Martin, 2000), which is designed and proposed by senior managers. Concrete environmental operations are implemented by the staff and employees, which are detailed activities towards environmental protection such as product eco-design and renewable energy application. Nevertheless, there should be a positive relationship between environmental strategy and concrete operations, as concrete environmental operations are often under the directive instruction of strategy. Previous research supports that a well prepared strategy is beneficial for the concrete environmental performance (Wagner & Schaltegger, 2004). For the energy conservation practices, we also separately discuss energy conservation strategy and concrete operations.

Fig. 1 illustrates the conceptual model described in this paper. Hypothesis 4, including both H4(a) and H4(b), contributes to explaining the mediation effect of the environmental concerns of senior managers for the external pressures on energy conservation practices of industrial firms. Other hypotheses are employed with literature supports showing in the following section, which make the conceptual model reliable and theoretically supportive. The external pressures demanding energy conservation are identified in the model from the INT perspective. Industrial practices relating to energy conservation are also introduced into the model (consisting of energy-saving strategies and concrete operations relating to energy conservation). There should be an indirect relationship between the environmental concern of senior managers and the concrete operations in the model, and these should be connected via the energy-saving strategy. The model also contains a connection between the external pressures and the industrial practices via the environmental concern of senior managers. The cost of energy saved and industrial scale are modeled as the control variables for the link between energy-saving strategy and concrete operations of energy conservation.

2.1. *The external pressure on industrial firms for energy conservation*

INT suggests that external pressure from society plays an important role in organizational decision making with respect to implementation of management practices (Meyer & Rowan, 1977). An increasing number of scholars are employing INT to identify the external factors that influence the environmental management or energy-saving practices of industrial firms (e.g. Zhu et al., 2013; Zhang & Wang, 2014). These external motivations push firms to carry out certain practices in order to obtain institutional value in the market and social community (Sumiani, Haslinda, & Lehman, 2007). DiMaggio and Powell (1983) pointed out that, according to INT, external pressures can be categorized into three different institutional isomorphic pressures: coercive, mimetic, and normative. We adopt this classification system to identify the external pressures on energy conservation in industrial firms.

Coercive pressure is related to the compulsory pressure exerted by powerful agencies such as the government (Rivera, 2004). It arises when firms pursue environmental certification in response to requirements imposed by other parties to whom their businesses are largely dependent (Nawrocka, Brorson, & Lindhqvist, 2009). In terms of a firm's energy-saving or low-carbon practices, environmental regulations or policy orientations play significant roles as coercive pressures, as verified by several authors (see, for example, Liu, 2014). Firms often have to make changes in response to energy and environmental policies, e.g. investment behavior towards energy-saving (De Groot, Verhoef, & Nijkamp, 2001). However, the coercive pressure from regulations and policy orientations is not always verified as a positive factor in regard of energy-saving practices in empirical analyses (Suk et al., 2013). This might be due to the fact that policy orientations towards energy conservation do not have a *direct* impact on industrial behavior. Instead, they must first influence the attitudes of the firm's senior decision-makers. Sometimes, barriers exist in this process, which impede the impact of the policy orientation from smoothly reaching the firms' energy conservation strategy. Actually, environmental regulations (or policy orientations) may enhance the environmental concern of senior managers and induce them to be concerned about environment-related activities in their organization. This has been verified by Gholami et al. (2013) who took the adoption of green information systems as an example, in support of their

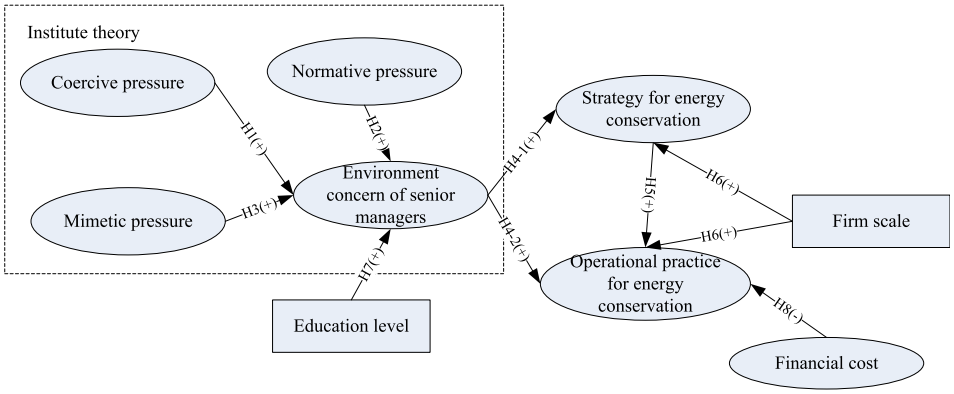

Fig. 1. Theoretical model for the associations between external pressures, environmental concern and corporate energy conservation practices.

argument that the coercive pressure positively influences managers' attitudes towards the adoption of environmental management practices. For industrial energy conservation practice, we propose that there should be a similar result. Therefore, we arrive at our first hypothesis:

Hypothesis 1. *Coercive pressure from regulations and policy orientations encountered by firms is positively related to the environmental concern of senior managers.*

Normative pressure refers to the influence exerted from society and external stakeholders who are important to the organization. A pro-environmental social climate can motivate a corporate responsibility to protect the environment and conserve energy. Many companies engaging in voluntary environment-related activities aim to satisfy social expectations (Duarte, 2010). Senior managers are inclined to exhibit pro-environment preferences when they live in a social community that cares about environmental issues, which further influences decisions made on behalf of the firm. Low-carbon demands from customers is another normative pressure that affect a firm's decisions regarding energy conservation (Zhu & Geng, 2013). Firms would like to meet customers' requirements for green production methods to improve their energy efficiency, especially in the context of international business (Yin & Ma, 2009). Pressure from supply chains has also been found to have a positive effect on environmental management practices (Zhang et al., 2008). Visionary managers may pay attention to market preference, and involuntarily strengthen their environmental concerns as a result of the impact of social consumer and supplier expectations and norms. Based on the discussion above, the second hypothesis is formulated as:

