Journal of Cleaner Production 112 (2016) 3423–3433

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

The relationships between regulatory and customer pressure, green organizational responses, and green innovation performance

Xiao-xing Huang [a,*], Zhen-peng Hu [a], Cun-shan Liu [b], Da-jin Yu [c], Liu-fang Yu [d]

[a] School of Management, Nanchang University, Nanchang, Jiangxi 330031, China
[b] Department of Mechanical and Electronical Engineering, Dongguan Polytechnic, Dongguan, Guangdong 523808, China
[c] School of Information Management, Jiangxi University of Finances and Economics, Nanchang, Jiangxi 330047, China
[d] School of Economics and Management, Hubei University of Automotive Technology, Shiyan, Hubei 442002, China

ARTICLE INFO

Article history:
Received 18 March 2015
Received in revised form
21 October 2015
Accepted 24 October 2015
Available online 2 November 2015

Keywords:
Regulatory pressure
Customer pressure
Green organizational responses
Green innovation performance

ABSTRACT

Although much research has been done to investigate the influence of regulatory and customer pressure on green innovations, the existing literature paid little attention to the question of how such pressure motivates organizations to improve their green innovation performance. A conceptual model based on the concept of green organizational responses is developed in this paper. The model is tested using structural equation modeling on a sample of 427 manufacturing organizations in six provinces in central China. The results of modeling show that regulatory and customer pressure promotes green organizational responses and enhances green innovation performance. However, these two forms of pressure are shown to have different impacts on specific organizational responses and different extent of impact on green innovation performance. For example, while regulatory pressure has significant positive impact on training and plays a direct role in green innovation performance, customer pressure has significant positive impact on research and development investments and collaboration networks. These results offer important implications for promoting green innovations in the manufacturing industry.

1. Introduction

With environmental degradation becoming one of the main threats to human survival in the future, an increasing number of organizations have been motivated to take green innovations as a strategy to achieve both environmental protection and economic growth. Green innovations refer to those innovations in products, processes and management that can lead organizations to achieve sustainable competitive advantages in an eco-effective way (Porter and Van der Linde, 1995b; Schiederig et al., 2012).

There is a growing stream of research examining the determinants of green innovations (Brunnermeier and Cohen, 2003; Chen, 2008; Freeman, 1983). Among these determinants, regulations and customer demands have been identified as the main drivers of green innovations (Montalvo, 2008; Porter and Van der Linde, 1995a; Yalabik and Fairchild, 2011). However, Frondel et al. (2008) and Eiadat et al. (2008) find that regulatory pressure does not significantly impact environmental innovations. At the same time, Rehfeld et al. (2007) find empirical evidence that the customer demand is not a strong driver of green product innovations, since eco-friendly products are more expensive.

The inconsistent results actually suggest that the mechanism through which regulatory and customer pressure drives green innovations is still largely unclear. To fill in this gap in the green innovation literature, this research proposes the concept of green organizational responses. A conceptual model is built based on the institutional theory and resource-based view to explore the effects of regulatory and customer pressure on green innovation performance through green organizational responses.

According to the pressure-response-performance framework, this study focuses on (1) the impacts of both regulatory pressure and customer pressure on different green organizational responses, (2) the effects of such responses on green innovation performance, and (3) the role of the responses as a mediator between the two forms of pressure and green innovation performance.

The remainder of the paper is structured as follows. Section 2 develops a theoretical framework and specifies its hypotheses. Section 3 describes the method used in the empirical analysis. Section 4

* Corresponding author.
E-mail address: merry0611@163.com (X.-x. Huang).

http://dx.doi.org/10.1016/j.jclepro.2015.10.106
0959-6526/

presents the results of the empirical study, followed by a discussion of these results in Section 5. Finally, Section 6 provides the conclusions.

2. Theoretical framework and hypotheses development

The theoretical framework adopted in our study combines the institutional theory with resource-based view.

According to the institutional theory, organizations respond to formal and informal institutions by incorporating institutional rules within their own structures. The theory identifies three different institutional mechanisms (DiMaggio and Powell, 2000): coercive isomorphism (pressure from government regulations), normative isomorphism (pressure from the public), and mimetic isomorphism (pressure mainly from leading companies). While government regulations represent a formal institution, which affects organizations through coercive isomorphism, changes in customer preferences reflecting dominant social norms and decisions of leading companies represent an informal institution whose impact on organizations is delivered mainly through normative and mimetic isomorphism (Liu et al., 2010). Therefore, regulatory and customer pressure are probably the two most important types of institutional pressure.

Though the institutional theory provides a suitable theoretical framework for understanding the role of institutions in determining organizational environmental strategies, it fails to explain how to achieve competitive advantage in a complex institutional context. At the same time, resource-based view (RBV), being complementary to the institutional theory, can differentiate the contribution of different resources to competitive advantage. The classical RBV suggests that achieving competitive advantage is possible by developing and accumulating valuable, unusual and non-replicable resources (Barney, 1991). However, it has been criticized for not being able to explain how such invisible resources are deployed to gain competitive advantage (DeSarbo et al., 2005). Based on the classical RBV, Hart (1995) developed the Natural RBV by introducing the concept of green capabilities. The Natural RBV highlights the importance of accumulation and management of green capabilities in contributing to competitive advantage related to opportunities and constraints of nature (Hart and Dowell, 2010).

According to the institutional theory and Natural RBV, when an organization perceives a green innovation as an effective way to respond to institutional pressure or achieve competitive advantage, it tends to create green capabilities required for the implementation of such innovations by developing various organizational supporting factors, such as top management support, R&D investments in green products or cleaner production technologies, training employees in environmental initiatives, creating green collaboration networks, and adopting environmental management systems (EMS).

Following Delmas and Toffel (2008), this study uses the term “green organizational responses” to describe organizational responses to a particular external driver influencing the level of green innovations (Zilahy, 2004). Further, based on prior research on firm performance, our study defines “green innovation performance” as achievements in the environmental, market, financial and knowledge fields at all stages of the implementation of green innovations (Cai and Zhou, 2014; Li, 2014; Pereira-Moliner et al., 2012). Based on the pressure-response-performance framework, in our conceptual model the two forms of institutional pressure are proposed as key external drivers that provoke organizational positive responses, which in turn improve their green innovation performance (Fig. 1).

2.1. Impact of regulatory and customer pressure on green organizational responses

Environmental initiatives largely depend on external pressure, where different types of external pressure may lead to distinct internal organizational responses (Bansal and Roth, 2000). This study uses the concept of green organizational responses to explain the internal dynamic characteristics within the organizational framework. Our main hypothesis is that there is a positive relationship between them.

