



An empirical study on the driving mechanism of proactive corporate environmental management in China

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ABSTRACT

Environmentalism in China is under transformation from the traditional command and control model to emphasize the advantages of economic tools and encourage the participation of the public. Firms are much more aware of the importance of environmental issues, and some of them have practiced environmental activities beyond compliance. In order to help understand the driving mechanism of proactive corporate environmental behaviors from the firm's perspective, this paper identifies the drivers affecting the proactive environmental management level (EML_p) based on the institutional theory, and gives an empirical study on the firms based in Changshu city of Jiangsu Province, China. The usable data, collected from the 117 valid respondents in a questionnaire survey, indicates that EML_p is still moderately low currently. Less than 10% of the samples are practicing all the six categorized types of voluntary environmental activities. The econometric exercise confirms a significantly positive effect of the externally mimetic pressure on EML_p , which may attribute to a higher sensitivity of Chinese companies to the market factors. However, the roles of the general public and industrial associations are not significant, showing the marginal power of selected normative pressures. Regarding internal factors, firms, which view environmental issues as opportunities and often arrange internal environmental training, are more likely to adopt proactive environmental activities. More concerns from the general public like neighborhood communities and mass media shall be addressed to enhance the normative power to improve EML_p in China from the future perspective.

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1. Introduction

Since the 1980s, a series of environment-related laws and policies have been enacted and carried out in China to harmonize the development of the economy, society and the environment. Chinese environmental policy can be typically classified as a regulative model in the past. The regulatory dominated approach has played active roles in alleviating further environmental deterioration. However, the traditional command and control measures for industrial pollution control, which solely address the simple interactions between government and business as the determinant of a firm's environmental performance, are insufficient partly due to the weak enforcement capacity at the practical level. In recent years, several market-based environmental instruments, like green credit and green insurance policies, have been initiated. Providing the public with easier access to environment-related information helps attract concerns from more

social actors, and therefore may exert heavier pressures on laggard enterprises or offer more incentives for the good performers (Pan, 2007). There is strong evidence to show that Chinese firms are becoming more aware of the importance of environmental issues and trying to improve their environmental performances. With the purpose to go beyond basic compliance and fulfill higher environmental values, some of them have started certain proactive environmental practices like self-reporting of environment-related information (Liu and Anbumozhi, 2009). The environmental behaviors of Chinese companies have been influenced not only by the government but also by some other stakeholders like investors, surrounding residents, industrial associations and employees as well (Clark, 2005). Alternative approaches such as economic incentives, business-leading voluntary initiatives and environmental information disclosure strategies should be added to enhance the interplays between the firms and their stakeholders for achieving better environmental goals (Henriques and Sadorsky, 1996).

Nevertheless, it is unclear so far to what extent the improvement of Chinese firm's environmental performance could be attributed to the ongoing policy changes. As is well known, the

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barrier for further development of alternative environmental instruments exists in understanding whether the approach could be well suited, and make the firms respond effectively. This gap prioritizes the research exploring the elementary motivations and principal factors which may shape a firm's engagement in environmental efforts. With aims to provide observations on the driving factors for Chinese firms' environmental efforts, specifically for those proactive management activities, this study analyzes both the influences of a firm's external stakeholders and the firm's internal factors indicating the capacities to moderate existing external pressures. Beyond developing a comprehensive framework on how the classified factors may determine a firm's proactive environmental practices, various measures are practiced to clarify the relationships between the institutional drivers, the firm's characteristics and proactive environmental behaviors.

2. Literature review

Previous studies have examined external and internal determinant factors of corporate environmental management (CEM) although researchers have not reached an agreement on which one is dominant.

Among the external factors, government regulations were believed to be the dominated forces for CEM in the past. A firm's environmental strategies are imposed coercively by environmental sanctions, as in the case of mandatory emission standards (Meegeren, 2001; Delmas, 2002). Government legislation and enforcement actions were found to be one of the most important factors affecting a firm's environmental decision-making (Henriques and Sadorsky, 1996). The studies started to examine the effectiveness of governmental interventions on a facility's environmental performance by focusing exclusively on two sectors, namely, pulp and steel industries (Gray and Deily, 1996; Helland, 1998). A positive relationship between compliance and enforcement decisions was confirmed. Later studies expanded to the other industrial sectors. Stafford (2002) studied the effect of a United States Environmental Protection Agency (USEPA) enforcement protocol on facility compliance of hazardous waste requirements. The violations were found to decrease along with the penalty change but the decrease appeared small relative to the increase of recommended penalty levels. Reijnders (2003) observed the regulatory influence on cleaner production and found that regulation by permits according to adequate law and negotiated agreements might act as more effective instruments. Similarly, Evangelinos and Oku (2006) assessed the regulatory and environmental problems of mining operations in the Cyclades, Greece. Mendivil et al. (2005) presented a systematic approach for the introduction of technology evolution, market and regulations affecting the past and future environmental performance of chemical manufacturers in Switzerland. Triebswetter and Hitchens (2005) examined, through three case studies, whether German industrial plants suffered from a negative impact on competitiveness caused by the stringent environmental legislations. The results encouragingly indicated that the pollution abatement initiatives had been implemented without obviously economic damage.

Besides the externally regulative driver, market actors and a firm's surrounding community, are playing more and more active roles for environmental issues (Chen and Soye, 2003). Economic studies recently started to examine the effects of non-regulatory external factors on CEM. By interacting with the suppliers and customers, manufacturers could potentially find more effective solutions to deal with environmental challenges (Prakash and Potoski, 2006; Vachon and Klassen, 2006). Zhu et al. (2007) found that market pressure has become a strong driver for Chinese auto companies to adopt green supply chain management.

Zhang et al. (2008) pointed out that pressures from supply chain, customers and communities but not from the regulatory system played positive roles on CEM in a relatively developed area. Several other studies have shown that many consumers would prefer to choose environment-friendly products (Weber, 1990; Bermmer, 1989). Wen and Chang (1998) viewed the market demand as a great power for better CEM in Taiwan. Gunningham et al. (2003) explicitly explored the effect of community pressure on CEM. Henriques and Sadorsky (1996) monitored the effect of community pressure due to self-reporting on decisions of Canadian firms to carry out an environmental plan. Maxwell et al. (2000) explored the desire of firms to preempt citizen's political action for stricter regulations at the state level and found that the expectation of citizen lobbying did affect facilities' reduction of emissions. Becker (2004) tested whether community characteristics help explain the level of expenditures for pollution abatement in manufacturing plants of the US. The estimations revealed that the community characteristics significantly affected regulatory interventions and the facility's environmental performance.