Hypothesis 2. *Normative pressure from social expectations and norms encountered by firms is positively related to the environmental concerns of senior managers.*

Mimetic pressure reflects the pressure on individuals to imitate the successful practices of other individuals because of their intention to learn from other's success. Wong, Lai, and Teo (2009) stated that it is natural for organizations to benchmark, or even imitate, industrial best-practice to stay competitive as this allows them to avoid environmental uncertainty during operation. As energy-saving practices often involve various uncertainties, e.g. unclear benefits (van Hemel & Cramer, 2002), senior managers may prefer to replicate a proven successful route and capture previously ignored market opportunity for energy conservation implementation. The environmental concern of senior managers might be strengthened during the process of learning from other firms' successful experience in energy conservation. Thus, we have the third hypothesis:

Hypothesis 3. *Mimetic pressure, i.e. pressure to imitate other's successful practices, encountered by firms is positively related to the environmental concern of senior managers.*

2.2. Relationship between the environmental concerns of managers and the energy conservation strategies and operational practices

It is noted that the internal pressure from top management is one of the key determinants for adoption of environmental management practices by firms (Delmas & Toffel, 2004). As environmental concern of the managers is an important driver for inclusion of pro-environment elements into their daily management activities, managers with positive attitudes are helpful for the success of proactive environmental practices. Some scholars have stated that firms are more likely to adopt environment-friendly practices, if the managers concerns on environmental issues are closer to that of the firm's CEO (Martin, Muûls, de Preux, & Wagner, 2012). Managers with greater environmental concern are keener on reducing the firm's environmental impact. They are also more likely to convey the strategic importance of green and low-carbon production across the different functional areas in their organizations. Accordingly, there can be more support and less resistance faced by managers to conduct environmental management practices in response to the external pressure in addressing environmental issues. As climate change has been a great concern for many industrial firms, energy conservation is being increasingly promoted by many senior managers. The impact of a manager's environmental concern is not necessarily limited to just decision making regarding energy-saving strategy. Rather the concern can be extended to cover concrete operations. From the above analysis, the following hypotheses are suggested:

Hypothesis 4a. *There is a positive relationship between a manager's environmental concern and the firm's energy conservation strategy.*

Hypothesis 4b. *There is a positive relationship between a manager's environmental concern and the firm's energy conservation concrete operations.*

Some scholars have stated that the positive effect of top management on the adoption of energy efficiency initiatives could hardly be significant without the involvement of the general top managers in operational roles (Blass, Corbett, Delmas, & Muthulingam, 2014). Sometimes, firms have the appropriate strategies for energy conservation, but lack the concrete operations to put the strategies into action. It is important for industrial firms to convert their strategic environmental practices into concrete activities for implementation. Nevertheless, having the strategies in the first place is a prerequisite for concrete operations. Without clear energy conservation strategies, firms may encounter difficulty in conducting energy-saving activities. From this perspective, we

have the following hypothesis:

Hypothesis 5. *There is a positive relationship between energy conservation strategy and energy conservation concrete operations in firms.*

2.3. Control variables

The firm's size is another important determinant of energy-saving practice. Darnall, Seol, and Sarkis, 2009 showed that there is a significant positive correlation between a firm's size and its environmental performance. Compared to small and medium enterprises, large firms are more likely to improve their performance in their operations to reduce their environmental impact. This might be due to the fact that larger firms are often more concerned about their social image (which often depends on having an environmentally friendly operation), and that they are more resourceful for technological innovation in addressing environmental issues. Besides this, larger firms tend to have a higher propensity to tackle environmental concerns (Hettige, Huo, Pargal, & Wheeler, 1996). Managers in larger firms are often well-educated and have better training opportunity than their counterparts in smaller firms (Saari, Johnson, Mclaughlin, & Zimmerle, 1988). There is often positive effect of education on the environmental concern (Nawrotzki and Pampel, 2013). Thus, larger firms may pay more attention on environmental issues than the smaller one. This leads to the sixth hypothesis:

Hypothesis 6. *There is a positive relationship between energy saving practices and firm size.*

An individual's education level has a positive relationship with his or her environmental concern. People who have received higher education often find it easier to understand the necessity for environmental protection and energy conservation. It has been observed that education can increase the environmental awareness of individuals (Tor, 2009). Education raises an individuals' responsibility for environmental protection, and provides useful knowledge to strengthen their capacity for adopting proactive environmental management practices. Therefore, well-educated managers should be more concerned about environmental issues and prefer to promote the firm's implementation of energy conservation practices. The seventh hypothesis is thus:

Hypothesis 7. *There is a positive relationship between the environmental concerns of senior managers and their education level.*

Financial factors are important determinants for implementation of environmental practices. It has been verified that the short-term cost burden (Sarkis, Presley, & Liles, 1997) and unclear benefits (van Hemel & Cramer, 2002) are barriers to firms considering environmental practices. Sometimes, energy conservation strategy is easy to make but hard to fulfill in practice because of high cost. Industrial firms may intend to participate in energy conservation practices but fail to implement their intentions due to the high operational cost. Therefore, we take financial cost as the control variable in the model, and adopt the following hypothesis:

Hypothesis 8. *There is a positive relationship between energy saving practices and financial costs in firms.*

3. Method of structural equation modeling with PLS estimation

In order to test the hypotheses proposed in Section 2, we use partial least square analysis to form the estimation method for analyzing the path model shown in Fig. 1. This paper employs structure equation model (SEM), a technique which can construct unobservable variables measured by indicators as well as explicitly model measurement errors in the observed variables (Chin, 1998). Two different approaches are often considered to estimate SEM parameters, one is covariance-based and the other is variance-based (Haenlein & Kaplan, 2004). PLS is a variance-based approach of high prominence. Here, we prefer variance-based PLS over covariance-based SEM because of the following considerations. PLS places minimal requirements on sample size and residual distribution to achieve sufficient statistical power and robustness (Hair, Hult, Ringle, & Sarstedt, 2013).