2.1.1. Impact of regulatory and customer pressure on top management support

Regulatory push and demand pull have been identified as essential external drivers of green innovation implementations. However, it would be difficult for an organization to initiate an environmental project without the support of the top management (Berry and Rondinelli, 1998; Menguc et al., 2010). Top managers may be forced to adopt a green innovation strategy by assessing the consequences of not complying with environmental regulations,

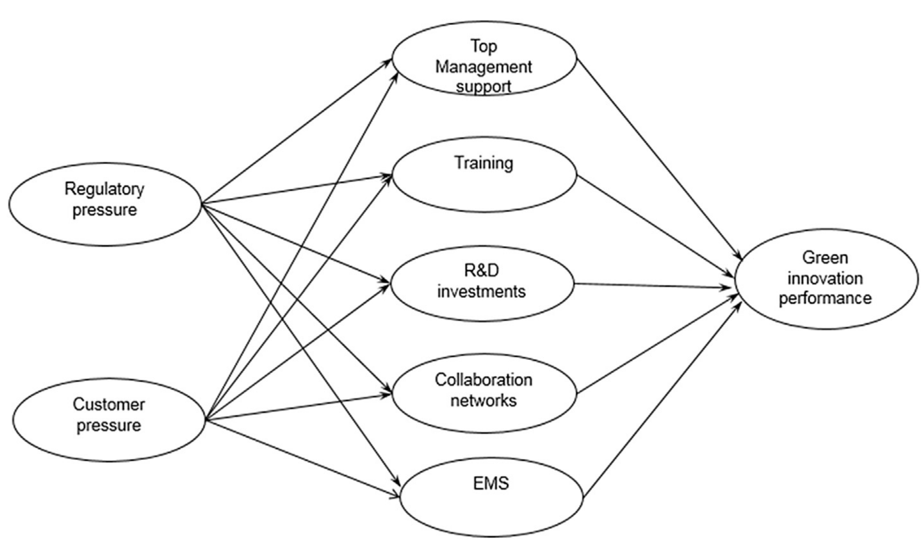

Fig. 1. The conceptual model of the impact of regulatory and customer pressure on green innovation performance via green organizational responses.

such as possible legal actions, fines and losses (Hoffman, 1999). In contrast, if the top management is supportive of green innovation activities, they may help the organization to build sound reputation and relations with government agencies (Colwell and Joshi, 2013). Similarly, in a competitive market environment, choosing not to conform to customers' green demands may lead to a loss of a market share, with the outcome eventually reflected in financial performance (Gualandris and Kalchschmidt, 2014). Thus, consumer demand is also a critical factor that influences the top management's decisions regarding green innovations.

In summary, the support of green innovations by the top management is needed to address regulatory and customer pressure. The hypotheses proposed in our study are as follows.

H1a. Regulatory pressure is positively correlated with the top management support of green innovations.

H1b. Customer pressure is positively correlated with the top management support of green innovations.

2.1.2. Impact of regulatory and customer pressure on training

A key element of innovations is the learning ability, which can be built by training. In the context of green innovations, training refers to a series of environmental activities for all types of employees aiming at specific objectives, such as training employees in methodologies and techniques of eco-design and recycling of materials, or use of cleaner or renewable technology (Unnikrishnan and Hegde, 2007).

Institutional pressure can motivate organizations to provide training in relation to green innovations, because such behavior can help organizations to obtain social legitimacy and enhance corporate image by increasing staff awareness and commitment to environmental issues. Such training can satisfy specific institutional demand (Backer, 2007).

As a result, stringent regulatory standards and clear customer demand have great potential to force organizations to utilize green training as a mean of reducing environmental impact. Hence, in this study the following hypotheses are further proposed.

H2a. Regulatory pressure is positively correlated with the extent of training.

H2b. Customer pressure is positively correlated with the extent of training.

2.1.3. Impact of regulatory and customer pressure on R&D investments

Real success of environmental innovations depends largely on the organization's technological capability, as well as other general innovations (Cai and Zhou, 2014). In this regard, the identification of driving forces of R&D investments in green innovations seems increasingly important.

Some empirical results have shown that organizations are more likely to increase environmental R&D investments and update pollution prevention technologies under the stringent regulations (Demirel and Kesidou, 2011; Horbach et al., 2012). Moreover, the role of customer pressure in driving green R&D investments should not be underestimated. Take Germany for example, the German government started to pay more attention to pollutions produced by the manufacturing industry since 1970s. Along with the growing awareness regarding environment-friendly products in Germany, the government successively published a series of regulations to promote energy conservation and its efficient use. Facing the pressure from both government and consumers, many manufacturers opted to invest more into R&D in cleaner production technologies or green products.

Based on the discussion above, this study establishes the following hypotheses.

H3a. Regulatory pressure is positively correlated with the R&D investments in green innovations.

H3b. Customer pressure is positively correlated with the R&D investments in green innovations.

2.1.4. Impact of regulatory and customer pressure on collaboration networks

External knowledge appears to be more important for green innovations than for other types of innovations (De Marchi, 2012). Organizations usually expand their external knowledge sources by enhancing their own network capabilities (Clausen, 2013). Since green innovations represent a technological frontier, organizations adopting green innovation strategies are faced with significant market and technical uncertainty. Through collaboration with universities, research institutions, suppliers and even their rival partners, organizations can utilize external sources as a complement to internal innovative sources to reduce risks caused by the market and technical uncertainty (Pohl, 2008).

In the face of stringent environmental regulations, organizations may seek to adopt networking activities to reach environmental standards set by the government, through which they can obtain not only external knowledge required for green innovations, but also relational capital beneficial to achievement of competitive advantage (Colwell and Joshi, 2013).

In a market economy, most of organizational behavior is driven by profits and high returns. The increase in the market share can greatly motivate organizations to follow customers' green demands and cooperate with external partners. For example, in order to green their products and processes, firms often choose to work with specific suppliers, provide green training, and even financial support, as the majority of their product components may originate from these suppliers (Ağan et al., 2014).

The facts outlined above suggest that there are also the following positive relationships between the two forms of pressure and strength of collaboration networks.

H4a. Regulatory pressure is positively correlated with the strength of the collaboration network.

H4b. Customer pressure is positively correlated with the strength of the collaboration network.

2.1.5. Impact of regulatory and customer pressure on environmental management systems (EMS)

Organizational ability plays an important role in the innovation process. Environmental organizational capabilities are often created by means of the implementation of the EMS. The EMS constitutes practices that can integrate specific environmental goals and activities related to the efficient use of energy by means of formal environmental monitoring or a production controlling system, behaving as a key factor in the implementation of green innovations.

Under strict government supervision, the implementation of EMS can be considered as a cooperative effort to fulfill government regulations and reduce regulatory pressure (Lin et al., 2014). Zhao et al. (2015) have empirically shown that environmental regulations serve as a key factor in influencing the organization's decision to adopt the EMS. In addition, Corporate customers may give top priority to those suppliers who can provide relevant environmental certifications, such as ISO 14000 (Delmas and Montiel, 2007). Accordingly, this study makes further hypotheses.

H5a. Regulatory pressure is positively correlated with the adoption of the EMS.

H5b. Customer pressure is positively correlated with the adoption of the EMS.