Besides external factors, CEM was found to be also determined by a firm's own characteristics like ownership, size and financial status. Henriques and Sadorsky (1996) identified that firms in the natural resource sector were more likely to prepare environmental plans, while firms in the service sector were less likely to do so. Downing and Kimball (1982) assessed the possibility of management's concerns about their firm's image for inducing out of compliance. Gray and Deily (1996) noted that larger steel plants were less inclined to be compliant and firm characteristics had little effect on compliance. Some other studies explored similar topics on firm-level financial and environmental performances and concluded that financial markets would provide incentives for firms to change environmental behaviors (Konar and Cohen, 1997; Gottsman and Kessler, 1998).

With aims to clarify the determinant factors for firms engaging in proactive environmental activities, several researches monitored the external factors, such as regulative and competitive forces (Christmann, 2000; Dean and Brown, 1995; Delmas, 2002; Hart, 1995; Russo and Fouts, 1997), or the pressures from non-governmental organizations (Lawrence and Morell, 1995). Prakash (2000) employed an institutional perspective and argued the existing explanations by concentrating on external factors at the expense of internal dynamics. Some others observed the roles of a firm's characteristic variables for explaining the adoption of proactive environmental strategies, including the firm's institutional context and design (Sharma, 2000; Sharma et al., 1999), organizational learning (Marcus and Nichols, 1999), and the leadership values (Egri and Herman, 2000). The firm's proactive environmental practices may be also motivated by strategic reasons, e.g., dis-advantaging the competitors by raising their costs (Lyon, 2003). Yang and Zhou (2004) classified the theories explaining drivers for a firm's proactive environmental practices into two categories. One is based on traditional economic theories and addresses the efficiency-based mechanisms. Another is rooted in institutional sociology and believes that a firm's environmental management is not necessarily based on rational economic philosophy.

While each of the above-mentioned literatures has provided useful understandings to this puzzle, there is a lack of comprehensive analysis of various matters explaining environmental behaviors of Chinese firms, especially for those proactive environmental activities (Zhang et al., 2008; Yang and Zhou, 2005; Zhu et al., 2007). A comprehensive approach by including more factors needs to be tested further. Meanwhile, proactive environmental management is a new concept for most Chinese companies. Very few domestic studies could be made as references. In order to fill up this gap, this paper chooses a relatively developed area in

China and gives an empirical analysis on the driving mechanism for Chinese firms to engage in environmental activities proactively.

3. Development of analytical framework

3.1. Basic institutional theory

The existing researches analyzing the determinant factors of CEM provides a possibility to combine different approaches for better understanding the case of Chinese firms. Within the perspectives discussing a firm’s environmental behaviors, institutional theory permits the elucidation of the overall context within which the firms are operating. Institutional theory emphasizes the influence of social pressures outside of the targeted organization (DiMaggio and Powell, 1983). Rules, norms and cultural beliefs are central ingredients of institutions, which shall also encompass associated behavioral and material resources (Scott, 2001). A firm’s institutional surroundings may determine the legitimate set of actions taken by the firm. The organizational field of a firm consists of government, critical business partners, funding providers, professional associations and the general public, etc. Organizations become more homogeneous by incorporating institutional rules within their own structures. There are three mechanisms of institutional isomorphism: coercive, normative and mimetic. Membership in the organizational field addressed the ability of related actors to impose these functions on the focal firm. Hoffman (2000) adds that the field is more than just a simple collection of the influential organizations, while actually it is the centre of channels for dialogue between the stakeholders.

Institutional theory has started to emphasize how enterprises build consensus on the emerging environmental issues and reveal the way in which ‘environmentally sound’ practices could be developed and diffused (Jennings and Zandbergen, 1995). Institutional pressures, especially the changing legitimacy demands on firms, are believed to play an essential role in determining a firm’s environmental strategies. In the general social-political realm, government regulations, public pressures and expectations from special interest groups are recognized as essential determinants, while competitors, suppliers and customers may be influential actors regarding the firm’s behaviors. As added by Jennings and

Zandbergen (1995), organizational fields concerning ecological processes would be grounded in a particular locale where communities tend to be centered.

3.2. Analytical framework and identification of determinant factors

The analytical framework, depicted in Fig. 1, admits the importance of externally coercive, normative and mimetic factors recognized by the institutional sociology (DiMaggio and Powell, 1983). It is expected to illustrate the complementary nature of the drivers for Chinese companies at an early stage of environmental policy transformation. However, the institutional perspective neglects certain fundamental issue of business strategy, such as why the organizations subject to the same level of externally institutional pressures perform differently (Prakash, 2000; Gunningham et al., 2003). Referenced from the reasoned action theory (Ajzen and Fishbein, 1980), we hypothesize that the firms adopt heterogeneous sets of environmental practices also due to the individual interpretation of the objective external pressures. The difference between ‘objective’ and ‘perceived’ pressures may explain the diverse responses of a firm. Our model adds two internal organizational factors, a firm’s orientation of environmental strategy and learning capacity, to jointly explain the proactive environmental practices at firm’s level. This approach may reasonably complement the institutional theory as it views a firm’s characteristics as moderators to magnify or diminish the influence of externally institutional pressures. The determinant factors are identified as follows.

3.2.1. Externally institutional pressures

In this study, we focus on the subset of institutional actors identified by Hoffman (2001) which are most likely to influence environmental practices at a plant level, including coercive pressure from the organizations holding mandatory power, normative pressure from the industrial association and the public, and mimetic pressure from the competitors in the same sector.