Estimation is a three-step process in PLS. The first step relates the indicators of the exogenous variables x_i to their associated measurement errors δ_i and the latent exogenous variablesξ_i, where i is the number of exogenous variables. The corresponding coefficient to be estimated is denoted by β_x so that

$$x_i = \beta_x \xi_i + \delta_i. \tag{1}$$

The second step deals with the relationship between the indicators of the endogenous variables y_j, their associated measurement error δ_j, and the latent endogenous variables η_j, where j is the number of endogenous variables. If β_y is the corresponding coefficient to be estimated, then

$$y_j = \beta_y \eta_j + \delta_j. \tag{2}$$

The last step describes the relationship between the latent endogenous η_j and exogenous ξ_i variables, and their associated measurement error ε_j.

$$\eta_j = \beta_\xi \xi_i + \varepsilon_j. \tag{3}$$

When discussing this relationship, we can also consider the effect of other endogenous variables η_m by using

$$\eta_n = \beta_{\eta m}\eta_m + \overline{\beta_\xi}\xi_j + \varepsilon_n \quad (m \neq n), \tag{4}$$

where ε_n is the associated measurement error. Data analysis was performed using SmartPLS v2.0 M3 software to test the model proposed in Fig. 1. A commonly used rule is that the minimum sample size necessary for robust PLS-SEM is 10 times the maximum number of paths aimed at endogenous constructs (Hair, Sarstedt, Ringle, & Mena, 2012). This suggests that the minimum sample size for this study should be 90.

4. Data source and collection

4.1. Questionnaire survey for data collection

A questionnaire survey was employed to collect data. The geographic distribution within the sample was intentionally restricted to the Circum-Bohai Sea Economic Zone (CBSEZ) of China. This includes the provinces of Hebei, Shandong, Liaoning, and the cities Beijing and Tianjin, as shown in Fig. 2. This region was chosen because it accommodates many energy-intensive industries and is currently facing severe environmental and sustainability problems. As China's capital is also located in this area, the pressure of governmental regulation and environmental concern is high, providing an ideal situation in which to study energy conservation by industrial firms.

The survey was conducted with the help of local government during the fall of 2012. As there are many industrial parks within CBSEZ, we held several seminars to invite the president or vice-president of firms to participate in the questionnaire survey in the name of the administrative committee of the local industrial park. In general, each seminar had 10–30 participants according to the scale of the industrial park. There was a short communication before the formal questionnaire survey. We gave a brief

Fig. 2. The location of Circum-Bohai Sea Economic Zone of China.

introduction about the purpose of the survey and showed the respondents how to finish the questionnaire. Low response rate and missing data are not important problems in our survey because it is a 'face-to-face' survey. We helped the participants to check the missing responses before they handed in their questionnaire. Out of a total of 196 questionnaires that were sent out, 194 were collected. Two participants did not finish their questionnaires because of their departure before the end of the seminars. However, there was a small group of questionnaires filled with a large proportion of repeat answers in neighboring items. For these respondents, we conducted a further telephone interview, and deleted 7 questionnaires with significant problems such as serious data missing. Finally, a total of 187 usable responses were collected. All the participants have agreed that the survey could be used for academic purpose.

Table 1 contains a description of the respondent firms in terms of industry type and scale. The scale of an industrial firm is often characterized by the number of full-time employees (Dean & Snell, 1991). The scale of the respondents' firms ranges from under 100 to over 2000 employees, with the majority of firms falling into a middle-sized class of between 100 and 1000 employees. We classified the type of industry into five classes for the respondents. As shown in Table 1, manufacturers relating to construction materials and furniture are dominant in the responses. These are followed by manufacturers of chemical products, who are the most energy intensive consumers and heaviest carbon emitters.

4.2. Measurement design and questionnaire development

The conceptual model in our research is constructed with latent variables. Measurements of the constructs were adapted from, or developed based on, prior research. The measurement of each item in the questionnaire is shown in Table 2. There are seven latent variables in the questionnaire: one for environmental concern, two for energy conservation practices and four for the external determinants. Each latent variable is measured by three observed variables. The statistic description of each measurement item is shown in Table A-1 of Appendix.

Energy conservation practices (including both energy conservation strategies and concrete operations) were measured by asking how long the target firm had conducted certain energy conservation practices. A five-point scale was used for measuring the items, in which 1–5 represents 'never considered it', 'plan to consider it', 'implemented within a year', 'implemented for 1–3 years', and 'implemented more than 3 years', respectively. Measurement of energy conservation strategy was adapted from the work of Zhang et al. (2012), which includes short term objective, long term vision and clear plan for energy conservation of the firm. The measurement of energy conservation concrete operations including systematic control, R&D investment and equipments substitution was based on the work of Aguilera-Caracuel, Hurtado-Torres, and Aragón-Correa (2012) and Zhang et al. (2012).

Environmental concerns were measured by asking the participants about their self-perceived responsibility for energy conservation. Three measurement items were designed in accordance with previous studies (Godin, Conner, & Sheeran, 2005; De Groot & Steg, 2009), as shown in Table 2. Respondents were asked to what extent they agree or disagree with each statement, and asked to use a five-point Likert scale, where 1 represents 'strongly disagree' and 5 'strongly agree'.

Measurement of the factors influencing energy conservation was also designed by asking for agreement on each item's statement using a five-point Likert scale. Three items for coercive determination were measured by the participants' perceived pressure from environmental regulation and policy orientation.