2.2. Impact of green organizational responses on green innovation performance

According to the natural RBV, positive organizational responses enable firms to obtain dynamic capabilities in managing their static resources strategically and, as a result, to improve their innovation performance (Hart and Dowell, 2010). In fact, an essential factor for realizing the goals of green innovation is the development of the firm's green capabilities, which can be enhanced by evoking green responses. In this regard, it is proposed that every green organizational response will affect the green innovation performance of the organization.

For instance, it is acknowledged that the support of the top management plays a crucial role as an important strategic resource (capability) of the organization in driving green innovations. In particular, through effective communication and initiating programs in support of green innovation initiatives, and commitment for environmental issues and provision of adequate resources in support of such initiatives, the top management contributes to improvements in green innovation performance (Drumwright, 1994).

Similarly, it is suggested that each of the other four types of green organizational responses (training, R&D investments, collaboration networks, and EMS) has positive impact on green innovation performance. First, it is argued that the impact of training on green innovations can be attributed to its role in strengthening learning abilities required for green innovations (Saturnino Neto et al., 2014). In particular, training can assist in motivating employees to reorient their traditional view of environment and adjust their behavior to enhance environmental learning abilities, which subsequently leads to improvements in green innovation performance.

Second, R&D investments serve as a key factor for improving technological capabilities required for green innovations. More R&D staff and higher expenditures imply a broader spectrum of enhanced absorptive capabilities, accelerating the process of technological innovations (Simpson and Samson, 2010). Rehfeld et al. (2007) find empirical evidence that R&D investments can significantly trigger environmental innovations by building and exploiting knowledge foundation required for the development of cleaner production technologies. Therefore, R&D investments are likely to facilitate improvements in green innovation performance.

Further, regarding external collaboration networks, it is suggested that inter-firm networks enable companies to utilize more innovative knowledge sources, and integrate external and internal knowledge in a systematic way, and thereby trigger green innovations in a more effective way compared to non-cooperative innovations (De Marchi, 2012). The collaboration with universities, institutes and, especially with suppliers can improve innovation efficiency through technical communication, knowledge transferring and trust building.

Finally, the EMS operates as a management mechanism through which firms can set up corresponding environmental targets and monitor the achievement of objectives (Cuerva et al., 2014). Improvements in eco-product and eco-process innovation performance can be expected due to possible identification and handling of incomplete information (Horbach et al., 2012).

Based on the discussion above, the following hypotheses are further assumed in this study.

H6. Top management support has positive impact on green innovation performance.

H7. Training has positive impact on green innovation performance.

H8. R&D investments have positive impact on green innovation performance.

H9. Collaboration networks have positive impact on green innovation performance.

H10. The EMS has positive impact on green innovation performance.

2.3. The relationship between the two forms of pressure, green organizational responses and green innovation performance

The hypotheses stated above imply that regulatory pressure and customer pressure should positively affect green organizational responses. In their turn, green organizational responses are expected to positively affect green innovation performance.

Hart (1995) argued that the success of green innovations depends upon the coordination between external drivers and internal capabilities. Different Organizations' responses to the same level of external pressure may explain why there is huge difference in their green innovation performance. When an organization is more responsive to the two forms of pressure, the establishment and utilization of green organizational resources or capabilities is more efficient, which is reflected in its green innovation performance. Hence, the following hypotheses are further established.

H11. Green organizational responses mediate the relationship between regulatory pressure and green innovation performance.

H12. Green organizational responses mediate the relationship between customer pressure and green innovation performance.

3. Research methods

The research methods are discussed in terms of data collection, measurement of variables, and common method bias assessment.

3.1. Data collection

This study utilizes a questionnaire survey to collect data and testify the hypotheses outlined above. Six provinces in central China (Hunan, Hubei, Jiangxi, Henan, Shanxi and Anhui provinces) are chosen for this research. These six provinces are very famous for equipment manufacturing in China. Other pillar industries mainly include ferrous and non-ferrous metals, electric power, and energy. Because of this, central China is subject to high pollutions and high energy consumption. However, under enormous pressure from stringent regulations and customers, the central region is now adopting green innovation strategies to improve environmental performance. The manufacturing industry was chosen for our research because it is one of the most polluted industries in China due to its high-energy consumption and high-pollution discharge. For this reason, firms operating in this industry are more likely to initiate green innovations.

In order to ensure the validity of the questionnaire, a pre-survey was carried out including 5 CEOs, 6 manufacturing directors, and 4 professors who specialize in environmental management. The questionnaire was revised based on their feedback. After the adjustment of the questionnaire, the survey was conducted following the steps below.

First, a random sample of 1441 manufacturing firms was selected in the central region using some official websites, such as websites of provincial environmental protection bureaus, made-in-china.com, and chinamanufacture.cn. Contact details for each firm were provided by the websites or local government agencies. Second, in order to enhance the effectiveness of the questionnaire survey and increase response rates, our research group employed eleven graduate students majoring in management science who were trained in research data collection techniques. Third, the questionnaires, filled in by top managers, were collected in two ways: (1) with the assistance of local governments and administrative bureaus, trained interviewers conducted on-site interviews with the top managers of these firms; (2) some questionnaires were collected directly via emails.

As a result, 427 valid responses were obtained. The respondents of the survey included CEOs, chairmen, environmental managers and manufacturing directors. The overall response rate was 29.6% (427/1441). More structured information on the sample is presented in Table 1.

3.2. Measurements of variables

To represent observable variables for each latent variable, the 7 point multi-item Likert scale was used. While the five-point Likert scale has been frequently used by other researchers, some previous studies indicate that the 7-point scale exhibits higher reliability (Oaster, 1989). According to the pre-survey results, a total of 34 items were selected by removing, adding and modifying indicators. Appendix 1 presents the items used in this study.

Regulatory pressure was measured using 5 items based on previous studies (López-Gamero et al., 2010; Liu, 2009; Zhao et al., 2015) and expert interviews. Customer pressure was measured using 4 different dimensions proposed by Lai and Wong (2012), Yen and Yen (2012) and Lin et al. (2013). Items measuring top management support were adapted from Eiadat et al. (2008), Fraj-Andrés et al. (2009) and Menguc et al. (2010). Items measuring training were adapted from Sarkis et al. (2010), Tung et al. (2014). Items measuring R&D investments were adapted from De Marchi (2012), Clausen (2013). Five items were used to measure collaboration networks and three items were selected to measure the EMS (Gonzalez et al., 2008; Tung et al., 2014). Green innovation performance was measured using 7 items following Yuan et al. (2010), Pereira-Moliner et al. (2012), Cai and Zhou (2014).

Table 1
Descriptive statistics of the sample used in the study.