3.2.1.1. Coercive pressure. As mentioned earlier, the most obvious actors that influence firms’ adoption of environmental practices are various government agencies. These agencies are authorized to

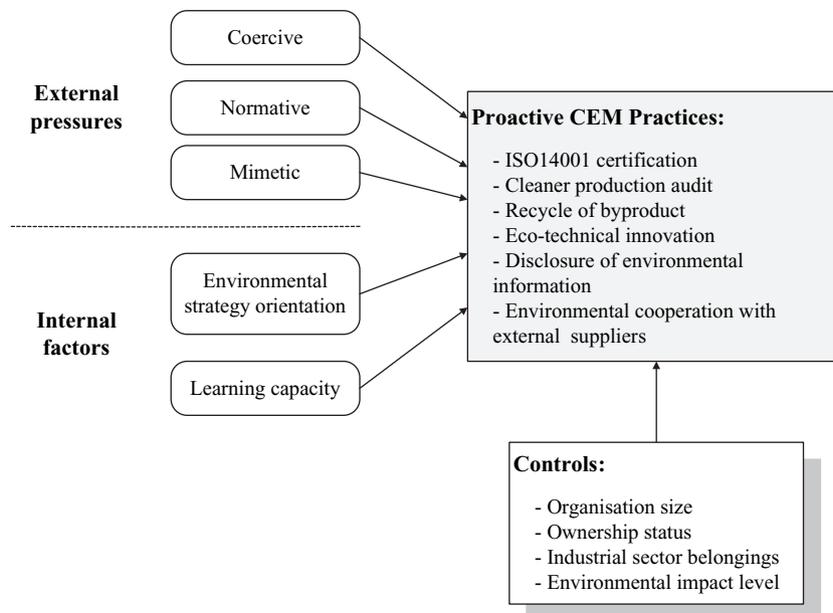


Fig. 1. Analytical framework and determinant factors for proactive CEM.

promulgate and enforce the regulations, and accordingly have coercive power over the related firms. Among the studies analyzing the influence of enforced legislation on firms' environmental practices (Carraro et al., 1996; Delmas, 2002; Majumdar and Marcus, 2001; Rugman and Verbeke, 1998), Delmas (2002) found that governments play an important role in a firm's adoption of certain voluntary environmental activities like the implementation of ISO 14001. The governments may give a clear message to encourage the firm's proactive environmental actions by either providing some incentives or announcing in advance mandatory environmental requirements for the next phase. The coercive pressure from foreign countries or international organizations may also influence a firm's environmental behaviors. Christmann and Taylor (2001) indicated that exporting manufacturers are more active in pursuing ISO14001 certification according to a survey of 101 enterprises in Shenzhen and Shanghai, China. In our study, the intensity of environmental enforcement and the export level of products are referred to as domestic and international coercive drives respectively.

3.2.1.2. Normative pressure. Normative pressure results from norms defined by institutions like industrial associations. Behaviors that comply with the norm legitimize the firm (Palmer et al., 1993). The public may impose normative pressure on companies via environmental activism or filing citizen's lawsuits. Previous studies found that a company's decisions of environmental practices are influenced by the desire to manage the relationships with the public. Henriques and Sadorsky (1996) surveyed 700 firms in 1992 and found that the local community put pressure on the firms to take environmental activities. Florida and Davison (2001) indicated that the adoption of the pollution prevention initiatives was positively correlated to the firms' engagement with the surrounding communities. A survey of ISO 14001 certified companies across 15 countries showed that one of the strongest motivating factors for the certification was the desire to be a good neighbor (Raines, 2002). Normative pressure also comes from professional networking such as industrial associations (King and Lenox, 2001). Although industrial associations appear to be still weak in China, their influences on corporate proactive environmental practices bear a test. Frequency of the public complaints and the influence of industrial associations are used to represent the normative pressures in this study.

3.2.1.3. Mimetic pressure. Besides the governmental and public actors, firms may facilitate mimetic isomorphism. For instance, multinational companies are widely viewed as important agents in the diffusion of practices by transmitting techniques to their subsidiaries and other firms in the host countries (Arias and Guillen, 1998). Customer preferences on environmental issues are important and thus greatly affect the firm's decision making. A survey of the largest Canadian firms showed that the customer was the second most cited pressure for them to adopt environmental plans (Henriques and Sadorsky, 1996). In order to keep a comparative competence, firms are likely to mimic the practices of leading companies in their sector. The overall level of environmental management of the industrial sector is therefore used to indicate the strength of mimetic pressure on the firms.

3.2.2. Internal factors

Whereas institutional theory addresses external constituencies determining strategic options available to the organizations, two internal factors, a firm's orientation of environmental strategy and its learning capacity, are added for a better understanding of the firm's choices of optional environmental strategies (Yang and Zhou, 2005).

3.2.2.1. Environmental strategy orientation. The theory of reasoned action includes two independent variables measuring attitudes and subjective norms (Ajzen and Fishbein, 1980). The immediate antecedent to behavior is behavioral intention and willingness. Awareness of the problems and subjective social norms, in turn, affect the formation of behavioral willingness. Because a vast majority of firms in China are small and medium sized, the top managers decide most of the operational issues. Their environmental willingness is more necessary for firms to be environmentally proactive since environmental initiatives require a higher managerial commitment than other operational things (Ramus and Steger, 2000). As the antecedent to willingness, a firm's awareness of environmental problems is selected as another variable for environmental strategy orientation.

3.2.2.2. Learning capacity. The environmental performance improvement of a firm is a dynamic process highly related to the abilities of the firm's members (Hart, 1995). A firm's learning capacity can be used as an indicator to present its ability for practicing proactive environmental activities. The employee's ability for implementing new environmental approaches is usually enhanced by self-learning, professional education and job training. The education level of employees and the frequency of internal environmental training are adopted as proxies of learning capacity since the former is the basis for a firm's learning capacity, and the latter can promote the firm's capacity of environmental management (Yang and Zhou, 2005).

4. Background of the study area – Changshu city

The empirical study was conducted in Changshu city of Jiangsu province, China, as indicated in Fig. 2. This county-level city is located in front of the Yangtze River delta. It has a land area of 1094 km² and a population of over one million. The total GDP of the city increased from USD 821.04 million in 1988 to USD 12.78 billion in 2007. The GDP per capita reached about USD 12,000 in 2007. Regarding the industrial structure, proportion of tertiary industry increased from 18.84% in 1988 to the current 39.05%, while the share of manufacturing industry remains stable at around 60% (CSB, 2008).