Table 1
Description of sampling characteristics and distribution in the survey.

Characteristics of respondents	Number	Percentage	Cumulative percentage
Number of employees			
<100	30	16%	15.9%
100–500	45	24.1%	40.1%
500–1000	34	18.2%	58.3%
1000–2000	42	22.5%	80.7%
>2000	36	19.3%	100%
Total	187	100%	–
Industrial type			
Manufacturer of equipments	36	19.3%	19.3%
Manufacturer of chemical products (e.g. fibers, fertilizer, plastics, pharmaceuticals, etc)	43	23.0%	42.2%
Processing of petroleum, coking, refining, puddling	29	15.5%	57.7%
Manufacturer of construction material, furniture	51	27.3%	85.0%
Others (e.g. Manufacturer of beverage, textile, dying, printing etc.)	28	15.0%	100%
Total	187	100%	

According to Zhu, Sarkis, and Lai (2007), environmental regulations can be identified from central governmental regulations, regional governmental regulations, and the regulations of export-receiving countries. This measurement structure was also introduced for the measurement of environmental regulation and policy orientation in our questionnaire. The measurement items for normative pressure were based on the literature (Jørgensen et al., 2010; Yin & Ma, 2009), whereas the environmental demands from customers or suppliers are considered to be the important motives for adopting green practices. There were also three measurement items for mimetic pressure using a design based on the work of Zhang et al. (2012). As pointed out in this reference, green strategies from competitors can promote similar practice.

The measurement items for financial cost were developed according to the framework of survey items used by Zhang et al. (2012), where it was shown that the financial pressures for carbon emission reduction can be identified from three perspectives: high investment, high operational cost, and unclear benefits. Some related studies, such as that by Sarkis et al. (1997) and van Hemel and Cramer (2002), support this item selection as well.

The questionnaire was then developed into a Chinese version. As there are several items adopted from the literature in the English version, we took critical steps to ensure they were acceptable and appropriate after item translation. In accordance with the work of Cha, Kim, and Erlen (2007), we took a 'committee' approach by forming an editing group consisting of four people. In addition to two scholars, two MBA students with more than 3 years management experience in Sino-foreign joint manufacturing, were also in the group. As the language of their working environment was English, and they had familiarity with the operations of the firms in China, their participation was beneficial to the wording of the items in the questionnaire. Separate translation was taken first, and then the differences were checked and discussed to classify the meaning of the questions in the Chinese version. An item could not be accepted until the group had reached agreement on it.

The questionnaire was further checked by performing a pilot test on four manufacturers in Hebei province, eastern China. The president or vice-president of the four companies were interviewed and asked to consider each question in the questionnaire. They thus verified that the questionnaire's content was correct and consistent. The revised version was further examined by the authors to guarantee its idiomatic, experiential, grammatical-

Table 2
Measurement items.

Construct	Items	Source or references
Energy conservation strategy	Short-term objective for energy conservation in the firm (ECS1) Long-term vision for how to reduce energy consumption in the firm (ECS2) Clear plan for how to conduct energy conservation activities (ECS3)	Zhang et al. (2012)
Concrete operations for energy conservation	Systematic control of energy consumption in production process and management (OPEC1) R&D investment on energy saving technology (OPEC2) Replacing the equipments with energy efficient one (OPEC3)	Aguilera-Caracuel et al.(2012), Zhang et al. (2012)
Environmental concern of senior manager	I would feel guilty about excess energy consumption in my company (ECSM1) I feel obliged to save energy to improve the social image of my company (ECSM2) I feel joint responsibility for the ecological damage due to excess energy consumption (ECSM3)	Godin et al. (2005), De Groot and Steg (2009)
Coercive pressure	There are great regulatory pressures and policies for energy conservation from central government (CP1) There are great regulatory pressures and policies for energy conservation from local government (CP2) There are great regulatory pressures and policies for energy conservation from export countries (CP3)	Zhu et al. (2007)
Normative pressure	There are great pressures from the requirements of customers on energy-saving (NP1) There are great pressures from the requirements of suppliers on energy-saving (NP2) There are great demands for energy conservation due to the emerging carbon market (NP3)	Jørgensen et al. (2010), Liu et al. (2013)
Mimetic pressure	Some competitors have taken successful practices on energy conservation (MP1) Some substitutes producers have taken successful practices on energy conservation (MP2) The industrial leaders have taken successful practices on energy conservation (MP3)	Zhang et al., (2012)
Financial cost	The investment of R&D on energy-saving and CO_2 abatement is too high (FP1) The cost for equipment replacement and process retrofit is too high (FP2) There are insignificant benefits from energy-saving in short-term (FP3)	Sarkis et al. (1997), van Hemel and Cramer (2002)

Table 3
Reliability and validity of measures.

Constructs	Alpha	CR	AVE	ECS	OPEC	ECSM	CP	NP	MP	FC
Energy conservation strategy (ECS)	0.90	0.94	0.83	**0.91**						
Concrete operations for energy conservation (OPEC)	0.75	0.86	0.67	0.71[a]	**0.82**					
Environment concern of senior manager (ECSM)	0.90	0.93	0.81	0.32	0.24	**0.90**				
Coercive pressure (CP)	0.96	0.97	0.92	−0.15	−0.16	0.04	**0.96**			
Normative pressure (NP)	0.70	0.81	0.60	0.31	0.30	0.42	0.37	**0.77**		
Mimetic pressure (MP)	0.78	0.87	0.69	0.49	0.39	0.56	−0.06	0.41	**0.83**	
Financial cost (FC)	0.75	0.86	0.66	−0.52	−0.50	−0.35	0.38	−0.37	−0.53	**0.82**

[a] The Spearman–Brown coefficient is used for two-item measures; alpha refers to Cronbach's α; CR is the value of composite reliability; AVE refers to average variance extracted. The boldface diagonal values are the square roots of AVE. The other values in the table are Spearman–Brown correlation coefficients.

syntactical, and conceptual equivalence.

