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Can Environmental Regulations Promote Corporate Environmental Responsibility? Evidence from the Moderated Mediating Effect Model and an Empirical Study in China

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Abstract: Based on the Stakeholder theory, a moderated mediating effect model is developed to reach the study objective, revealing an important connection that suggests environmental regulations (ERs) influence corporate environmental responsibility (CER) (Porter Hypothesis). In building the model, the validity of the questionnaire data was analyzed with factor analysis. By employing a two-step approach, a regression analysis is utilized to discuss the mediating effect of altruistic motivation and moderating effect of green innovation, and a structural equation model is used to explore the interactive mechanism of different variables. It is found that altruistic motivation plays a medium role in the relationship between ERs and CER, and green innovation engages a positive coordination in the relationship. The empirical study identifies factors affecting enterprises' willingness to undertake environmental responsibility, including environment policies, corporate culture, and personal characters among others. It is also revealed that altruistic motivation is conducive to forming a community interests among enterprises and enhancing their resistance to market risks, which explains and corroborates the Stakeholder theory; and the higher the level of green innovation, the more willing enterprises are to implement environmentally friendly operations.

Keywords: environmental regulation; corporate environmental responsibility; altruistic motivation; green innovation; Porter Hypothesis

1. Introduction

The *Environmental Performance Index: 2016 Report* indicated that Chinese environmental performance index (EPI) ranked 109 among 180 countries. Particularly, China is the hardest hit by PM2.5 haze disasters, which have posed a significant threat to physical health as well as living quality of all residents [1]. A recent study published in *Nature* estimated that outdoor air pollution, mostly by PM2.5, leads to 3.3 (95 percent confidence interval 1.61–4.81) million premature deaths per year worldwide, predominantly in Asia. Surprisingly, 1.357 million, or 41.2 percent of the world total, occurred in China alone [2]. To compare, the figure for the United States is 55,000. Along with a *Lancet* study [3], the mortality attributable to air pollution in China is approximately an order of magnitude higher than that attributable to Chinese road transport injuries and HIV/AIDS, and ranks among the top causes of death. Furthermore, according to *Chinese Environmental Situation Communique in 2016*, only 84 cities and provinces could meet the air quality standard out of 338 cities and provinces

(24.9%) in China. Therefore, environmental conditions in China are becoming critically worse [4]. Consequently, national appeals about an ecological low-carbon environment have been spread all over the country [5], as Chinese citizens have raised awareness of environmental protection [6]. As such, environmental regulations (ERs) with external constraints eliminating or reducing various pollutions emerge and their role is widely concerned with raising the level of corporate environmental responsibility (CER) [7].

In this study, ERs refer to a series of mandatory requirements from administrative and public powers, emphasizing the coordination between environmental safety and economic benefits, and developing and utilizing resources by setting goals of harmonious development between the social-economic demands and environment [8]. Faced with intensifying environmental problems, governments at all levels must strengthen the implementation of ERs to promote related industries and enterprises to undertake environmental responsibilities and seek a synergetic growth of environment and economy [9]. Meanwhile scholars pay great attention to the effect of ERs from both the business growth and the level of environmental destruction [10,11]. There is a growing trend of research that investigates the positive and negative influences of ERs. Three representative opinions are formed, Traditional Hypothesis [12], Porter Hypothesis [13] and Uncertainty Hypothesis [14]. However, the existing research mainly focuses on the influence mechanism of ERs on business performance; fewer explore the internal reasons for interaction. Hence, exploring the interactive mechanism of ERs on the CER becomes a vital issue.

Wu et al. suggested that corporate culture and manager's personal features are among key factors that influence enterprise decisions [15]. Moreover, in research concerning CER, altruistic motivation and green innovation are respectively the most representative personal feature factor and corporate culture factor [16,17]. In addition, China is implementing a comprehensive extended producer responsibility (EPR) system, which is one of the most representative ERs [18]. Subsequently, studying CER while neglecting the influence of altruistic motivation or green innovation is likely to lead to a poor theoretical integrity or poor practical guidance in conclusions. Our main aim is to investigate the interactive mechanism of ER on CER, taking personal features (altruistic motivation) and corporate culture (green innovation) into account.

In the remainder of the paper, Section 2 presents an overview of related literature and formulates research hypotheses. Section 3 describes the methodology and deals with the pre-test of research hypotheses. In Section 4, we elaborate the empirical results. Section 5 discusses the results obtained. Section 6 provides conclusions and significance in our research. Finally, Section 7 outlines the limitations of the study and ensuing future perspectives of research.

2. Conceptual Framework and Research Hypothesis

2.1. Theoretical Review

Environmental pollution and ecological damage have reached an unprecedented situation in China [19]. As the primary resource consumers, enterprises have inescapable responsibilities for environmental problems. However, Friedman pointed out that an enterprise is a profitable organization and has a typical feature of profit-seeking: aiming at to increase the operating efficiency and economic benefits, enterprises will choose to abandon environmental responsibilities gradually [20]. Moreover, they tend to intensify environmental pollution once ERs cannot prevent their sabotages. Thus, it is easy to see that ER is faced with substantial challenges all over the world [21]. Meanwhile, based on the Stakeholder theory, Lee reported that corporate social responsibility strategies are influenced by public opinions including the media, except for institutional factors such as ERs [22].