Founded time	Percent	Employees	Percent	Total assets	Percent
<5 years	17.33%	<500	15.69%	<50 million	14.52%
6–10 years	23.19%	500–999	16.86%	50–100 million	17.33%
11–25 years	38.41%	1000–5000	32.08%	100–400 million	22.25%
>25years	21.08%	>5000	35.36%	Above 400 million	45.90%

Sector of manufacturing industry	Subsector	Percent
Equipment manufacturing	Transportation equipment	11.71%
	Electrical machinery and equipment	8.90%
	General and special equipment	10.30%
	Communication & computers	3.51%
Raw material industry	Petroleum processing and coking	10.77%
	Ferrous metals (steel and iron production)	10.54%
	Non-ferrousmetals (Non-ferrous smelting, pressing and manufacturing)	9.13%
	Chemical materials and products manufacturing	7.26%
	Building materials	5.85%
Light industry	Paper-making	7.26%
	Food, alcohol and beverage	5.62%
	Textile and apparels	3.98%
	Tobacco processing	4.92%

3.3. Common method bias assessment

Since only one respondent from each manufacturing organization was interviewed, the common method bias may have posed a problem to our study (Podsakoff et al., 2003). To solve this problem, the Harman's single factor test was performed using the exploratory and un-rotated factor analysis. The results show that no one single factor accumulates the majority of the variance and the first factor accounts for 36.4% percent of the total variance, suggesting that common method bias does not represent a serious problem in our study.

4. Results

This section presents the results of the empirical analysis, including reliability and validity of the model, testing of hypotheses, mediation analysis, and modifications of the proposed model.

4.1. Reliability and validity of the model

The reliability of the model was evaluated using both Cronbach's α, for which values higher than 0.7 are considered acceptable, and composite reliability, for which values equal to or above 0.6 are considered acceptable (Nunally and Bernstein, 1978). As can be seen in Table 2, the Cronbach's α and composite reliability indexes are well above threshold values, indicating that the variables are sufficiently reliable.

The validity mainly refers to convergent validity and discriminant validity. To assess convergent validity, the standardized loadings and average variance extracted (AVE) were used (Chin, 1998). As Table 2 shows, all loadings are above the recommended threshold value of 0.5. The AVE for each construct is also above the recommended level of 0.5, except for the green R&D investments (0.495) and EMS (0.487), which are slightly below the recommended value of 0.5. In summary, the results provide general support for convergent validity among the constructs.

Discriminant validity of the eight constructs was evaluated by checking for each construct whether the square root of the AVE is greater than the possible inter-construct correlation coefficient (Bagozzi et al., 1991). In all cases, the square root of the AVE was found to be larger than the correlation between all possible pairs of constructs, suggesting sufficient discriminant validity (Table 3).

4.2. Hypotheses testing

SEM analysis was performed to examine proposed hypotheses in our study. The results of the estimation of the structural equation model are presented in Table 4. As can be seen from Table 4, both regulatory pressure and customer pressure have significant positive impact on top management support ($\gamma_{11} = 0.193$, $t = 2.026$; $\gamma_{12} = 0.255$, $t = 3.672$). Thus, both hypotheses H1a and H1b are fully supported. Also, both forms of pressure were found to be significantly and positively correlated with the EMS ($\gamma_{51} = 0.427$, $t = 6.903$; $\gamma_{52} = 0.185$, $t = 2.337$), supporting hypotheses H5a and H5b. Customer pressure has significant positive impact on R&D investments ($\gamma_{32} = 0.309$, $t = 4.811$), as well as on collaboration networks ($\gamma_{42} = 0.261$, $t = 5.259$). As a result, both hypotheses H3b

Table 2
Reliability and validity of the model.

Constructs	Items	Standardized loading	Cronbach's α	Composite reliability	Average variance extracted
Regulatory pressure(RP)	Emission standards	0.751	0.804	0.852	0.536
	Production technology standards	0.801			
	Legal risks	0.704			
	Government supervision	0.686			
	Administrative penalties	0.714			
Customer pressure(CP)	Increased awareness of environmental issues among our customers	0.762	0.822	0.86	0.607
	Customers' preferences for environmental friendly products	0.817			
	Customers' continuous attention to our firm' environmental behavior	0.725			
	Customers who seek green suppliers	0.809			
Top management support (TMS)	Communicate that addressing green innovations are an important component of the strategy	0.659	0.791	0.837	0.563
	Consider that green innovations are an effective competitive strategy of our firm	0.734			
	Initiate programs of green innovation	0.831			
	Provide adequate resources to support green innovations	0.767			
Training (TR)	Training employees in methodologies and techniques for eco-design	0.741	0.764	0.820	0.532
	Training employees in recycling/reusing materials or parts	0.755			
	Training employees in use of cleaner or renewable technology	0.689			
	Training employees in disposal of production waste	0.732			
R&D investments (R&D)	The amount of R&D staff investments in green innovations	0.681	0.72	0.662	0.495
	The amount of R&D expenditures in green innovations	0.726			
Collaboration networks (CN)	With suppliers	0.817	0.798	0.856	0.544
	With competitors	0.706			
	With research institutions or universities	0.742			
	With customers	0.729			
	With government agencies	0.686			
Environmental management systems(EMS)	Measurable environmental targets	0.658	0.723	0.738	0.487
	Environmental assessment procedures for internal use(such as ISO 14000 certification)	0.783			
	Written environmental policy	0.643			
Green innovation performance (GIP)	Reduction of energy consumption	0.827	0.877	0.921	0.627
	Reduction of air emissions, waste water, solid waste	0.874			
	Environmental patent application	0.79			
	Market share	0.785			
	Customer satisfaction	0.758			
	New product sales revenue	0.772			
	After-tax profits	0.726			

and H4b are supported. There is also a positive and significant relationship between regulatory pressure and training ($\gamma_{21} = 0.336$, $t = 5.625$). Thus, hypothesis H2a is also supported.

Unlike the results stated above, Table 4 shows that, while the effect of regulatory pressure on R&D investments is positive, it is not significant. Our study concludes that hypothesis H3a is partially supported ($\gamma_{31} = 0.071$, $t = 1.582$). Customer pressure also has positive effect on training, but the effect is also not significant ($\gamma_{22} = 0.095$, $t = 1.641$). Thus, hypothesis H2b is also partially supported. Additionally, there is no significant positive effect of regulatory pressure on green collaboration networks ($\gamma_{41} = -0.053$, $t = -1.340$). Therefore, hypothesis H4a is rejected.

Table 4 also indicates that all three types of responses (top management support, training and R&D investments) have significant positive effects on green innovation performance ($\beta_{61} = 0.314$, $t = 4.582$; $\beta_{62} = 0.131$, $t = 1.983$; $\beta_{63} = 0.342$, $t = 3.658$), supporting hypotheses H6, H7, and H8. Moreover, Table 4 demonstrates that the effects of the other two types of green organizational responses (collaboration networks and EMS) on green innovation performance are positive, but they are not significant ($\beta_{64} = 0.046$,

Table 3
Discriminant validity test.