4.3. Reliability and validity tests

Before testing the research hypotheses, the reliability and validity of the measurement model were assessed in our analysis. Cronbach's α coefficient was used to test the lower boundary of the internal consistency reliability. As shown in Table 3, all of the α coefficients of the measurement items are above 0.70, and therefore pass the threshold value for reliability recommended by Nunnally and Bernstein (1994). This suggests good internal consistency for the measurement scale. In addition, we also assessed the upper boundary for true reliability with an application of composite reliability (CR). The majority of the CR coefficients of the measurement items are above 0.85 (the lowest is 0.81), which is also an acceptable result for this reliability test. However, it has been argued that Cronbach's α is inappropriate and meaningless for a two-item scale, and that alternative correlation coefficients should be advocated in such cases (Hulin, Netemeyer, & Cudeck, 2001). We further report Spearman–Brown correlation coefficients in Table 3, from columns 5 to 11 except the boldface diagonal values. These measurements confirm that adequate reliability is indeed shown.

We consider both convergent and discriminant validity in this paper. Convergent validity is assessed using average variance extracted (AVE) values. As shown in Table 3, all the AVE values are above 0.8, and so the criterion that AVE values should exceed 0.5 is satisfied (Hair et al., 2013). Discriminant validity is also assessed in our analysis. It can be observed from Table 3 that the square root of the AVE value for each latent construct is greater than the correlation coefficients with the remaining construct. In addition, the loading of items in their corresponding constructs are all larger than their loading in other latent constructs (see Table A-2 in Appendix). Discriminant validity is therefore supported.

4.4. Test for common-method bias

As the questionnaires collected data in the same sessions and from single sources, there is a possibility that common-method bias may arise which is attributed to the use of common measurement methods rather than the construct of interest (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We adopted the following procedures to control this potential issue. First, we gave an introduction before the questionnaire survey to guarantee confidentiality and to protect the response information. Second, questions related to this research were distributed over four different sections, namely, 'energy conservation practice', 'environmental awareness', 'external and internal pressures for energy conservation', and 'demographic information'. There were also cover stories between each of the two sections of the questionnaire, which separate the sections to make respondents feel that the measurement of the predictor variables were not connected with the measurement of the criterion variables.

In addition, we employed Harman's single-factor test to further examine the possibility of common-method bias. This was conducted by loading all the items into an exploratory factor analysis (Podsakoff et al., 2003). There are five factors extracted from the factor analysis. The total variance explained by factors with eigenvalues larger than 1 is 73.28%, with the loading variance of each factor above 10%. The largest loading variance accounted for 19.37%. As no single factor accounts for the majority of the covariance among the measures, common-method bias is not considered to be a problem in our survey.

5. Results

The stated hypotheses (shown in Fig. 1) were tested by running a structural equation model in SmartPLS. Fig. 3 shows the results. The R^2 values for the three endogenous variables, environmental concern, energy conservation strategy, and concrete operations of energy conservation, are 0.39, 0.10, and 0.55, respectively. This gives an indication of the percentage of the variance of each endogenous variable that is explained by their predictors. Falk and Miller (1992) recommend that the threshold value for R^2 should be 0.1. Therefore, the R^2 values in our model adequately demonstrate the good effect of the predictors on the predicted variables. Goodness-of-fit (GoF) is used to test the model fit of variance based structural equation model. It is defined as the geometric mean of the average communality and average R^2. The GoF value reported in our model is 0.56, which is across the baseline 0.36 and adequate support to validate the PLS model globally (Wetzels, Odekerken-Schröder, & van Oppen, 2009).

Path weights are also shown in Fig. 3. The environmental concern of senior managers has a positive influence on energy conservation strategy ($path = 0.32 \pm 0.08$,[1] $t = 4.17$, $p < 0.01$), but no significant, direct impact on concrete operations of energy conservation ($path = -0.06 \pm 0.06$, $t = 0.84$, $p > 0.1$). Thus, hypothesis H4a is supported while H4b is rejected. Both normative pressure ($path = 0.25 \pm 0.12$, $t = 2.00$, $p < 0.05$) and mimetic pressure ($path = 0.45 \pm 0.11$, $t = 3.90$, $p < 0.01$) have positive impact on the environmental concern of senior managers. Hypotheses H2 and H3 therefore are supported. It is observed from the results that there is no significant relationship between coercive pressure and the environmental concern of senior managers ($path = 0.01 \pm 0.09$, $t = 0.066$, $p > 0.1$). Hypotheses H1 is therefore not supported. Financial cost plays a negative role in the concrete operations of energy conservation ($path = -0.24 \pm 0.07$, $t = 3.12$, $p < 0.01$), wherein hypothesis H8 is supported. Hypothesis H7 posits that senior managers with higher education levels have stronger environmental concerns. This is verified in our analysis ($path = 0.16 \pm 0.09$, $t = 1.97$, $p < 0.05$). Hypothesis H6, which states that larger firms are more likely to conduct concrete operations of energy conservation, is also supported ($path = 0.18 \pm 0.08$, $t = 2.41$, $p < 0.01$).

The mediating effect of a firm's energy conservation strategy and senior managers' environmental concern are discussed further

[1] The path value is shown in the format of ().