As the life of people there improves, they call for better environmental qualities. The residents and media are increasingly concerning about firms' environmental performances. Local government has explored certain innovative measures to encourage the public to act against industrial pollutions. As examples, roundtable meetings, normally attended by residential delegates, enterprise's representatives and governmental officials, provide chances for achieving consensus on environmental issues through dialogues. The establishment of an environmental hotline helps the public to complain a firm's bad environmental behaviors (Liu et al., 2008). With stricter supervisions by the government and the public, it becomes more difficult for a firm to commit environmental violations. Various environmental practices have been taken by the companies, including certain proactive efforts such as cleaner production audit, ISO 14001 certification and environmental management through supply chains. The better background of Changshu on environmental management provides us the possibility to test the roles of identified factors on a firm's proactive environmental behaviors. In addition, Changshu has been honored as National Garden City, National Model City for Environmental Protection, and National Ecological City due to its environmental achievements (CSEPB, 2009). The city's environmental protection status may represent the current situation of most China's developed areas.

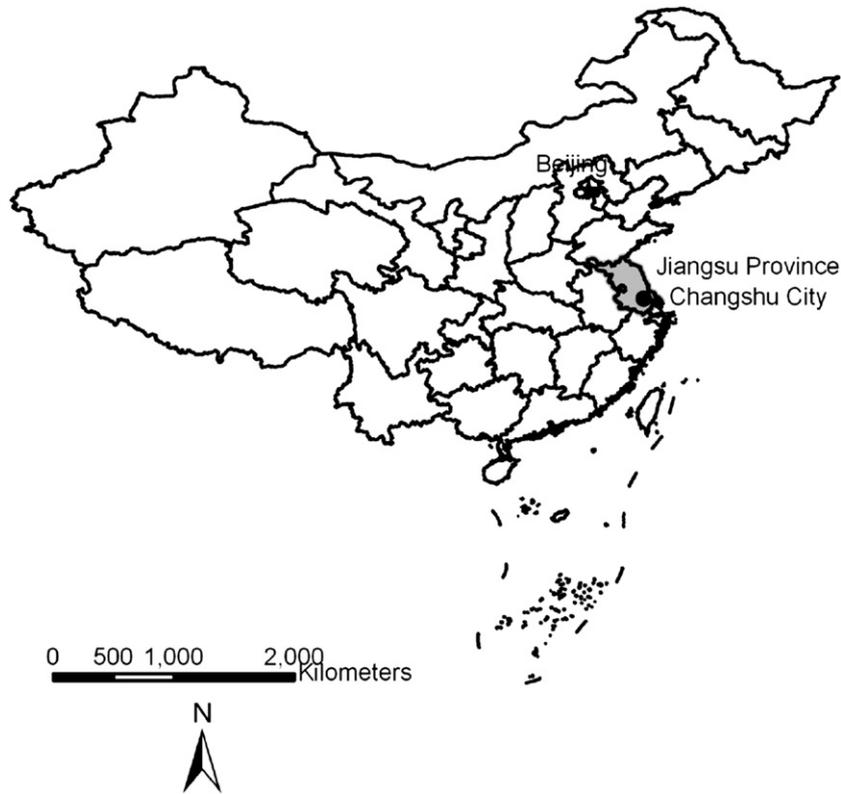


Fig. 2. Geographical location of Changshu city.

5. Methodology

5.1. Samples and data collection

The data of this study was collected by a questionnaire survey conducted in Changshu during April to September, 2008. Based on a preliminary understanding of the contextual background of the study area, a questionnaire was prepared to monitor firms' proactive environmental behaviors and classified factors. The questionnaire format consists of three major components: general information of the firm; proactive environmental management behaviors such as whether the firm passed ISO14001 certification; and the degree of pressures being felt by the firm.

The survey targeted the managers to ask for their knowledge of environmental issues affecting their firms. Over the period of approximate six months, the survey was done in three steps. Six local government officials and thirty enterprises were communicated at the very beginning to clarify the status of CEM in the city. Then the tentative questionnaire was sent to 51 enterprises in an Economic Development Park to test its feasibility for answering. The finalized questionnaire was lastly posted to 1300 enterprises on a list provided by the city's environmental protection bureau (EPB). A total of 132 firms responded, meaning a 10.2% response rate achieved. Amongst the respondents, 117 were confirmed to be valid. The distribution of usable samples by industrial sectors is listed in Table 1.

5.2. Econometric approach

5.2.1. Identification of the econometric model

In our study, a firm's adoption of proactive environmental behaviors is hypothesized to be jointly determined by the external and internal factors identified in section 3. The externally coercive, normative, and mimetic pressures are hereby indicated by vector C ,

N and M , respectively. Similarly, a firm's environmental strategy orientation is represented by a vector E and its learning capacity is represented by a vector L . A firm's other characteristics, such as size, ownership status, etc., are indicated by a vector Ch , which may also influence the decision process of environmental issues. They are defined as control variables in the analysis. As stated, a firm's proactive environmental management level (EML_p) can be presented in a reduced-form as Equation (1).

$$EML_p = f(C, N, M, E, L, Ch) \tag{1}$$

5.2.2. Dependent variable

The EML_p is the dependent variable in our study. Usually, the comprehensiveness of a firm's environmental management is presented by a series of environmental strategies, goals, administrative procedures as well as the practical efforts to improve the environmental performance (Coglianese and Nash, 2001). It is difficult to

Table 1
Distribution of the surveyed samples and respondents by industrial sectors.

Sector	Number of samples	Percentage	Number of respondents	Percentage
Paper	3	0.2	1	0.9
Textile, dyeing and clothing	367	28.3	14	12.0
Chemicals	237	18.2	30	25.6
Metals and non-metals	247	19.0	28	23.9
Machinery and equipments	116	8.9	9	7.7
Power generation	8	0.6	5	4.3
Others	322	24.8	30	25.6
In total	1300	100	117	100

Table 2
Variable definition, proxies and valuation.