As the leading regulation role of the market mechanism is determined in China [23], ERs influence CER through multiple forms such as environmental taxes, administrative fines, a cap-and-trade system, production subsidies and special trading. In particular, the internal function routes need further discussions to provide practice implications. Hambrick and Mason point out that corporate

decisions reflect psychological features of a management layer [24]. If a general manager has a strong sense of environmental protection, he or she would not blindly chase high profits at the expense of environmental damage. Haniffa and Hudaib also believe that responsible behaviors are consistent with the cognition of managers in enterprises [25]. Therefore, as a representative personal feature [26], altruistic motivation might play an important role in the action process of ERs on CER. Meanwhile, enterprise values, which are an important influencing factor in decision-making, also have non-negligible impact on CER [27]. Both academia and business circles generally deem green innovation to be a value manifestation that enterprises use to cope with ERs and improve competitive advantages [28]. Paying attention to the moderating effect of green innovation on the relationship between ER and CER is conducive to clearly showing their conditional and indirect relationship.

2.2. ER and CER

In 1998, McGee first discussed the reasons why enterprises had to undertake environmental responsibilities [29], and institution, morality and the economy are widely accepted as three main reasons [30]. However, along with deepening social divisions of labor and the great extension of industrial chains around the world, the phenomenon of information inaccuracy is becoming more and more serious. The matching of supply and demand is getting remarkably difficult in the market [31]. In other words, low efficiency of the market mechanism in resource allocation tends to be a prominent problem. ERs, which are regarded as "tangible hands", have become an important reason for enterprises to fulfill environmental responsibilities [32]. Effects of ERs are mainly manifested by policy constraint and public opinion.

The government guides enterprises to adopt environmental protection behaviors by formulating specific and detailed policies. Enterprises must improve production modes for institutional pressure. For instance, to avoid a fine or stopping business for internal rectification, they will implement ecological design and waste preprocessing, develop environmentally friendly products, and make legal production activities [33]. In contrast, based on the comparison of disclosure of corporate environmental information in China and Japan, He found that with the increase of environmental awareness among the public, public opinions are more likely to pay close attention to environmental information disclosure in enterprises, except for policy constraints [34]. Enterprises must undertake environmental responsibilities and adopt green production to meet green consumption demands which are popular in the modern consumer market. Thus, the first hypothesis is proposed:

Hypothesis 1 (H1). *ERs have positive correlation with CER.*

2.3. Mediating Effect of Altruistic Motivation

China's economic development has entered a new era. Meanwhile, consumption upgrading is accelerating remarkably in China [35]. Goods labelled with green signs can always cater to consumer demand and sell well. On the other hand, enterprises adopting environmentally-friendly technologies in production also get more advantages in marketing competition. Because they meet consumers' needs of environmental protection [36], enterprises are motivated to undertake responsibilities for environmental protection.

Orlitzky et al. doubted a previous conclusion that enterprises undertake social responsibilities for financial motivation [37]. Graafland explained the causes of altruistic motivation from perspectives of external pressure and self-knowledge [38]. On the one hand, government, consumers, and stakeholders require enterprise managers to take all involved parties into consideration all the time. This compels managers to accept altruistic motivation passively. On the other hand, huge pressure from stakeholders forces enterprise managers to accept altruistic motivation subjectively because passive behaviors such as evading supervision will lead to an increase in the cost of business operations. Moreover, the punishment will be severe once passive behaviors come to light [39]. In addition, with the development of networked social structures, Osman believed that the

traditional competitive relationships among enterprises would be gradually replaced by the friendly co-petition relationship [40]. If enterprise managers can pursue interests of all stakeholders rather than maximization of their own economic benefits, they will view environmental protection as a moral responsibility that they must do [41]. Besides, enterprises will also gain legal, market and psychological recognition from environmental protection behaviors. Therefore, managers who work as the direct makers of business strategies, through their personal features—altruistic motivation—will influence an enterprise's willingness to undertake environmental responsibilities directly, and the effect of ERs on CER is to adopt the altruistic motivation as a mediator variable. Thus, the second hypothesis is proposed:

Hypothesis 2 (H2). *Altruistic motivation can mediate the relationship between ERs and CER.*

2.4. Moderating Effect of Green Innovation

ERs and manager's personal features will influence business decisions. However, corporate culture determines the extent of influence [42]. In other words, the corporate culture regulates the effects of other factors on business decisions. Chen et al. pointed out that the green innovation is the key corporate cultural factor nowadays [43]. It has become a powerful tool for enterprises to improve competitive advantages [36]. If green innovation could be internalized into initiative behaviors in an enterprise's daily operation, the consciousness of environmental protection would be profoundly embedded into the corporate culture. When faced with selection between economic benefits and environmental interests, green innovation will encourage enterprises to undertake environmental responsibilities positively [44]. Much research has divided green innovation into green products and green technique [45]; however, both forms of green innovation must be integrated into the entire life cycle of products. This will help realize differentiation advantages of products and gain approvals from both the policy and the market. Nevertheless, business decisions are faced with far higher uncertainty and complexity compared with individual decisions, especially under the background of the relatively light penalty for environmental pollution in China. As a result, most enterprises have not undertaken their environmental responsibilities and they usually implement green innovation selectively as a result of fluke mind or high cost [46]. Therefore, green innovation has no constraint on CER, but only regulates the influence. Thus, the third hypothesis is proposed:

Hypothesis 3 (H3). *Green innovation can regulate the relationship between ERs and CER.*

2.5. Moderated Mediating Effect

The mediating effect of altruistic motivation and moderating effect of green innovation have been discussed previously in this section. Referring to Edwards and Lambert, who put forward a moderated mediating effect model [47], we hold the view that green innovation also regulates the mediating effect of altruistic motivation on the relationship between ERs and CER. Once enterprises integrate green innovation into daily business operations, perceptual factors like altruistic motivation will impel enterprises to undertake environmental responsibility actively. Accordingly, the indirect effect of ERs on CER will be enhanced. Thus, the fourth hypothesis is proposed:

Hypothesis 4 (H4). *Green innovation can regulate the mediating effect of altruistic motivation on the relationship between ERs and CER.*

Figure 1 displays the theoretical framework of the moderated mediating effect model.
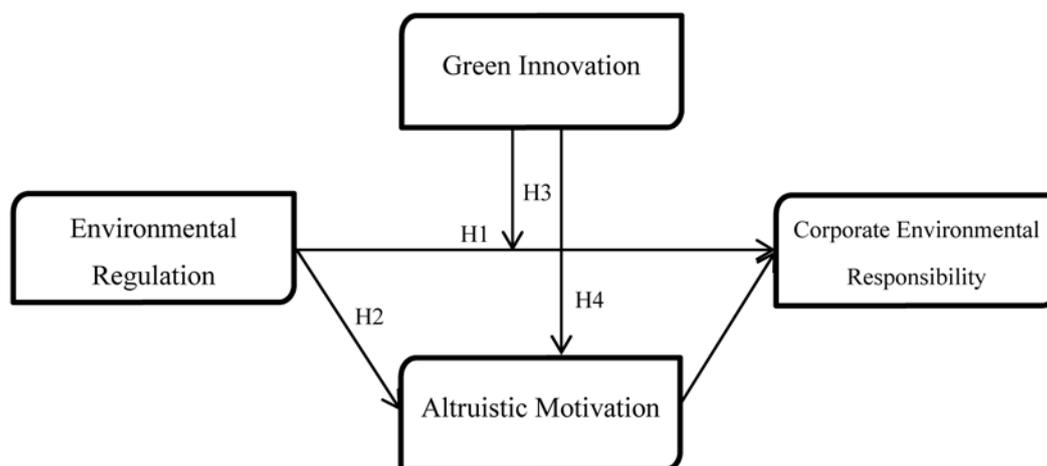
Figure 1. Conceptual framework.

3. Methodology

3.1. Questionnaire Design and Data Collection

In this study, a 7-mark Likert scale where "1" represents strong disagreement and "7" represents strong agreement was used. Empirical data were collected by questionnaire survey. China published the *Plan of Extended Producer Responsibility System* in January 2017. It stipulates that manufacturing enterprises are assigned to high-pollution enterprises, including electric and electronic enterprises. Meanwhile, scholars generally believe that manufacturing enterprises are the main cause of environmental pollution [47]. Therefore, we mainly chose manufacturing enterprises as research objects. Enterprise samples include electric and electronic manufacturing enterprises, automobile manufacturing enterprises and lead-acid battery production enterprises. Additionally, to ensure representativeness of questionnaire data, enterprise samples were widely located in the Yangtze River Delta region, Pearl River Delta region, northeast industrial zone, and middle and west regions in China. Questionnaires were issued in paper form or by e-mail. Respondents were all informed about the academic purpose and specific filling requirements before filling out the questionnaire. All questionnaires were completed anonymously to assure the safety of respondent's personal information.

To guarantee validity of survey data and reduce effects of random factors on conclusions, questionnaires were issued and collected from February to May 2017. A total of 300 questionnaires were distributed and 239 were collected. After processing and screening, 218 effective questionnaires were utilized, showing an effective rate of 72.6%. Statistical information about key features of valid questionnaires is shown in Table 1. Ownership types of enterprise samples include state-owned or state holding enterprises, private enterprises, and foreign-owned enterprises or Sino-foreign joint ventures. Enterprise scales cover the mini (less than 100 workers), small-sized (from 100 to 300 workers), mid-sized (from 300 to 600 workers) and large-sized (more than 600 workers). Among them, 81.7% of enterprises have an annual sale volume of over RMB 100 million, which ensures representativeness of questionnaire data. Respondents include CEOs, general managers, directors of production and marketing departments, professional technicians, and researchers, which helps avoid sample deviation. Viewed by working years in related industries, 63.7% of respondents have more than 3 working year is in industry. This ensures the reliability of survey data.