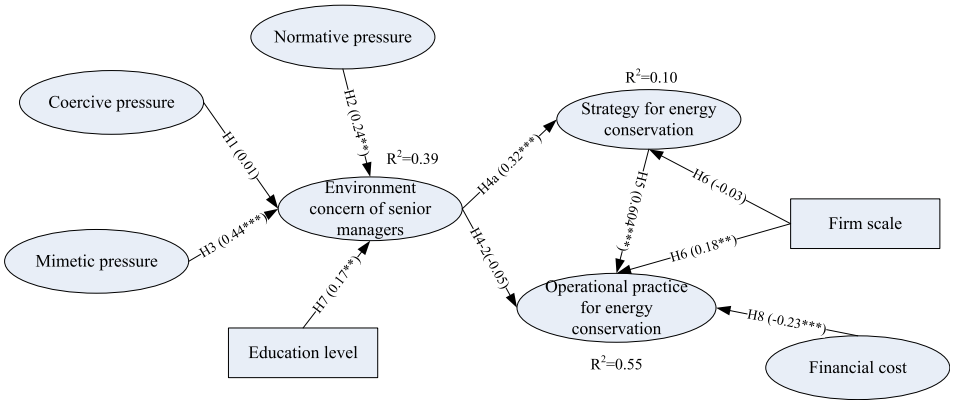

Fig. 3. Structural model for the associations between external pressures, environmental concern and corporate energy conservation practices. Notes: The values in parentheses are estimated coefficients; **p < 0.05; ***p < 0.01. The coefficients are reported in standardized.

in this paper. Following Zhang, Fang, Wei, and Chen (2010), there are three steps required to examine the mediation effects. First, the relationship of independent with dependent variables should be tested. Then, the impact of an independent variable on the mediator should be examined. Finally, both the independent variable and the mediator should be used to predict the dependent variable. If the effect of the mediator on the dependent variable is significant while the independent variable shows no significant effect, then we can conclude that the mediation effect is full. Otherwise, if both the independent variable and mediator have significant effects on the dependent variable, then the mediator shows a partial mediation effect. Table 4 provides a summary of the resulting mediating effects. We can observe from the table that a firm's energy conservation strategy fully mediates the impact of environmental concern on concrete operations of energy conservation. This is because there is no direct relationship between the managers' environmental concern and concrete operations of energy conservation. In addition, as there is no direct path between external pressure and the firms' strategy, senior managers' environmental concern could be considered as full mediator that bridges the two indicators.

6. Discussion

This research helps us understand the role played by senior managers' environmental concerns in the firms' energy conservation practices. In summary, senior managers' environmental concern serves to bridge between external influences and energy-saving practices. For developing countries in Asia, saving energy has become a crucial issue in sustainable development. Industrial firms are therefore facing increasing pressure to save energy and reduce emissions (Zhang et al., 2012). The question is, how does the external pressure connect to energy-saving practice in industrial firms? Our research provides a possible explanation. The external pressure to conserve energy is positively associated with the environmental concerns of senior managers. The concerns are positively related to energy-saving decisions of managers on behalf of the industrial firms. This explanation is also supported by the empirical results of our analysis.

Our study contributes to the literature (e.g. Prajogo et al., 2012; Zhu & Geng, 2013) in that we find the mediation effect of mangers' environmental concern on bridging the external pressures and corporate environmental practices. However, it is apparent from our results that the environmental concerns of senior managers only positively relate to firms' energy conservation strategy. That is, it fails in connecting to the concrete operations associated with energy conservation. Our results explain why there are poor environmental performances for some firms that seem to have great concern on environmental issues from their managers. It is the obligation of senior managers to formulate the long term strategy for their firms. Nevertheless, to execute the strategy as expected is rarely neat and tidy due to the presence of uncertainties such as shift in regulations, surprising choices by customers and poor performance of employees (Sull, 2007). Also, it is important to balance the prioritized execution of strategies in the firm due to the time limit of managers (Sinha & Kalé, 1993). High priority strategy over the entire firm often attracts more concentration in the actual operations and is implemented first. This might result in the less concentration with fewer processors in the actual operations for lower concerned strategy. Comparing with environmental strategy, profit related strategies are often more preferable by firms, particularly at operational level. Thus, the environmental concerns of managers are insufficient to influence the environmental operations. From our results, there seems to be no direct relationship between the environmental concern of the senior managers and concrete operations of energy conservation. However, its impact on energy conservation strategy would indirectly lead to actual energy saving practices.

Environmental regulations and policy preferences were often considered to be the important drivers for implementation of environment-friendly practices in previous studies. However, in our analysis, the coercive pressure was not found to be important for energy conservation in firms. This result is consistent with the opinions of some workers, e.g. Suk et al. (2013), who suggested that coercive pressure has no significant effect on energy saving activities. Regulation has legal effect and is considered as a mandate imposed by authorities. The government's regulations on energy conservation in China are weak. There is a lack of compulsory responsibility on industrial firms to take on energy conservation. Although there has been a target of 40–45% reduction in carbon emission per GDP, it is difficult to allocate the target to industrial firms in China without a market mechanism. Different from regulations that are restrictive and impose sanctions upon companies, policies are more flexible to help in guiding organizations to

Table 4
Results of mediation effect analysis.

IV	M	DV	Coefficients				Mediation
			IV→DV	IV→M	M→DV	IV$\overset{M}{\rightarrow}$DV	
ECSM	SEC	OPEC	–	0.32***	0.60***	0.19***	Full
CP	ECSM	SEC	–	–	0.32***	–	None
NP	ECSM	SEC	–	0.24**	0.32***	0.08**	Full
MP	ECSM	SEC	–	0.44***	0.32***	0.14***	Full

IV refers to independent variable; M refers to mediator; DV refers to dependent variable. The coefficients are reported in standardized.
**p < 0.05, ***p < 0.01.

achieve the goals. Other than restrictive measures such as carbon tax, there are motivation measures such as “cap-and trade” market mechanism as well (Elliott et al., 2010). However, the progresses of carbon trading and carbon tax are a bit slow in China, where a national carbon market is far from being complete (Shen, 2013). Senior managers, as a result, have not felt much pressure from policy regulation. Their environmental concern, with respect to energy conservation, is hardly affected by external regulations, according to our results.