Variable	Proxy	Valuation				
		0	1	2	3	4
<i>Panel A: Dependent variable</i>						
<i>EML_p</i>	ISO14001 certification Cleaner production audit Recycle of byproduct Eco-technical innovation Disclosure of environmental information Environmental cooperation with external suppliers					
<i>Panel B: Independent variables</i>						
External pressures	Coercive	Intensity of environmental enforcement (REGULATION) Export rate of the product (EXPORT)				
	Normative	Frequency of the public complaints (COMPLAINT) Influence of the association of industrial sector (ASSOCIATION)				
Internal factors	Mimetic	Level of sector environmental management (SECTORLEVEL)				
	Environmental orientation	Awareness on environmental problems (AWARENESS) Willingness to solve environmental problems (WILLINGNESS)				
	Learning capacity	Education level of the employees (EDUCATION) Frequency of internal environmental training (TRAINING)				
<i>Panel C: Control variables</i>						
Characteristics of the firm	Organisation size (SIZE) Ownership status (OWNERSHIP) Industrial sector (SECTOR) Environmental impact level (ENVIMPACT)					

measure a firm's environmental management level since it does not necessarily equal the sum of environmental plans and tools. A feasible way is to list a series of adopted environmental management activities (EMAs), which could reflect the CEM level. In this study, the number of proactive EMAs under implementation is defined as the substitutive variable indicating a firm's *EML_p*.

As listed in panel A of Table 2, six typical EMAs were selected as proactive behaviors of Chinese companies currently. These practices are all beyond the requirements of existing mandatory regulations. Since the relative importance of each practice for a firm is difficult for the quantification, the six practices are assumed to be equally contributing to a firm's *EML_p* in this study. A value of '1' is assigned to a practice if the firm has adopted it. Otherwise, a score of '0' is given. Each item of EMAs will obtain a score of '1' or '0'. The sum of the scores of the six practices is used to represent a firm's *EML_p*. A higher score reflects a higher level of proactive environmental efforts.

5.2.3. Independent variables

Recalling Equation (1), the independent variables *C*, *N*, *M*, *E* and *L* individually represent coercive, normative and mimetic pressures, environmental strategy orientation and learning capacity. The proxies of these factors have been identified in section 3.2 and are listed in panel B of Table 2. Except the 'Intensity of environmental enforcement', the descriptions of the other independent variables were directly used as the survey items in the questionnaire. The level of effluent fee, which was frequently adopted by previous studies to represent non-compliance sanctions for Chinese firms, is used as a proxy indicating the 'Intensity of environmental enforcement' in this study (Zhang et al., 2008). This is because a firm's effluent fee is charged according to its volume of pollutant emissions in China. The higher effluent fee a firm pays, more money would be penalized if its environmental violation was caught. The probability of being inspected would also increase. In our survey, the firms were asked to judge the overall levels of their effluent fee charged by the government.

As expressed in panel B of Table 2, a five-level method was basically used for the valuation of independent variables. The firms were requested to give a value to measure the level, strength or the agreement degree of each factor with '1' = very low; '2' = relatively low; '3' = moderate; '4' = relatively high; and, '5' = very high. The only exception is the export rate of the product, which used a four-level classification with '4' representing more than half of the products being exported; '3' having a 25–50% export ratio; '2' being a 10–25% export ratio; add '1' meaning an export ratio of less than 10%. This categorization of export rate of a company is adopted to indicate the coercive power of international regulations since a company with a higher export level is more likely to be affected by international rules (Yang and Zhou, 2004).

5.2.4. Control variables

Previous studies showed that big companies are more likely to be supervised by environmental authorities and the public (Hettige et al., 1996). Companies with higher environmental impact may be more willing to improve their environmental performances. As indicated in panel C of Table 2, organization size, ownership status, industrial sector, and environmental impact level are defined as control variables (represented by SIZE, OWNERSHIP, SECTOR and ENVIMPACT, respectively). For the valuation, the firm's size is divided into three categories by its turnover in 2007. The ownership of the firms consists of five types and the industrial sector is classified as traditional and high-tech industries. The environmental impact level is rated on a scale of '1' to '5' with '5' being very strongly adverse and '1' being very slightly adverse impact.

5.2.5. Econometric model

According to the above explanations, the regression equation capturing the functional relationship between the *EML_p* and the listed variables can be constructed and expressed by equation (2), where ε represents the error term and β_0 is the constant.

Table 3
Summarization of the independent variables.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
REGULATION	109	3.29	0.72	1	5
EXPORT	101	2.15	1.24	1	4
COMPLAINT	117	1.53	0.68	1	3
ASSOCIATION	116	3.29	1.10	1	5
SECTORLEVEL	116	3.53	0.86	1	5
AWARENESS	115	4.39	0.62	3	5
WILLINGNESS	113	4.02	0.88	1	5
EDUCATION	107	1.93	1.01	1	5
TRAINING	117	4.16	0.82	2	5

$$\begin{aligned}
 EML_p = & \beta_0 + \beta_1 \text{REGULATION} + \beta_2 \text{EXPORT} + \beta_3 \text{COMPLAINT} \\
 & + \beta_4 \text{ASSOCIATION} + \beta_5 \text{SECTORLEVEL} \\
 & + \beta_6 \text{AWARENESS} + \beta_7 \text{WILLINGNESS} \\
 & + \beta_8 \text{EDUCATION} + \beta_9 \text{TRAINING} + \beta_{10} \text{SIZE} \\
 & + \beta_{11} \text{OWNERSHIP} + \beta_{12} \text{SECTOR} \\
 & + \beta_{13} \text{ENVIMPACT} + \varepsilon
 \end{aligned}
 \tag{2}$$

6. Results and discussions

6.1. Statistical summary of the independent and control variables

Stata8.0 was used for the statistical analysis. Table 3 summarizes the independent variables listed in Equation (2). It is indicated that most companies are aware of their environmental problems (with an average of 4.39) and express higher willingness to make efforts (averaged at 4.02). The internal environmental training is frequently carried out in the sampled companies although the average education level of the employees is low. The environmental enforcement intensity is moderately felt by the firms probably because the majority of them have been in compliance. The sampled companies are not often complained by the public such as neighboring citizens.

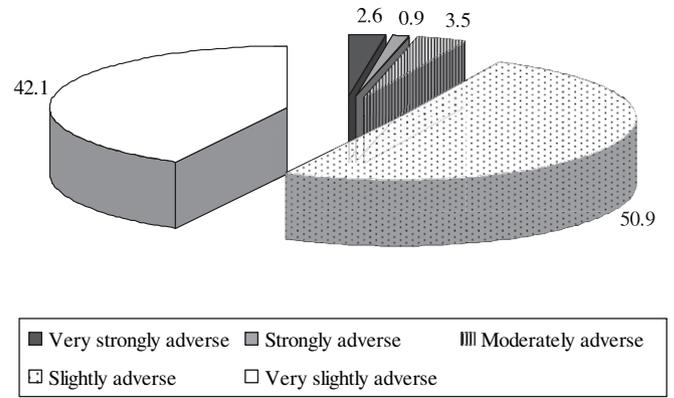


Fig. 3. Distribution of firm's environmental impact level (rated by the firms themselves, N = 117).