Table 1. Statistical information about key features of valid samples.

Category	Distribution	Sample Size	Percentage (%)
Ownership nature	State-owned or state-controlled enterprise	58	26.6
	Private enterprise	109	50.0
	Foreign-capital enterprise	21	9.6
	Joint-venture enterprise	30	13.8
Enterprise scale	Less than 100 workers	16	7.3
	From 100 to 300 workers	31	14.2
	From 300 to 600 workers	69	31.7
	More than 600 workers	102	46.8
Annual turnover	Less than 60 million yuan	12	5.5
	From 60 million to 100 million yuan	28	12.8
	From 100 million to 300 million yuan	86	39.5
	More than 300 million yuan	92	42.2
Position	Top-level manager	72	33.0
	Department head	86	39.5
	Technician	16	7.3
	Scientific personnel	44	20.2
Operating age	Less than 1 year	15	6.9
	From 1 to 3 years	64	29.4
	From 3 to 5 years	81	37.1
	More than 5 years	58	26.6
Industry	Electrical and electronic	83	39.9
	Automobile	60	28.8
	Lead-acid battery	65	31.3

3.2. Variable Measurement

This survey was divided into a pre-survey and a formal survey. The pre-survey was accomplished in Nanjing development zone and chemical park. Five junior or senior managers working in petroleum, chemical engineering and machinery companies were invited to a semi-structured interview (including two general managers in state-owned enterprises, one head of security services in a state state-controlled enterprise, one director of environmental affairs in a listed company and one general manager in a private enterprise). Next, questions in the scale were translated into Chinese and English by the double-blind method with references to mature scales at home and abroad. After careful discussions and amendments, the final formal questionnaire contents were determined by the third party. During formal survey, to reduce self-selection deviations and eliminate disturbances of social desirability, the non-commercial purpose of our study was declared again in the filling instructions. Meanwhile, real contact information of respondents was provided by human resource department in the enterprise, and target respondents were mainly those who have worked in high-pollution industries for many years. All above were aimed at increasing the quality of questionnaire data.

Measurement scale includes: (1) ER. According to Kshetri [48] and Feng [49], three items were designed to measure the regulations implemented by government departments. With references to research conclusions from Tian and Liu [50], four items about clients, community and media were designed to measure the regulations implemented by public opinion; (2) CER. It was divided into corporate community responsibility and corporate environmental responsibility according to the research scale used by Wahba [51] and Testa and D'Amato [52]. It was measured by five items, such as "We help to increase living quality of community actively"; (3) Altruistic motivation. According to the altruistic motivation evaluation system proposed by Schwartz and Boehnke from the perspectives of humanity, tradition, and safety [53], six items were set with consideration to the particular Chinese situation; (4) Green innovation. Combining with research obtained by Chang [54], it was measured from two aspects of green product innovation and green technology innovation.

Noteworthy, key features of samples will influence CER significantly [55], and hence we chose the size of an enterprise and the nature of the ownership as the control variables. The former was measured by employee population at four levels: 1 (less than 100 workers); 2 (from 100 to 300 workers); 3 (from 300 to 600 workers) and 4 (more than 600 workers). The latter was further divided into two categories: "1" stands for state-owned or state-controlled enterprises, and "0" stands for non-state-owned enterprises. These two control variables will be transformed into dummy variables before hypotheses are verified.

3.3. Reliability and Validity Measurement

The reliability of the 218 questionnaire data was validated by SPSS18.0. The overall reliability index of Cronbach's α is 0.725 (>0.7), which reflects a good internal consistence of our questionnaire contents. As shown in Table 2, Cronbach's α values of all variables are higher than 0.7, KMO values are all higher than 0.6, and F values of Bartlett's test are all 0. The minimum value of factor explainable variance is 63.706%. All these indicate that our scale is quite stable and has a high reliability.

Table 2. Measurement validation.

Variable	Cronbach's α	KMO Value	F Value of Bartlett's Test	Percent Explained (%)
ER	0.714	0.658	0.000	63.706
CER	0.738	0.686	0.000	65.619
Altruistic motivation	0.822	0.677	0.000	74.805
Green innovation	0.869	0.732	0.000	62.738

Furthermore, the validity of items is analyzed by AMOS17.0. Results demonstrate that χ^2/df = 2.208 (<3), NFI = 0.937 (>0.9), CFI = 0.964 (>0.95), RMSEA = 0.037 (<0.05) and SRMR = 0.050 (<0.1). These indicate a goodness of fit and our hypothetical model conforms to research requirements. In addition, as shown in Table 3, the composite reliability of items is higher than 0.7 and all factor loadings are higher than 0.5. Most of the factor loadings are higher than 0.6, and mainly at about 0.7. Individual values are also higher than the minimum standard of 0.5. This reflects a high convergent validity of the questionnaire. Finally, all variables' square root of average variance extracted values (AVE) are higher than the correlation coefficient between the variable and other variables, which also shows a good discriminant validity.

Table 3. Confirmatory factor analysis.