The driving forces that raise the environmental concern of senior managers come from normative and mimetic pressure. This suggests that market indicators are often the key drivers for senior managers' decisions on energy conservation strategy. Senior managers have to care about energy conservation issues to satisfy market demand if there is an energy-saving demand that comes from market pressure. If they did not, then there would be a loss of benefit for the firm due to their reluctance to adopt energy conservation. This is not the kind of action expected of senior managers. The demand for energy saving and environmental protection from customers or suppliers has been an important normative pressure for many Chinese firms which has forced them to consider their environmental problems (Zhu & Geng, 2013). This is especially so after China's participation in the WTO and is embedded in the global supply chain. Chinese firms have to adhere to stringent environment protection criteria and low-carbon requirements from foreign business partners in order to retain competitiveness in their international business. In addition, energy conservation has become a new business opportunity for many Chinese industrial firms as part of their international business. As there are comparatively mature carbon trading markets in Europe, and some other developed countries, Chinese firms can also derive certain financial benefits from energy conservation by participating in carbon trading (e.g. CDM projects). Moreover, the successful environmental practices of competitors will sometimes attract the attention of senior managers, raise their concern, and prompt them to embrace similar pro-environmental activities. Industrial leaders may also provide a mimetic effect, driving followers in the industry to consider implementation of energy conservation (provided they themselves have successful experience of energy conservation practices).

Financial cost is considered to be one of the control variables in our analysis. Our results show that cost is negatively related to concrete operations of energy conservation. Although some senior managers are sufficiently concerned about environmental problems, implementation of energy conservation still faces some difficulties, largely due to high expenditure or unclear future benefit. Some related studies on environmental practices, for example, those by Sarkis et al. (1997) and van Hemel and Cramer (2002), also support this conclusion. Therefore, reducing the cost of energy saving measures and investigating how to excavate the potential benefits from energy conservation are important topics for industrial firms in China. From this perspective, carbon trading, which provides a platform for turning the reduced carbon from energy conservation into economic benefits, could become a useful tool to promote firms' energy saving practices in the future.

Education level and the firm's scale are also used as control variables in this paper. Senior managers with better educational backgrounds are more concerned about environmental protection issues. This may have an impact upon the firm's energy conservation practices, and be beneficial to their implementation. Compared to small companies, larger firms are more likely to be concerned about energy saving practices. This might be due to the fact that large firms have abundant financial sources for energy conservation practices. Also, the corporate social responsibility of large firms can serve as an important incentive to take voluntary action in respect of energy conservation.

7. Conclusions

This paper develops and empirically tests a conceptual model that explains the role played by a senior manager's environmental concerns in forming the firm's energy conservation practices. The external pressures contained in the model that relate to energy conservation were identified using institutional theory. A questionnaire survey was used to collect data from industrial firms located in the Circum-Bohai Sea Economic Zone of China. PLS structural equation analysis was employed to analyze the collected data and test the research hypotheses. Compared with most of the previous studies, this paper contributes to the literature by building a connection between the external pressures related to energy conservation and the firms' energy saving practices via the environmental concern of the senior managers. This provides a theoretical explanation for how the energy saving decisions taken in industrial firms are influenced by external pressure.

Our work supports the idea that senior managers' environmental concerns play a significant role in connecting a firm's energy saving practices and the external pressure for energy conservation. However, the environmental concern of senior managers only positively relates to firms' energy conservation strategy — it has no significant association with the concrete operations related to energy saving. The relationship between external pressures and concrete operations of energy saving is indirectly connected via the energy conservation strategy.

Our results indicate that market tools are more effective than policy regulations in promoting a firm's energy conservation practices in the present situation in China. This might be related to the fact that there is a lack of compulsory regulations and clear criteria for industrial firms to reduce energy consumption. In contrast to pollution emission, it is difficult to clarify how much energy each firm should save. Therefore, energy conservation relies more on voluntary practices within the industrial firm. Demand for energy saving from customers or suppliers can readily raise a firm's concern over energy conservation. Keeping competitive also forces the firm to learn from the energy saving experiences of their competitors. These market indicators should be highlighted in the policy design. In addition, as financial cost is the main barrier to concrete operations of energy conservation, promoting carbon trading should considered to excavate the economic benefit of energy saving practices.

Although this study has some valuable findings, it has several limitations which we leave for future research. As our study is cross-sectional, an important limitation of the results is that the design does not allow inferring cause − effect patterns. Our results show the correlation between variables rather than the causality. The survey did not strictly involve random sampling as we chose firms located in industrial parks as the target respondents. This made data collection easy but meant the survey lost a certain amount of representativeness. In addition, the survey relied on the companies to self-report their information during data collection. Some survey bias might therefore be present in spite of our efforts to use statistical methods to control this. Therefore, it will be important to carry out some case studies in future studies to further test the conclusions we have made.

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Appendix

Table A-1
Descriptive statistics of mean, standard deviation and Pearson correlation for measurement items.