	RP	CP	TMS	TR	R&D	CN	EMS	GIP
RP	**0.732**							
CP	0.235***	**0.779**						
TMS	0.247***	0.423***	**0.750**					
TR	0.429***	0.202**	0.441***	**0.730**				
R&D	0.153*	0.573***	0.55***	0.336**	**0.704**			
CN	0.184**	0.474***	0.432***	0.134*	0.542***	**0.737**		
EMS	0.437***	0.291***	0.387***	0.408***	0.255***	0.107	**0.697**	
GIP	0.287***	0.278***	0.497***	0.376***	0.443***	0.331***	0.286***	**0.792**

Notes: Diagonal values indicate the square root of the AVE. Off-diagonal values indicate the correlation coefficients of constructs.

Table 4
Results of the path analysis of the structural model.

Path	Standardized estimate	S.E.	C.R.	P	Result
RP → TMS	0.193	0.101	2.026	0.043	Supported
RP → TR	0.336	0.183	5.625	0.000	Supported
RP → R&D	0.071	0.286	1.582	0.124	Partially supported
RP → CN	−0.053	0.084	−1.340	0.180	Rejected
RP → EMS	0.427	0.207	6.903	0.000	Supported
CP → TMS	0.255	0.181	3.672	0.000	Supported
CP → TR	0.095	0.201	1.641	0.112	Partially supported
CP → R&D	0.309	0.288	4.811	0.000	Supported
CP → CN	0.261	0.176	5.259	0.000	Supported
CP → EMS	0.185	0.244	2.337	0.018	Supported
TMS → GIP	0.314	0.180	4.582	0.000	Supported
TR → GIP	0.131	0.063	1.983	0.046	Supported
R&D → GIP	0.342	0.211	3.658	0.000	Supported
EMS → GIP	0.104	0.091	1.777	0.076	Partially supported
CN → GIP	0.046	0.157	1.261	0.161	Partially supported

Notes: Goodness of fit index: $\chi^2/df = 2.75(\chi^2 = 919, df = 334)$, NFI = 0.886, CFI = 0.920, IFI = 0.921, GFI = 0.848, RMSEA = 0.071; $^{***}p < 0.001$, $^{**}p < 0.01$, $^{***}p < 0.05$.

$t = 1.261$; $\beta_{65} = 0.104$, $t = 1.777$). Thus, both hypotheses H9 and H10 are partially supported.

4.3. Mediation analysis

According to Baron and Kenny (1986), mediation effects may exist when there is a large difference in path coefficients of the model incorporating the mediator and those of the model without the mediator. Our study reveals that the path coefficients between the two forms of pressure and green innovation performance without green organizational responses are 0.114 and 0.556, respectively. By incorporating the five types of green organizational responses, the effects of the two forms of pressure on green innovation performance become 0.053 and 0.141, respectively. The results indicate that mediation effects probably exist in our model.

Subsequently, our study employed the bootstrap method to test the significance of mediation effects. The mediation effects are proved to be significant, provided that 95% confidence intervals for these path coefficients do not include zero (Williams and MacKinnon, 2008). According to the estimation (Table 5), the effect of regulatory pressure on green innovation performance is mediated by green organizational responses (CI: 0.007–0.120). Thus, hypothesis H11 is accepted. The findings also indicate that customer pressure indirectly influences green innovation performance through green organizational responses (CI: 0.102–0.255). As a result, hypothesis H12 is accepted as well.

4.4. Modification of the proposed model

In this study, the model was further modified by removing paths that were not statistically significant and adding paths that should have been examined according to the modification indexes, until all remaining paths were statistically significant. The modified model is superior to the proposed model in terms of seven related indexes of fit, therefore, the modified model was chosen as an alternative to the proposed model (Fig. 2).

Fig. 2 shows that the direct effect that regulatory pressure has on green innovation performance is found to be significant ($\beta = 0.142$, $t = 2.016$), which possibly means that the relationship between regulatory pressure and green innovation performance is partially mediated by green organizational responses. Other than this, the direct effect that customer pressure has on green innovation performance was found to be not significant. This suggests the relationship between customer pressure and green innovation performance is totally mediated by green organizational responses.

Fig. 2 also shows that top management support affects EMS and collaboration networks positively and significantly, which implies that top managers' support is valuable for the adoption of EMS and establishment of green collaboration networks.

5. Discussion

Based on insights from the institutional theory and resource-based view, this study empirically examines the extent to which regulatory and customer pressure affects green organizational responses. Further, this study explores five types of green organizational responses, namely, top management support, training, R&D investments, collaboration networks and the EMS, and their effects on green innovation performance.

The findings suggest that regulatory pressure and customer pressure have different roles in promoting different type of green organizational response. While customer pressure has significant positive impact on R&D investments and collaboration networks, the impact of regulatory pressure on R&D investments and collaboration networks is not significant. This can be explained by the fact that these two types of responses may be more dependent

Table 5
Bootstrap analysis of mediation effects.

Path	Standardized indirect effect	95% confidence interval	
		Lower limit	Upper limit
Total indirect effect	0.194	0.131	0.327
Regulatory pressure → Green organizational responses → Green innovation performance	0.053	0.007	0.120
Customer pressure → Green organizational responses → Green innovation performance	0.141	0.102	0.255

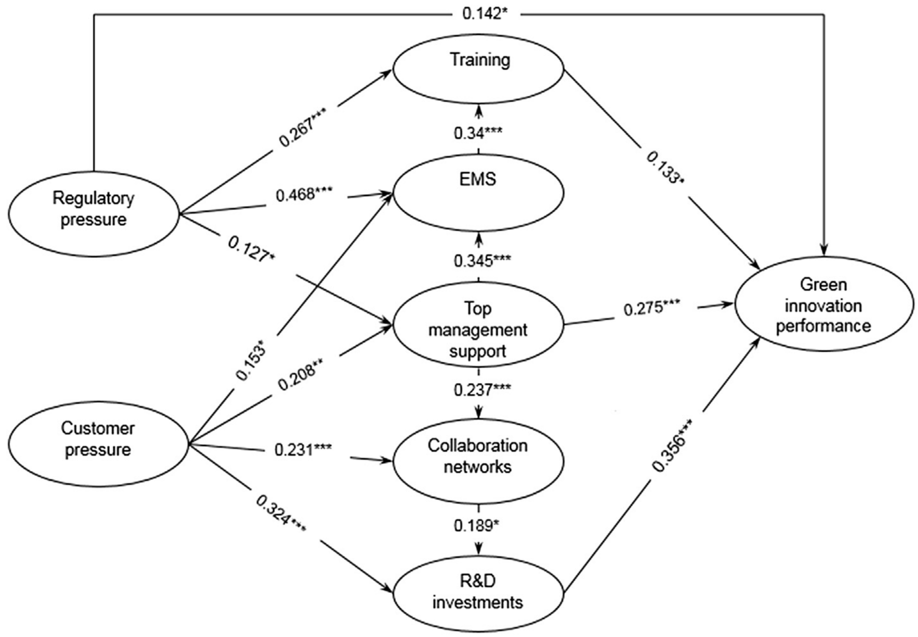

Fig. 2. Alternative model of the impact of regulatory and customer pressure on green innovation performance via green organizational responses. **Notes**: Goodness of fit index: χ^2/df = 2.61 (χ^2 = 872, df = 334), NFI = 0.893, CFI = 0.925, IFI = 0.926, GFI = 0.861, RMSEA = 0.068; $^{***}p < 0.001$, $^{**}p < 0.01$, $^{***}p < 0.05$.

on resource input than the other three types (top management support, training and EMS). This finding is in line with prior studies which argue that green responses cannot be fully triggered by one single policy instrument (Frondel et al., 2008; Montalvo, 2008). Compared to the significant positive impact of regulatory pressure on training, the impact of customer pressure on training is positive but not significant. Unlike the previous ones, this finding is inconsistent with some prior studies (Jabbour, 2013; Sarkis et al., 2010; Unnikrishnan and Hegde, 2007). A possible explanation is that training mainly involves technical training of researchers in eco-design within the context of consumer demand, and the contents of training in this study are not limited to eco-design but the LCA of products.