Regarding the control variables indicating a firm's characteristics, most of the samples are small and medium sized. Large companies, with an annual turnover of more than CNY 300 million, account for 8.6% of the total. Small enterprises, whose annual turnovers are below CNY 30 million, share 47.6%, and the remaining 43.8% is medium enterprises. The ratios of collectively owned, private, wholly foreign-funded, joint venture and other types are 5.3%, 24.6%, 16.7%, 21.1%, and 32.5%, respectively. Nearly two-thirds of the samples are classified as traditional industry, while enterprises belonging to high-tech industry share one third. Fig. 3 shows the environmental impact rated by the firms themselves. Most of enterprises regard their environmental impacts as slightly or very slightly adverse (with shares of 50.9% and 42.1%). Only 2.6% of them think they have very strongly adverse impact on the environment.

6.2. Result of firm's proactive environmental management behaviors

Fig. 4 provides a summary of proactive environmental management practices adopted in the responding enterprises. Recycling of byproducts is the most adopted practice (71.8%). Two-thirds of

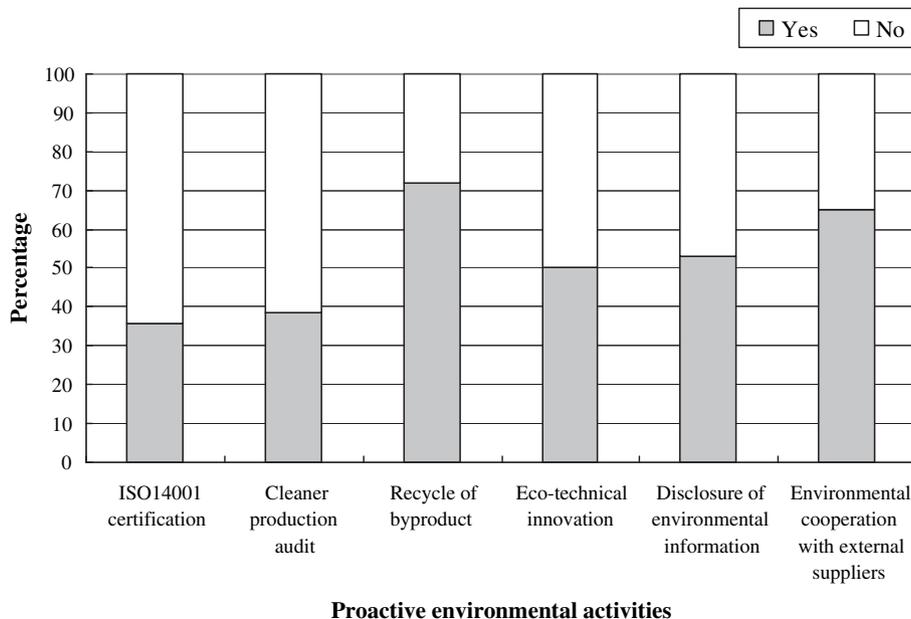


Fig. 4. Distribution of firm's proactive environmental activities (N = 117).

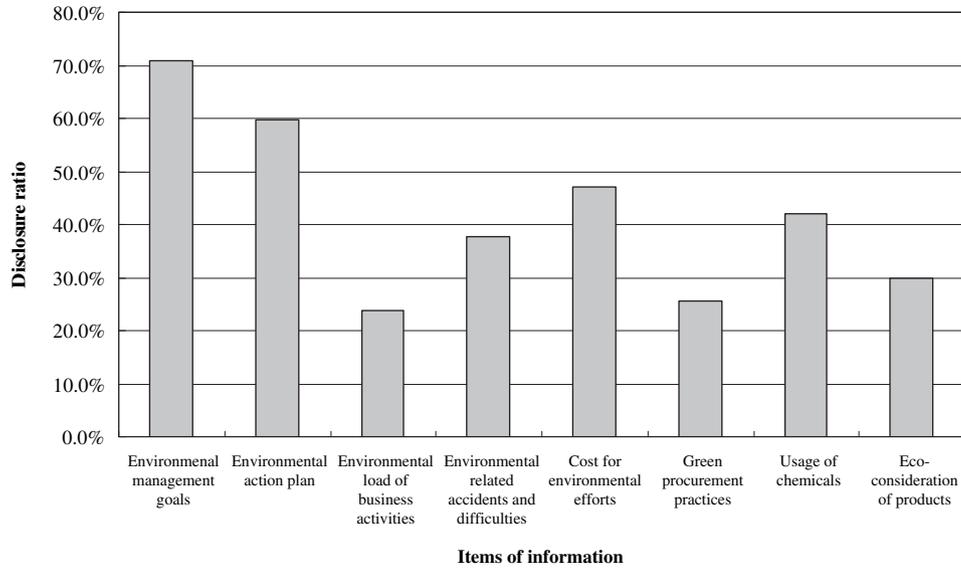


Fig. 5. Disclosure ratio of environmental information items of the practicing enterprises (N = 62).

enterprises have cooperated with external suppliers on environmental issues to a certain degree, e.g., half of the enterprises expressed concern about the environmental behaviors of their suppliers. The shares of enterprises, which passed ISO14001 certification and carried out a cleaner production audit, are relatively low (35.9% and 38.5%, respectively).

Although more than half of the enterprises are disclosing environmental information in different ways, as indicated in Fig. 5, it is easier for them to disclose subjective information like environmental goals and action plans. They are reluctant to open information on actual performances, such as pollution load and environmental related difficulties. Fig. 6 shows the distribution of the level of proactive CEM behaviors of the respondents. The average EML_p is 3.15 indicating a moderately lower level of the samples to adopt proactive environmental activities. Less than 10% of the 117 respondents are practicing all the six kinds of environmental activities, whereas nearly 60% of them are just implementing three items of environmental activities or less.