Variable	Item	Factor Loading	Composite Reliability	AVE
ER	Environmental policies are systematic and specific.	0.559	0.750	0.435
	We hold the view that the intensity of ERs in China is enhancing.	0.735		
	Existing punishments in ERs are severe.	0.612		
	Business operations are in the supervision from the public and the media.	0.694		
	We pay close attention to comments from the public and the media.	0.711		
	Journalists focus on negative reports about enterprise operations such as pollution discharge surreptitiously.	0.549		
	The public prefers goods produced with environmentally-friendly technologies.	0.727		
CER	We take environmental protection into consideration when formulate strategies for business.	0.694	0.712	0.450
	We put a great deal of resources in developing green production technologies.	0.698		
	Waste recycling system is complete and recovery rate is high.	0.647		
	We help to increase living quality of community actively.	0.681		
	Our social reputations are elevated due to green management.	0.630		

Table 3. *Cont.*

Variable	Item	Factor Loading	Composite Reliability	AVE
Altruistic motivation	We share the environment.	0.785	0.733	0.486
	We hold the view that man should live harmoniously together with nature.	0.723		
	Our environmentally-friendly practices would affect others positively.	0.621		
	We response to the call for ecological civilization construction in China.	0.664		
	Ecological environment is abominable nowadays.	0.738		
	Later generations would benefit from green production technologies.	0.637		
Green innovation	The concept of environmental protection is integrated into the product design and packaging.	0.723	0.791	0.550
	Outlook on green development has incorporated into production process.	0.742		
	Production technologies need to be environmentally-friendly.	0.711		
	Supporting services such as transportation should also be environmentally-friendly.	0.787		

3.4. Descriptive Statistics

Mean, variance and Pearson correlation coefficient are shown in Table 4. Results show that ER has positive impacts on CER ($\beta = 0.134$, $p < 0.05$). Altruistic motivation is positively correlated with CER ($\beta = 0.256$, $p < 0.01$). The green innovation has a positive correlation with ER ($\beta = 0.115$, $p < 0.05$) and CER ($\beta = 0.185$, $p < 0.05$). According to the analysis, correlation coefficients of variables are consistent with previous hypotheses and conform to the theoretical expectation.

Table 4. Mean, standard deviation and correlation coefficient of variables.

Item Variable	Mean	Standard Deviation	1	2	3	4	5	6
Enterprise scale	5.816	0.644	1					
Ownership nature	2.374	1.215	−0.001	1				
ER	3.135	0.640	0.251 *	0.175	1			
CER	4.239	0.518	0.044	0.239 *	0.134 *	1		
Altruistic motivation	3.718	0.689	0.087	0.062	0.286	0.256 **	1	
Green innovation	3.461	0.903	0.046	0.156 *	0.115 *	0.185 **	0.206 **	1

Note: * and ** represent the level of significance of coefficients at $p < 0.05$ and $p < 0.01$ respectively.

## 4. Hypothesis Testing

4.1. Regression Analysis

Hypothesis H2 is to test the mediating effect of altruistic motivation in the relationship between ERs and CER. Based on sequential regression analysis (Baron and Kenny) [56], the mediating effect of altruistic motivation is studied in four steps: 1) regression analysis of independent variable on dependent variable; (2) Regression analysis of independent variable on mediator variable; (3) Regression analysis of mediator variable on dependent variable; (4) Regression analysis of independent variable and mediator variable on dependent variable (in this step, coefficient of independent variable should be lower than that in step 1). It can be seen from Table 5 that ER has a positive impact on CER ($\beta = 0.341$, $p < 0.01$). ER has a positive impact on altruistic motivation ($\beta = 0.236$, $p < 0.05$). In addition, altruistic motivation has a positive impact on CER ($\beta = 0.187$, $p < 0.05$). While ER ($\beta = 0.309$, $p < 0.05$) and altruistic motivation ($\beta = 0.096$, $p < 0.05$) also have a positive impact on CER, the positive impact of ER decreases ($0.341 > 0.309$). To sum up, ER has a significantly positive impact on CER. So, hypothesis H1 is proved true. At the same time, altruistic motivation works as a mediator variable in the relationship between ERs and CER, so hypothesis H2 is proved true. In Table 5, coefficients in parentheses are calculated through Ordered Probit Model. It is discovered that most of these coefficients are consistent with those from sequential regression analysis, including positive and negative and the level of significance. This further verifies the results of sequential regression analysis.

Table 5. Results of regression analysis.

Independent Variable	Altruistic Motivation	CER				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Enterprise scale	0.014 (0.008)	0.135 ** (0.074 **)	0.156 * (0.087 **)	0.205 ** (0.113 **)	0.079 * (0.044)	0.075 * (0.041)
Ownership nature	0.006 (0.003)	0.243 ** (0.134 **)	0.097 (0.054)	0.153 * (0.085 *)	0.136 * (0.075 *)	0.128 * (0.070 *)
ER	0.236 * (0.130 **)	0.341 ** (0.188 **)		0.309 * (0.170 **)		
Altruistic motivation			0.187 * (0.103 *)	0.096 * (0.053 *)		
Green innovation					0.438 ** (0.243 **)	
ER × Green innovation						0.414 * (0.229 **)
R^2	0.416	0.510	0.457	0.590	0.604	0.623
F value	6.042 *	43.409 **	21.372 *	34.861 *	64.887 **	65.364 *
D-Watson	1.973	2.127	2.214	2.252	2.075	2.094

Note: * and ** represent the level of significance of coefficients at $p < 0.05$ and $p < 0.01$ respectively.