Analysis of the relationship between green organizational responses and green innovation performance showed that three types of green organizational responses (top management support, training, and R&D investments) are significantly and positively related with green innovation performance. This is in line with prior studies, which suggest that these three types of green organizational responses behave as crucial factors in the implementation of green innovations (Cuerva et al., 2014; Rehfeld et al., 2007; Zilahy, 2004). The results also suggest that the other two types of green organizational responses (collaboration networks and EMS) have positive but not significant effect on green innovation performance. This result is inconsistent with some prior studies (Corral, 2002; Wagner, 2008). Although the establishment of collaboration networks or introduction of EMS can usually be utilized as a means to alleviate stakeholder pressure in the present context of China, such responses of some firms are characterized by the lack of real action for green innovations, such as in-depth R&D cooperation and real implementation of EMS. This means that the achievement of green innovation performance depends not on collaboration networks and EMS themselves, but mainly on the platforms they provide for real actions and implementation of green innovations.

As noted earlier in the mediation analysis section, our findings suggest that the effects of both regulatory pressure and customer pressure on green innovation performance are mediated by green organizational responses. This can be explained by the fact that green organizational responses allow organizations to be more efficient in the perception and elimination of regulatory and customer pressure, which eventually results in the improvement of green innovation performance. The findings also provide managers with insights into specific organizational responses that they need to focus on in order to improve green innovation performance. In particular, they highlight the importance of top managers in developing green innovations. Besides the direct effect on green innovation performance, top management support also has direct effect on the other two types of green organizational response (collaboration networks and EMS). Therefore, it is significant for practitioners to strengthen the roles of top managers in operating and managing green innovation processes.

Though our results show that the indirect effect of customer pressure on green innovation performance is larger than that of regulatory pressure, its direct effect on green innovation performance is not significant, unlike the direct effect of regulatory pressure. Customer demand, especially domestic customer demand, is not sufficient to improve green innovation performance directly in the present context of China. Li (2014) pointed out that Chinese customers cannot be compared to customers in developed countries, neither in income levels nor in living standards. This means that their green consumption consciousness is not as strongly developed as that of consumers in developed countries. Besides, they may not accept the high price of environmentally sound products. To some extent, Chinese green innovation is passively affected by stringent environmental regulations, which supports Li (2014) and Zhao et al. (2015).

6. Conclusions

Regulatory and customer pressure has been identified as the determinant factor of green innovations. However, the mechanism through which the two forms of pressure affect green innovations remains unclear. This study contributes to our deeper understanding of the relationship between regulatory and customer pressure and green innovations by proposing a new research framework, and provide a beneficial guidance for improving green innovation performance. The most important contributions of this research are as follows. First, one of hidden assumptions of prior studies is that firms adopt green innovation strategies under the pressure from regulations and customers. This assumption leads to conflicting results. To address the issue, this study proposes the concept of green organizational responses, and utilizes it to describe organizational responses to the regulatory and customer pressure influencing the level of the implementation of green innovations. This concept can serve as a basis for a more in-depth analysis in the future. Second, the existing literature on green innovations mainly focuses on the direct impact of regulatory and customer pressure on green innovations, but ignores possible mediators can better explain the mechanisms through which the two forms of pressure affect green innovations. Different from previous studies, the research considers green organizational responses as a mediation variable and establishes a conceptual model to interpret the structural relationships among regulatory and customer pressure, green organizational responses, and green innovation performance. This conceptual model can provide some inspiration to the exploration of the relationships among other antecedent variables, such as the relationship between market competition and green innovations etc. Third, the study tests the proposed conceptual model using the structural equation analysis based on the data collected from Chinese manufacturing firms. Hence, the extent to which the two forms of pressure can affect specific green organizational responses and green innovation performance is clear. This sheds light on the impacting mechanism of regulatory and customer pressure on green innovations.

In addition, the findings from this study offer practical implications to policymakers and managers in developing countries, where customers' environmental consciousness is relatively weak and mandatory environmental regulations are playing important roles in boosting green innovations. For example, the different impacts of regulatory pressure and customer pressure on specific green organizational responses reflect the fact that policymakers should identify the scope in which both forms of pressure play their roles, and combine the two external drivers together, to achieve dual effect from them. In this sense, the government should publish much stricter environmental regulations to stimulate manufacturing organizations to implement green innovations, and, at the same time, the society should greatly initiate green concepts and make every effort to strengthen the green consumption consciousness of the public, and then indirectly help firms expand domestic green market demand required for green innovations. Moreover, as a core force in firms, top managers play crucial and decisive roles in driving green innovations. Therefore, firms should address environmental responsibility of top managers in order to provide more support to the successful implementation of green innovations. Finally, firms should also take into consideration the creation of collaboration networks and certification for EMS, as they can improve green innovation performance through other green organizational responses (e.g., R&D investments and training).

There are some limitations in our study. First, our study is limited to central region of China. For a more broad analysis, the findings of this study can be generalized to other regions of China, as well as other countries. Second, the structural equation modeling is chosen as our approach to verify the hypotheses, which implies that the study is rather static and cannot reflect changing characteristics of green innovations. Multi-scale approaches, such as the hierarchical regression, should be encouraged to be used in follow-up studies in order to obtain a more accurate portrayal of dynamic characteristics. Third, the indicators of latent variables are chosen using previous studies and may not be comprehensive. Future research may include wider spectrum of indicators to describe the meaning of latent variables completely and clearly. Fourth, our study focuses on two antecedent factors only. Future studies should investigate how other factors (such as policy incentives or market competition) affect green innovation performance through green organizational responses.

Acknowledgments

The National Natural Science Foundation of China (No.41261053), the National Social Science Foundation of China (No. 13BGL010), University of Jiangxi Province Philosophy and Social Science Project (No. ZDGG02), and the Graduate Students' Innovation Fund Project of Jiangxi Provincial Ministry of Education (No. YC2014-B009) are gratefully acknowledged for their provision of support for this study.

Appendix 1

Questionnaire.