Items	Mean	Std. dev	ECS2	ECS3	OPEC1	OPEC2	OPEC3	CP1	CP2	CP3	ECSM1	ECSM2	ECSM3	MP1	MP2	MP3	NP1	NP2	NP3	FP1	FP2	FP3	Education level
ECS1	3.86	1.12	0.833**																				
ECS2	3.73	1.17	1																				
ECS3	3.61	1.24	0.772**	1																			
OPEC1	3.12	1.29	0.564**	0.608**	1																		
OPEC2	3.32	1.27	0.561**	0.555**	0.593**	1																	
OPEC3	2.74	1.32	0.463**	0.578***	0.494**	0.421**	1																
CP1	3.01	1.63	−0.047	−0.145*	−0.064	−0.024	−0.291**	1															
CP2	2.96	1.60	−0.083	−0.179*	−0.055	−0.055	−0.227**	0.953**	1														
CP3	3.25	1.47	−0.119	−0.174*	−0.073	−0.087	−0.222**	0.846**	0.870**	1													
ECSM1	4.40	0.95	0.326**	0.263**	0.204**	0.269**	0.203**	−0.012	−0.025	−0.016	1												
ECSM2	4.60	0.77	0.279**	0.113	0.147*	0.158*	0.011	−0.032	−0.051	0.012	0.702**	1											
ECSM3	4.35	0.91	0.247**	0.131	0.217**	0.295**	−0.006	0.151*	0.143	0.164*	0.726**	0.752**	1										
MP1	3.68	1.16	0.271**	0.242**	0.167*	0.252**	0.195**	0.137	0.138	0.167*	0.429**	0.254**	0.306**	1									
MP2	2.82	1.46	0.035	−0.088	0.103	0.186*	−0.059	0.580**	0.581**	0.515**	0.062	−0.051	0.183*	0.521**	1								
MP3	3.77	1.07	0.297**	0.252**	0.287**	0.278**	0.106	0.398**	0.383**	0.402**	0.354**	0.311**	0.330**	0.499**	0.298**	1							
NP1	4.04	0.867	0.308**	0.186*	0.207**	0.314**	0.061	0.159*	0.125	0.169*	0.499**	0.371**	0.406**	0.334**	0.298**	0.308**	1						
NP2	4.14	1.11	0.406**	0.354**	0.293**	0.342**	0.297**	−0.122	−0.14	−0.094	0.577**	0.385**	0.348**	0.306**	−0.042	0.319**	0.492**	1					
NP3	4.07	1.07	0.385**	0.444**	0.228**	0.304**	0.304**	−0.237**	−0.269**	−0.169*	0.484**	0.347**	0.220**	0.291**	−0.102	0.265**	0.462**	0.664**	1				
FP1	2.08	1.19	−0.389**	−0.380**	−0.291**	−0.301**	−0.476**	0.298**	0.304**	0.336**	−0.393**	−0.287**	−0.235**	−0.304**	0.051	−0.171*	−0.233**	−0.510**	−0.448**	1			
FP2	2.01	1.20	−0.278**	−0.310**	−0.217**	−0.253**	−0.322**	0.223**	0.206**	0.277**	−0.320**	−0.211**	−0.143	−0.528**	−0.005	−0.301**	−0.151*	−0.309**	−0.304**	0.637**	1		
FP3	2.27	1.38	−0.481**	−0.469**	−0.334**	−0.329**	−0.424**	0.334**	0.337**	0.294**	−0.317**	−0.138	−0.127	−0.299**	0.164*	−0.155*	−0.266**	−0.465**	−0.459**	0.456**	0.403**	1	
Education level	3.24	1.10	0.004	−0.082	−0.108	−0.192**	0.094	−0.141	−0.166*	−0.193**	0.272**	0.224**	0.079	−0.004	−0.228**	0.002	−0.005	0.162*	0.224**	−0.088	−0.067	−0.205**	1
Firm size	3.05	1.37	0.008	−0.043	0.115	0.250**	−0.032	0.081	0.101	0.111	0.084	0.074	0.099	−0.031	0.068	0.074	0.057	0.059	−0.05	0.155*	0.091	0.127	−0.118

Note: **p < 0.05, ***p < 0.01.

Table A-2
PLS cross-loadings of the items.

Items	ECS	ECSM	OPEC	MP	CP	NP	FC
OPEC1	0.613446	0.210960	0.854924	0.293835	−0.070086	0.258283	−0.351786
OPEC2	0.580248	0.268951	0.828618	0.386112	−0.063322	0.308870	−0.365840
OPEC3	0.537221	0.096796	0.768808	0.275732	−0.255473	0.159411	−0.509149
FP1	−0.409999	−0.350983	−0.431294	−0.475692	0.331249	−0.255924	0.859809
FP2	−0.285799	−0.262799	−0.321172	−0.303966	0.257504	−0.456182	0.794984
FP3	−0.532805	−0.232619	−0.440629	−0.474044	0.327083	−0.232741	0.787723
CP1	−0.104682	0.031048	−0.149506	−0.070536	0.952395	0.350161	0.356706
CP2	−0.146265	0.015937	−0.133717	−0.103540	0.957349	0.342670	0.355114
CP3	−0.159226	0.047790	−0.152668	−0.030326	0.966182	0.362233	0.373142
ECSM1	0.230019	0.896004	0.211366	0.396955	0.163019	0.366781	−0.208756
ECSM2	0.349077	0.922882	0.276154	0.628382	−0.016701	0.435291	−0.423209
ECSM3	0.255906	0.888136	0.131028	0.443519	−0.013575	0.303483	−0.259210
MP1	0.300576	0.481046	0.241642	0.791041	0.165025	0.381890	−0.273519
MP2	0.472710	0.408039	0.355898	0.831972	−0.216882	0.294095	−0.506619
MP3	0.452433	0.504159	0.380071	0.872453	−0.115647	0.338071	−0.538472
NP1	0.296143	0.369462	0.276808	0.359282	0.413966	0.847228	−0.245382
NP2	0.270832	0.378886	0.250569	0.374355	0.158829	0.876814	−0.444402
NP3	−0.035032	0.069377	0.097501	0.069597	0.570319	0.551330	0.095304
ECS1	0.896798	0.356115	0.568012	0.513481	−0.130984	0.262118	−0.448561
ECS2	0.952909	0.320278	0.648602	0.439928	−0.093257	0.314555	−0.482097
ECS3	0.886096	0.200978	0.708765	0.387179	−0.172045	0.261330	−0.482930

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