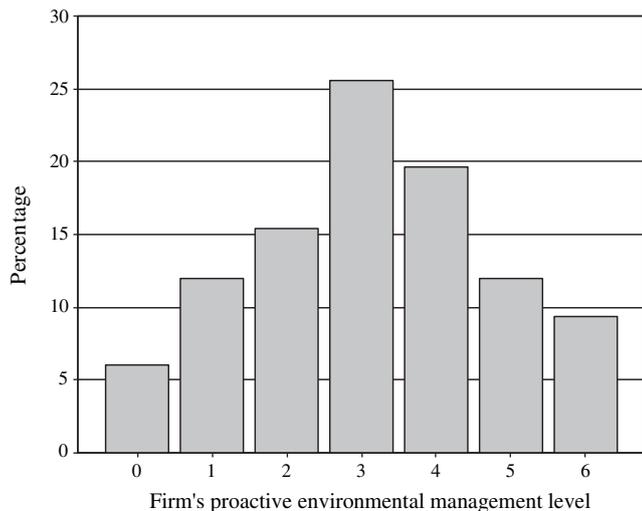


Fig. 6. Distribution of firm's proactive environmental management level (N = 117).

6.3. Correlation matrix and bi-variable results

Pearson rank correlation was used in this study to explore the relationship between the quantitatively independent variables and the EML_p . The result is shown in Table 4. There is no indication that an unacceptable level of multi-collinearity is present between these variables as the highest correlation coefficient is 0.387 for WILLINGNESS (Willingness to solve environmental problems) and 0.482 for TRAINING (frequency of internal environmental training). Harmful levels of multi-collinearity were expected not to be present until the correlation coefficient reached ± 0.8 or ± 0.9 (Farrar and Glauber, 1967). The result indicates that TRAINING is significantly positive to EML_p at $P < 0.01$. Another variable showing positive correlation with EML_p , significant at $P < 0.01$, is WILLINGNESS. This result appears consistent with previous research documenting that the internal drivers, including a firm's environmental orientation and learning capacity, play more prominent roles to the implementation of ISO14001 (Yang and Zhou, 2005).

6.4. Multivariate analysis and discussions

As the dependent variable is in an ordinal measure, the ordered logistic regression was performed and the results are listed in Table 5. The robustness of the results was tested by repeating the regression with certain of the variables omitted. Three models were adopted. Model 1 is the case of omitting all the control variables. Model 2 is the case of adding three indicator variables of firms like SIZE, OWNERSHIP and SECTOR. Model 3 is the case of including all the variables discussed earlier. There are no obvious changes between the results of the three regressions. Due to data missing for some respondents, the total number of samples for econometric exercise is 74.

The results in Table 5 show that the intensity of environmental enforcement, as a major coercive pressure, has a limited positive effect on EML_p . This is probably because environmental violations become more and more difficult for the companies based in the areas like Changshu city with a relatively developed economy. The companies there have learned to manage the relationship with the government by taking certain proactive environmental actions. No positive relationship was found between EML_p and the level of product export and the normative pressures. This is probably

Table 4
Correlation coefficients of the quantitative variables.

	EML _p	REGULATION	EXPORT	COMPLAINT	ASSOCIATION	SECTORLEVEL	AWARENESS	WILLINGNESS	EDUCATION	TRAINING
EML _p	1									
REGULATION	-0.087	1								
EXPORT	0.088	-0.054	1							
COMPLAINT	0.046	0.151	0.002	1						
ASSOCIATION	0.277 ^b	0.098	-0.045	0.161	1					
SECTORLEVEL	0.302 ^b	-0.107	0.156	0.021	0.127	1				
AWARENESS	0.097	-0.077	0.052	-0.131	0.059	-0.044	1			
WILLINGNESS	0.387 ^b	-0.164	0.044	-0.016	0.077	0.070	0.078	1		
EDUCATION	0.275 ^b	-0.172	-0.037	-0.188	0.115	-0.048	0.207 ^a	0.258 ^b	1	
TRAINING	0.482 ^b	-0.076	0.13	-0.063	0.244 ^b	0.254 ^b	0.172	0.266 ^b	0.271 ^b	1

^a Significant at 5%.
^b Significant at 1%.

Table 5
Ordered logistic regression result of the econometric model (N = 74).

	Model 1		Model 2		Model 3	
	Coef.	P	Coef.	P	Coef.	P
REGULATION	0.52 (0.34)	0.125	0.64 (0.38)	0.091	0.64 (0.38)	0.091
EXPORT	0.19 (0.17)	0.265	0.10 (0.19)	0.598	0.1 (0.19)	0.595
COMPLAINT	0.49 (0.35)	0.157	0.52 (0.36)	0.146	0.52 (0.35)	0.146
ASSOCIATION	-0.06 (0.21)	0.761	-0.08 (0.25)	0.751	-0.08 (0.25)	0.753
SECTORLEVEL	0.74 (0.26)	0.004	0.73 (0.26)	0.006	0.73 (0.27)	0.006
AWARENESS	-0.20 (0.37)	0.589	-0.23 (0.40)	0.572	-0.23 (0.40)	0.567
WILLINGNESS	0.65 (0.33)	0.049	0.74 (0.34)	0.032	0.74 (0.35)	0.034
EDUCATION	0.41 (0.21)	0.054	0.36 (0.26)	0.168	0.36 (0.26)	0.169
TRAINING	1.10 (0.33)	0.001	1.06 (0.35)	0.003	1.06 (0.35)	0.003
ISIZE-2			0.33 (0.57)	0.561	0.35 (0.59)	0.559
ISIZE-3			0.31 (0.92)	0.734	0.33 (0.30)	0.726
IOWNERSHIP-3			0.14 (1.36)	0.92	0.11 (1.39)	0.935
IOWNERSHIP-4			-0.12 (1.58)	0.939	-0.13 (1.59)	0.934
IOWNERSHIP-5			0.14 (1.40)	0.923	0.12 (1.41)	0.933
ISECTOR-2			0.57 (0.56)	0.3	0.57 (0.56)	0.313
ENVIMPACT					0.03 (0.31)	0.93
L R chi	39.39***		42.05***		42.06***	
Pseudo R ²	0.147		0.157		0.152	

Note: the data in the parenthesis is standard error.

because the survey does not distinguish between export destinations and the type of exports for which proactive CEM would act as a screening device (Prakash and Potoski, 2006). This also indicates that the role of international regulations, public pressure and

influence from industrial associations are still not significantly felt by the sampled companies. However, mimetic pressure is significantly affecting the EML_p. This interesting finding indicates that the companies are sensitive to market factors. Firms are quite anxious about losing the advantage if they can not perform environmentally as well as their competitors in the same sector. As expressed by Hoffman (1999), the different kinds of external drivers usually have certain linkages and one of them may be determinant at a specific stage. Milstein et al. (2001) added that coercive pressures, followed by normative pressures, are normally more important at the beginning phase of the formulation of legitimacy. The mimetic driver will replace the previous two pressures to become a major force until the basic legitimacy has been formed. According to these viewpoints, this study provides the evidence that the companies in the study area have basically achieved environmental legitimacy.