1 Your position	

2 The firm was created in the year	

3. State the main business your firm operates in	

4. Number of employees	
Below 500	
Between 500-999	
Between 1000-5000	
Above 5000	

5. Total assets of your firm(in RMB/Yuan)	
Below 50 million	
Between 50-100 million	
Between 100-400 million	
Above 400 million	

6. How important, you think, each of the following item is in driving your firm to take on green innovation activities? (1=not at all, 4=moderately, 7=great extent)							
Emission standards	1	2	3	4	5	6	7
Production technology standards	1	2	3	4	5	6	7
Legal risks	1	2	3	4	5	6	7
Government supervision	1	2	3	4	5	6	7
Administrative penalties	1	2	3	4	5	6	7

7. How important, you think, each following item is in driving your firm to take green innovation activities? (1=not at all, 4=moderately, 7=great extent)							
Increased awareness of environmental issues among our customers	1	2	3	4	5	6	7
Customers' preferences for environmental friendly products	1	2	3	4	5	6	7
Customers' continuous attention to our firm' environmental behavior	1	2	3	4	5	6	7
Customers who seek green suppliers	1	2	3	4	5	6	7

8. Top managers in our firm (1=strongly disagree 4=neutral 7=strongly Agree)							
Communicate that addressing green innovation is an important component of the strategy	1	2	3	4	5	6	7
Consider that green innovations are an effective competitive strategy of our firm	1	2	3	4	5	6	7

Initiate programs of green innovations	1	2	3	4	5	6	7
Provide adequate resources to support green innovations	1	2	3	4	5	6	7

9. Please indicate the frequency with which your firm provide training to your employees on the following topics (1=never, 4=neutral 7=frequently)							
Methodologies and techniques for eco-design	1	2	3	4	5	6	7
Recycling/ reusing materials or parts	1	2	3	4	5	6	7
Use of cleaner or renewable technology	1	2	3	4	5	6	7
Disposal of production waste	1	2	3	4	5	6	7

10. What do you think of your firm' position regarding the following items compared to the average level of your domestic industry? (1=least, 4=industry average level, 7=most)							
The amount of R&D staff investments in green innovations	1	2	3	4	5	6	7
The amount of R&D expenditures in green innovations	1	2	3	4	5	6	7

11. To what extent did your firm cooperate with the following stakeholders to develop green innovations (1=not at all, 4=moderately, 7=great extent)							
With suppliers	1	2	3	4	5	6	7
With competitors	1	2	3	4	5	6	7
With research institutions or universities	1	2	3	4	5	6	7
With customers	1	2	3	4	5	6	7
With government agencies	1	2	3	4	5	6	7

12. In order to successfully implement green innovations, our firm has (1=strongly disagree, 4=neutral, 7=strongly agree)							
Measurable environmental targets	1	2	3	4	5	6	7
Environmental assessment procedures for internal use(ISO 14000 certification)	1	2	3	4	5	6	7
Written environmental policy	1	2	3	4	5	6	7

13. What do you think of your firm' position in the following items compared to the level of the same domestic industry? (1=least, 4=industry average level, 7=most)							
Reduction of energy consumption	1	2	3	4	5	6	7
Reduction of air emissions, waste water, solid wastes	1	2	3	4	5	6	7
Environmental patent application	1	2	3	4	5	6	7
Market share	1	2	3	4	5	6	7
Customer satisfaction	1	2	3	4	5	6	7
New product sales revenue	1	2	3	4	5	6	7
After-tax profits	1	2	3	4	5	6	7

References

Ağan, Y., Kuzey, C., Acar, M.F., Açıkgöz, A., 2014. The relationships between corporate social responsibility, environmental supplier development, and firm performance. J. Clean. Prod. 30, 1–10.

Backer, L., 2007. Engaging stakeholders in corporate environmental governance. Bus. Soc. Rev. 112, 29–54.

Bagozzi, R.P., Yi, Y., Phillips, L.W., 1991. Assessing Construct Validity in Organizational Research. Administrative Science Quarterly, pp. 421–458.

Bansal, P., Roth, K., 2000. Why companies go green: a model of ecological responsiveness. Acad. Manag. J. 43, 717–736.

Barney, J., 1991. Firm resources and sustained competitive advantage. J. Manag. 17, 99–120.

Baron, R.M., Kenny, D.A., 1986. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J. Personal. Soc. Psychol. 51, 1173.

Berry, M.A., Rondinelli, D.A., 1998. Proactive corporate environmental management: a new industrial revolution. Acad. Manag. Exec. 12, 38–50.

Brunnermeier, S.B., Cohen, M.A., 2003. Determinants of environmental innovation in US manufacturing industries. J. Environ. Econ. Manag. 45, 278–293.

Cai, W., Zhou, X., 2014. On the drivers of eco-innovation: empirical evidence from China. J. Clean. Prod. 79, 239–248.

Chen, Y., 2008. The driver of green innovation and green image–green core competence. J. Bus. Ethics 81, 531–543.

Chin, W.W., 1998. Commentary: Issues and Opinion on Structural Equation Modeling. JSTOR.

Clausen, T.H., 2013. External knowledge sourcing from innovation cooperation and the role of absorptive capacity: empirical evidence from Norway and Sweden. Technol. Anal. Strat. Manag. 25, 57–70.

Colwell, S.R., Joshi, A.W., 2013. Corporate ecological responsiveness: antecedent effects of institutional pressure and top management commitment and their impact on organizational performance. Bus. Strat. Environ. 22, 73–91.

Corral, C.M., 2002. Environmental Policy and Technological Innovation: Why Do Firms Adopt or Reject New Technologies? Edward Elgar Pub.

Cuerva, M.C., Triguero-Cano, Á., Córcoles, D., 2014. Drivers of green and non-green innovation: empirical evidence in low-tech SMEs. J. Clean. Prod. 68, 104–113.

De Marchi, V., 2012. Environmental innovation and R&D cooperation: empirical evidence from Spanish manufacturing firms. Res. Policy 41, 614–623.

Delmas, M.A., Montiel, I., 2007. The Adoption of ISO 14001 within the Supply Chain: when are Customer Pressures Effective? Institute for Social, Behavioral, and Economic Research.

Delmas, M.A., Toffel, M.W., 2008. Organizational responses to environmental demands: opening the black box. Strat. Manag. J. 29, 1027–1055.

Demirel, P., Kesidou, E., 2011. Stimulating different types of eco-innovation in the UK: government policies and firm motivations. Ecol. Econ. 70, 1546–1557.

DeSarbo, W.S., Anthony Di Benedetto, C., Song, M., Sinha, I., 2005. Revisiting the miles and snow strategic framework: uncovering interrelationships between strategic types, capabilities, environmental uncertainty, and firm performance. Strat. Manag. J. 26, 47–74.

DiMaggio, P.J., Powell, W.W., 2000. The Iron Cage Revisited-Institutional Isomorphism and Collective Rationality in Organizational Fields (Reprinted from the American Sociological Association vol. 48, pg 147–160, 1983). JAI Press INC, 100 Prospect Street, Stamford, CT 06901-1640 USA, pp. 143–166.