Hypothesis H3 is to verify the moderating effect of green innovation in the relationship between ERs and CER. In Table 5, the interaction term of ER and green innovation has a positive influence on CER ($\beta = 0.414$, $p < 0.05$). In addition, the explanation of interaction term is 2% higher than that of green innovation alone. We choose one positive or negative standard deviation of mean to disclose the moderating effect of green innovation in the relationship more clearly. As shown in Figure 2, green innovation can regulate the relationship between ERs and CER. Hypothesis H3 is proved true.
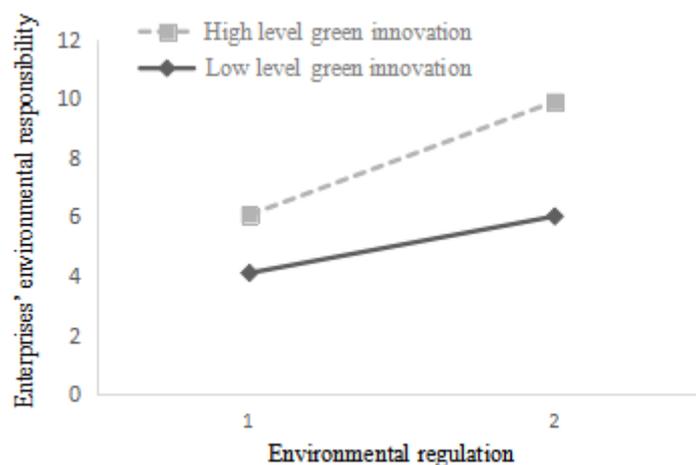
Figure 2. Moderating effect of green innovation.

Hypothesis H4 is proposed to verify whether green innovation could regulate the mediating effect of altruistic innovation. According to Moderated Path Analysis [47], calibrated confidence interval of 1000 samples is gained by Bootstrap method, which can analyze the mediating effect and the significance test of difference. To display results of moderated mediating effect model intuitively, two equations are constructed in our study: (1) $M = \beta 1 + \beta 2X$ and (2) $Y = \alpha 1 + \alpha 2X + \alpha 3M + \alpha 4Z + \alpha 5M \times Z$, where X, Y, M and Z represent respectively independent variable (ER), dependent variable (CER), mediator variable (altruistic motivation) and moderator variable (green innovation). In addition, Equation (1) is utilized to display the first-stage impact of moderated mediating effect model, while Equation (2) is used to reflect the second-stage impact and direct impact. Table 6 shows that ER under high-level green innovation influences the mediating effect

of altruistic motivation more strongly compared to that under low-level green innovation. In addition, the intergroup difference in the second stage is 0.117 and conforms to the requirement of significance. In addition, whether green innovation is low level ($\beta = 0.057$, $p < 0.01$) or high level ($\beta = 0.144$, $p < 0.05$), the indirect effects are both significant. Here, the intergroup difference is 0.087, which also passes the test of significance ($p < 0.01$). To sum up, green innovation regulates the mediating effect of altruistic motivation. Therefore, hypothesis H4 is proved true.

Table 6. Moderated mediating effect model.

| | Stage | | Effect | | |
Moderator Variable	Stage One	Stage Two	Direct Effect	Indirect Effect	Cumulative Effects
	ER(X)→Altruistic Motivation(M)→CER(Y)				
Low-level green innovation	0.183 **	0.279 **	0.154 **	0.057 **	0.211 **
High-level green innovation	0.183 **	0.396 **	0.154 **	0.144 **	0.298 **
Intergroup difference		0.117 **		0.087 **	0.087 **

Note: * and ** represent the level of significance of coefficients at $p < 0.05$ and $p < 0.01$ respectively.

4.2. Structural Equation Model

To reveal interactive relations of different variables, path fitting in research hypotheses is explored by structural equation model. In the aspect of fitting indexes, $\chi^2/df = 1.348$ (<3), CFI = 0.924 (>0.7), AGFI = 0.907 (>0.9), CFI = 0.885 (<0.7) and RMESA = 0.040 (<0.1). All indexes reach the acceptable standards, indicating the higher goodness of fit in our model.

Function route and path coefficient of structural equation model are listed in Table 7. Specifically, the path coefficient of ER on CER is 0.28 and passes the test of significance ($p < 0.01$). It shows that ER has a positive impact on CER. In other words, strict ERs will compel enterprises to take the initiative to undertake responsibilities for environmental protection. So, hypothesis H1 is supported. At the same time, the path coefficient of ER on altruistic motivation and that of altruistic motivation on CER are respectively 0.17 ($p < 0.05$) and 0.20 ($p < 0.01$). It demonstrates that positive effects of ER on altruistic motivation as well as the positive effects of altruistic motivation on CER. In addition, the altruistic motivation plays a mediator role on the relationship between ERs and CER. Therefore, hypothesis H2 is supported. The path coefficients of green innovation on ER, altruistic motivation and CER are respectively 0.14, 0.27 and 0.33. All P values are smaller than 0.01 and the levels of significance meet related requirements. It indicates that the green innovation can positively regulate the effects of ER on CER. In other words, the higher the level of green innovation, the stronger the effects of ER on CER. So, hypothesis H3 is supported. To sum up, the results of structural equation model are consistent with that of regression analysis and this explains the mediating effect of altruistic motivation in detail, which further verifies the hypotheses.