The internal factors, like WILLINGNESS and TRAINING, appear obvious effects to EML_p. This shows that if a firm views environmental issues as opportunities rather than threats, it is more possible to practice proactive environmental behaviors. The awareness on environmental problems and the education level of employees do not have a significant effect on EML_p in this analysis. In general, environmental awareness may be an important factor to engage the enterprises in environmental initiatives. It shall not be a potential matter for the firms in this survey since almost all of the respondents (94.9%) have confirmed their clear understanding of self environmental conditions. The average educational level of the

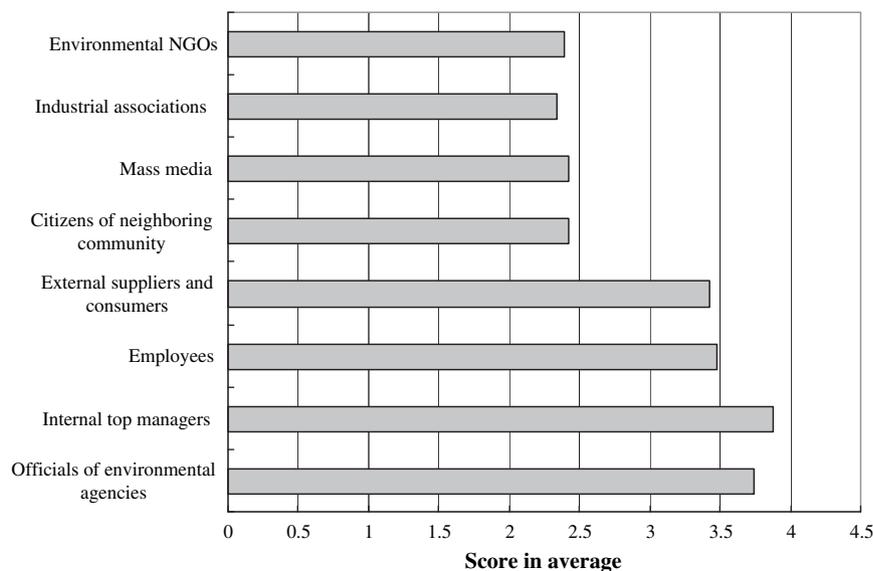


Fig. 7. Relative importance of the stakeholders of firms for proactive CEM (N = 117).

firm's employees is not significant probably because environmental management skills are mainly improved by internal training. The findings on internal factors in this study are different with some previous studies focusing on institutional theory. They are not controversial since this study extends the application conditions for institutional theory. The internal factors do exist and may play significant roles for proactive environmental practices.

As indicated in Table 5, none of the control variables are significant to EML_p . This would be different from the results obtained by some scholars, who indicated that plant size, ownership status, industry sector, and environmental management experience would somehow influence CEM (Zhang et al., 2008; Dasgupta et al., 1997; Arora and Cason, 1996). This difference may be due to a different definition of dependent variable in our analysis. This study only focuses on the proactive CEM practices while excluding those CEM activities in basic environmental compliance. One more possible reason is that this study only selected a small area for the survey. The respondents may have similar characteristics as defined by control variables.

6.5. The importance of the stakeholders

In order to find out which stakeholders are more important in promoting the level of a firm's proactive environmental performance, the companies were also asked to rate the importance of classified stakeholders by giving a score from '1' to '5' with '5' standing for the most important. Fig. 7 shows the rating results. The internal top managers (scored 3.88 in average) and officials of environmental agencies (averagely scored 3.74) are the two important stakeholders recognized by the samples for environmental practices. This result is some consistent with the above statistical analysis, which identifies a firm's willingness to solve environmental problems as an effective driver for EML_p . The roles of industrial associations, environmental NGOs, mass media and the public are regarded as less important, which thus represents a weak normative pressure for firms in the current Chinese context.

7. Conclusions

This study has sought to identify major driving factors for firms to take proactive environmental behaviors and conducted an empirical analysis in Changshu City of China. The defined drivers are partly supported by the econometric exercises, which recognized the overall environmental management performance at sector level, corporate willingness to solve environmental problems and frequently internal environmental training as significantly positive drivers. The EML_p does not seem to vary much in terms of characteristic factors like organization size and ownership status. This argument necessitates future close observation of the relationship between a firm's characteristics and proactive environmental behaviors in the Chinese context. The weak role of the general public and industrial associations confirmed by this study shows that Chinese environmentalism transformation is still at an early stage. These findings imply that Chinese environmental policy makers should continue to help the public to actively participate in environmental issues. More pipes should be created to facilitate easier accesses of social actors to the firm's environmental information. The effective reactions of company stakeholders will generate pressures or incentives for the firms to improve their environmental performances.

There are several shortcomings of this study. The survey relies on a firm's self-reporting for data collection. Due to lower concerns from the firms in China currently, only a limited number of usable samples was gathered for econometric analyses. Additionally, only

a few factors were identified and analyzed by this empirical study. The selection of a small city as the study area may cause a certain degree of bias since similar determinant factors may act differently for the firms located in different places due to the disparity of economic and environmental background (Liu and Anbumozhi, 2009). Future studies shall seek to fill up the above-mentioned gaps by addressing some other driving factors or conducting similar surveys in other geographical regions. These research efforts would further help clarify the functional mechanism of optional environmental policies for Chinese firms to improve their environmental performances.

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