Drumwright, M.E., 1994. Socially responsible organizational buying: environmental concern as a noneconomic buying criterion. J. Mark. 1–19.

Eiadat, Y., Kelly, A., Roche, F., Eyadat, H., 2008. Green and competitive? An empirical test of the mediating role of environmental innovation strategy. J. World Bus. 43, 131–145.

Fraj-Andrés, E., Martínez-Salinas, E., Matute-Vallejo, J., 2009. Factors affecting corporate environmental strategy in Spanish industrial firms. Bus. Strat. Environ. 18, 500–514.

Freeman, R.E., 1983. Strategic management: a stakeholder approach. Adv. Strat. Manag. 1, 31–60.

Frondel, M., Horbach, J., Rennings, K., 2008. What triggers environmental management and innovation? Empirical evidence for Germany. Ecol. Econ. 66, 153–160.

Gonzalez, P., Sarkis, J., Adenso-Diaz, B., 2008. Environmental management system certification and its influence on corporate practices: evidence from the automotive industry. Int. J. Operat. Prod. Manag. 28, 1021–1041.

Gualandris, J., Kalchschmidt, M., 2014. Customer pressure and innovativeness: their role in sustainable supply chain management. J. Purch. Supply Manag. 20, 92–103.

Hart, S.L., 1995. A natural-resource-based view of the firm. Acad. Manag. Rev. 20, 986–1014.

Hart, S.L., Dowell, G., 2010. A natural-resource-based view of the firm: fifteen years after. J. Manag. 37, 1464–1479.

Hoffman, A.J., 1999. Institutional evolution and change: environmentalism and the US chemical industry. Acad. Manag. J. 42, 351–371.

Horbach, J., Rammer, C., Rennings, K., 2012. Determinants of eco-innovations by type of environmental impact—the role of regulatory push/pull, technology push and market pull. Ecol. Econ. 78, 112–122.

Jabbour, C.J.C., 2013. Environmental training in organisations: from a literature review to a framework for future research. Resour. Conserv. Recycl. 74, 144–155.

Lai, K., Wong, C.W., 2012. Green logistics management and performance: some empirical evidence from Chinese manufacturing exporters. Omega 40, 267–282.

Li, Y., 2014. Environmental innovation practices and performance: moderating effect of resource commitment. J. Clean. Prod. 66, 450–458.

Lin, R., Tan, K., Geng, Y., 2013. Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry. J. Clean. Prod. 40, 101–107.

Lin, H., Zeng, S., Ma, H., Qi, G., Tam, V.W., 2014. Can political capital drive corporate green innovation? Lessons from China. J. Clean. Prod. 64, 63–72.

Liu, Y., 2009. Investigating external environmental pressure on firms and their behavior in Yangtze River Delta of China. J. Clean. Prod. 17, 1480–1486.

Liu, X., Liu, B., Shishime, T., Yu, Q., Bi, J., Fujitsuka, T., 2010. An empirical study on the driving mechanism of proactive corporate environmental management in China. J. Environ. Manag. 91, 1707–1717.

López-Gamero, M.D., Molina-Azorín, J.F., Claver-Cortés, E., 2010. The potential of environmental regulation to change managerial perception, environmental management, competitiveness and financial performance. J. Clean. Prod. 18, 963–974.

Menguc, B., Auh, S., Ozanne, L., 2010. The interactive effect of internal and external factors on a proactive environmental strategy and its influence on a firm's performance. J. Bus. Ethics 94, 279–298.

Montalvo, C., 2008. General wisdom concerning the factors affecting the adoption of cleaner technologies: a survey 1990–2007. J. Clean. Prod. 16, S7–S13.

Nunally, J.C., Bernstein, I.H., 1978. Psychometric Theory. McGraw-Hill, New York.

Oaster, T., 1989. Number of alternatives per choice point and stability of Likert-type scales. Percept. Mot. Ski. 68, 549–550.

Pereira-Moliner, J., Claver-Cortés, E., Molina-Azorín, J.F., Tarí, J.J., 2012. Quality management, environmental management and firm performance: direct and mediating effects in the hotel industry. J. Clean. Prod. 37, 82–92.

Podsakoff, P.M., MacKenzie, S.B., Lee, J., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. 88, 879.
Pohl, C., 2008. From science to policy through transdisciplinary research. Environ. Sci. Policy 11, 46–53.
Porter, M.E., Van der Linde, C., 1995a. Green and competitive: ending the stalemate. Harv. Bus. Rev. 73, 120–134.
Porter, M.E., Van der Linde, C., 1995b. Toward a new conception of the environment-competitiveness relationship. J. Econ. Perspect. 97–118.
Rehfeld, K., Rennings, K., Ziegler, A., 2007. Integrated product policy and environmental product innovations: an empirical analysis. Ecol. Econ. 61, 91–100.
Sarkis, J., Gonzalez-Torre, P., Adenso-Diaz, B., 2010. Stakeholder pressure and the adoption of environmental practices: the mediating effect of training. J. Operat. Manag. 28, 163–176.
Saturnino Neto, A., José Chiappetta Jabbour, C., Beatriz Lopes de Sousa Jabbour, A., 2014. Green training supporting eco-innovation in three Brazilian companies: practices and levels of integration. Ind. Commer. Train. 46, 387–392.
Schiederig, T., Tietze, F., Herstatt, C., 2012. Green innovation in technology and innovation management–an exploratory literature review. R&D Manag. 42, 180–192.
Simpson, D., Samson, D., 2010. Environmental strategy and low waste operations: exploring complementarities. Bus. Strat. Environ. 19, 104–118.
Tung, A., Baird, K., Schoch, H., 2014. The relationship between organisational factors and the effectiveness of environmental management. J. Environ. Manag. 144, 186–196.
Unnikrishnan, S., Hegde, D., 2007. Environmental training and cleaner production in Indian industry—a micro-level study. Resour. Conserv. Recycl. 50, 427–441.
Wagner, M., 2008. Empirical influence of environmental management on innovation: evidence from Europe. Ecol. Econ. 66, 392–402.
Williams, J., MacKinnon, D.P., 2008. Resampling and distribution of the product methods for testing indirect effects in complex models. Struct. Equ. Model. 15, 23–51.
Yalabik, B., Fairchild, R.J., 2011. Customer, regulatory, and competitive pressure as drivers of environmental innovation. Int. J. Prod. Econ. 131, 519–527.
Yen, Y., Yen, S., 2012. Top-management's role in adopting green purchasing standards in high-tech industrial firms. J. Bus. Res. 65, 951–959.
Yuan, L., Zhongfeng, S., Yi, L., 2010. Can strategic flexibility help firms profit from product innovation? Technovation 30, 300–309.
Zhao, X., Zhao, Y., Zeng, S., Zhang, S., 2015. Corporate behavior and competitiveness: impact of environmental regulation on Chinese firms. J. Clean. Prod. 86, 311–322.
Zilahy, G., 2004. Organisational factors determining the implementation of cleaner production measures in the corporate sector. J. Clean. Prod. 12, 311–319.