Table 7. Results of structural equation model and corresponding hypotheses.

Function Route	Path Coefficient	F Value	Corresponding Hypothesis	Result
ER→CER	0.28	**	H1	Support
ER→Altruistic motivation	0.17	*	H2	Support
Altruistic motivation→CER	0.20	**	H2	Support
Green innovation→ER	0.14	**	H3	Support
Green innovation→Altruistic motivation	0.27	**	H3	Reject
Green innovation→CER	0.33	**	H3	Support

Note: * and ** represent the level of significance of coefficients at $p < 0.05$ and $p < 0.01$ respectively.

5. Discussion

Based on the results of regression analysis and structural equation model, our research on the relationship between ERs and CER, which takes altruistic motivation as a mediator variable and green innovation as a moderator variable, has the following conclusions:

(1)　Positive effects of ER on CER. Corporate initiative in shouldering environmental responsibility needs obligation by ERs and guidance by altruistic motivation (As shown in Model 2 and Model 3, Table 5, the coefficients both pass the significance test). This is different from previous conclusions that enterprises make environmental protection behaviors by a single factor [57]. Therefore, business managers should consider mandatory pressure of policies and non-mandatory influence of public opinion as well as overall interests of all stakeholders including supplier, client, and wholesaler. Then by undertaking environmental responsibility, enterprises can solve appeals of stakeholders and gain both social performance and competitive advantages [58]. Moreover, the empirical study above reveals that the correlation coefficient of ER on CER is positive (In Table 5, the coefficient is 0.341. In Table 7, the coefficient is 0.28. In addition, they all pass the test of significance in 1% level). In other words, ER has a positive impact on CER, which verifies the Porter Hypothesis to the particular Chinese situation. In detail, ERs impose great pressure on enterprises which adopt old-fashioned production technologies. So those enterprises are forced to invest in pollution control technology and advanced production technology and implement environmentally friendly operations in the whole life cycle. Although enterprises must put abundant resources in the process of undertaking environmental responsibility, advantages (such as environmental tax refunding, productivity growth and social image improvement) which are brought from behaviors of environmental protection will contribute to long-term development [59]. So, if only enterprises focused on long-term development, they would have the initiative to implement environmental protection behaviors. In addition, it is the objective of ERs. Conversely, once more enterprises undertake environmental responsibility actively or more environmental responsibilities are accepted by enterprises on their own initiative, CER will be blended into an enterprise's daily operation and even into industry regulations [60]. Then corresponding ERs will be improved and enhanced. Therefore, the relationship between ERs and CER may be interacted.

(2)　Mediating effect of altruistic motivation. In Figure 3, we can clearly find that altruistic motivation works as a mediator variable in the relationship between ERs and CER. So, value factors such as altruistic motivation play an important role in promoting enterprises to fulfill environmental protection responsibility. This disagrees with conclusions of Broon and Kenny [56]: policy constraint plays the decisive role in driving enterprises to adopt environmental protection technology [12]. However, a great change has taken place in the modern market. Unlike the concept of marketing in the late 1980s when Broon and Kenny were working, the concept of social marketing becomes more and more recognized this century, especially in the Internet era [61]. Faced with intensifying market competition and social networking, an enterprise's survival is determined not only by its strength, but also by the comprehensive interests of stakeholders including employees, clients, and social organizations [22]. Besides, alliance of government, production, teaching, research, and consumers contributes to information sharing and becomes an important way to improve an enterprise's discourse power in the industrial chain. It is becoming a popular pattern in modern business. So nowadays market competition has been evolved from the primary stage (individual-to-individual pattern) to the senior stage (group-to-group pattern) [62]. Therefore, business managers must set up the idea of altruism and integrate altruistic motivation into corporate culture. Furthermore, enterprises are supposed to formulate an operation strategy of "value co-production and win-win cooperation" and construct a platform for regular communication among partners, which can promote the free circulation of talents, information, technology, and other resources [63]. A community of shared interests

thereby will be established. Altruistic behaviors are also necessary because the enhancement of ERs and CER is keeping up the pressure against the enterprises. Enterprise's competitive advantages will disappear gradually in the inter-group competition situation. The value of altruism is becoming an essential concept of operation in the Internet age.

(3)　Moderating effect of green innovation. Regression analysis results reveal that green innovation can regulate the effects of ER on CER (s shown in Table 5, the coefficient of ER is 0.341 in Model 2, while the coefficient of interaction term, ER × Green innovation, is 0.414 in Model 6), and enterprises with high-level green innovation will implement environmental protection behaviors more actively (As shown Figure 2). So green innovation decides whether the enterprise could take an advantage in a fierce market competition. Enterprises with low-level green innovation should regard environmental protection as a profitable opportunity and implement a proactive environmental strategy [64]. This will help the enhancement of ERs and CER. Then mandatory constraint such as ERs, and non-mandatory factors such as CER and altruistic motivation, both will promote green innovation to get into business operation. Finally, green innovation will help enterprises take an unshakable advantage in reducing unnecessary costs such as avoiding supervision of environmental authorities and the public. Those enterprises also should actively improve environmental management level and realize a "win-win" between environmental performance and economic performance by setting about to construct a pollution-free and low-consumption production system from multiple aspects including product design, environmental governance, energy saving, emission reduction, pollution control as well as waste recycling. Subsequently, managers could improve the consciousness of green innovation by training or learning. Managers also need to enhance the propagation of environmental business culture to lead employees to accept and support green innovations [65]. It will help create a feasible atmosphere for green innovation. Meanwhile, the government must strengthen ERs and use different combinations of ERs such as command-control ER, market-based incentive ER and voluntary ER. The intensive cleaner production also needs to be introduced in laws to gradually dissolve the ecological crisis [66]. Not to be neglected, the media and the public should take their wider regulatory role in encouraging and supervising green innovation behaviors in enterprises. The media can expose an enterprise's production process in time and rev up publicity for green innovation. The public can choose green and environmentally friendly commodities or services proactively.
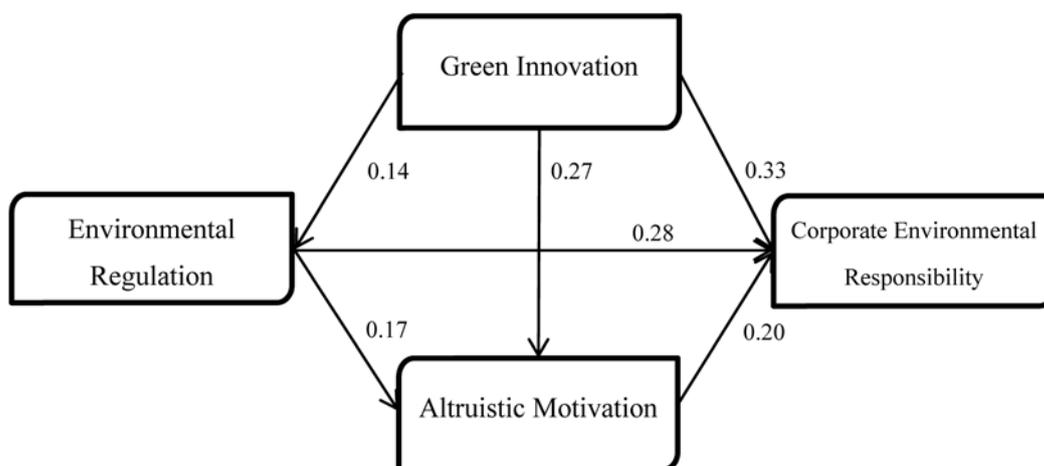

Figure 3. Results of structural equation model.

6. Conclusions

An empirical study is carried out by using regression analysis and the structural equation model. The moderated mediating effect model is proposed. The results provide theoretical guidance for related departments to implement ERs and for enterprises to formulate business strategies. The main conclusions are as follows:

(1) ER and CER. The former can influence the later significantly. Enterprises faced with ERs may be able to improve competitiveness through "first-mover advantage" and "innovation compensation". Thus, the environmental responsibility offers an opportunity for the long-term development in enterprises. It further verifies the Porter Hypothesis.

(2) Mediating effect of altruistic motivation. Altruistic motivation plays a medium role in the relationship between ERs and CER. This offsets the shortages of previous research which emphasized the decisive role of external environment but neglected the influence of personal features.

(3) Moderating effect of green innovation. Green innovation can strengthen the constraints of ER on CER. The higher the level of green innovation, the stronger the willingness of enterprises to undertake environmental responsibility. Attention to value factors such as corporate culture in studying CER is beneficial to improve the smoothness of business strategies.

(4) Moderated mediating effect. The indirect effect of ER on CER through altruistic motivation will be strengthened by green innovation.

7. Prospect

This paper has some shortcomings. Firstly, research objects are limited in manufacturing enterprises. Whether heavy-pollution enterprises could represent the current status of Chinese enterprises is doubtful. Future research can expand sample size and involve more industries to improve the universality of conclusions. Secondly, we only choose the most representative personal features as the mediator variable. Whether other personal features have a strong mediating effect still needs further exploration. Therefore, on the one hand, future research should explore the mediating effects of different personal features. On the other hand, attention should be paid to the mediating effects of multiple mediated variables in the relationship between ERs and CER. Thirdly, we only chose enterprise size and property rights as control variables. Future research should consider the effects of other control variables on this model.

Author Contributions: Benhong Peng and Yu Tu co-designed and wrote the paper, and Guo Wei put forward the valuable suggestions and modified the draft. All authors read and approved the final manuscript.

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