



# Heterogeneous Corporate Social Responsibility, Technological Innovation and Firm Performance - the Moderating Effect of Environmental Regulation

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**Abstract.** Based on the stakeholder theory, we take the data of listed companies on the main board of Shanghai and Shenzhen from 2014 to 2020 as the object to study the relationship between heterogeneous social responsibility and corporate performance, and examine the mediating role of technological innovation and the moderating role of environmental regulation. The results of the study show that: CSR is significantly positively correlated with corporate performance, in which actively fulfilling internal social responsibility will have a positive effect on corporate performance, and undertaking external social responsibility will have a crowding out effect on corporate performance. Technological innovation acts as a significant mediator in the relationship between social responsibility and corporate performance. The impact of technological innovation on firm performance is positively regulated by environmental regulation. When undertaking social responsibility, the greater the intensity of environmental regulation, the lower the performance of enterprises. The results of the study provide experience for promoting the implementation of social responsibility under specific environmental regulations.

**Keywords:** Corporate Social Responsibility, Technological Innovation, Firm Performance, Environmental Regulation, Heterogeneity

## 1 Introduction

In the research on the relationship between social responsibility and corporate performance, scholars have conducted relevant studies based on executive traits, informal systems, corporate redundancy resources, market competition intensity and other moderating variables. And in the context of China's high-quality development and green development, environmental regulations are becoming more and more perfect, and what kind of effect on corporate performance exists has become a hot spot of empirical attention in the academic community. Therefore, this paper starts from heterogeneous corporate social responsibility, based on stakeholder theory and resource base theory, firstly, we study the relationship between internal and external social responsibility, technological innovation and enterprise performance. Secondly, we

introduce environmental regulation as a regulating variable, with the intention of exploring how enterprise performance will change under the control of national policies, so as to help enterprises find a way forward to realize the common progress of enterprise and society.

## 2 Theoretical Analysis and Research Hypotheses

From the perspective of content heterogeneity, CSR can be categorized into internal and external social responsibility, and this categorization criterion is mainly based on stakeholder theory <sup>[1]</sup>. Stakeholder theory refers to the management activities carried out by enterprises to balance the interests of various stakeholders. CSR is an enterprise's feedback to stakeholders, including responsibility activities such as giving back to society, giving feedback to shareholders and treating employees well. The more social responsibility a company takes into account the interests of stakeholders, the more harmonious its relationship with stakeholders, the more resources it will obtain from stakeholders, and the more successful it will be. Zhou L and Huang J (2012) found that family firms with rich external contacts have a greater impact on firm performance when they assume social responsibility <sup>[2]</sup>. Zhu Y and Li J (2021) found that due to the different parties involved, it will make the impact of CSR on firm performance heterogeneous, but overall it still shows the relationship that social responsibility promotes the improvement of corporate performance <sup>[3]</sup>. Therefore, the following hypotheses are proposed:

H1/ H2: Internal/ External social responsibility is positively related to corporate performance.

According to existing research, there are two driving factors for technological innovation in enterprises: external drivers, internal drivers. Corporate responsibility behavior will promote technological innovation activities from both external and internal driving factors. Yang Z et al. (2021) from the perspective of CSR as a strategic competitive tool, concluded that social responsibility would have a positive effect on innovation subsidies and tax incentives for companies <sup>[4]</sup>. Based on social exchange theory, Zhang X and Wei H (2021) found the mediating role of technological innovation between social responsibility and corporate performance through quantitative analysis <sup>[5]</sup>. Li J et al. (2021) conducted a study on the relationship between corporate environmental, social and corporate governance (ESG) performance on corporate performance from the perspective of corporate innovation, and pointed out that the level of corporate innovation would be improved with the improvement of corporate ESG performance <sup>[6]</sup>. Therefore, the following hypotheses are proposed:

H3: Social responsibility (internal and external) can significantly promote corporate technological innovation.

H4: Technological innovation plays a significant mediating role in the relationship between social responsibility (internal and external) commitment and corporate performance.

Under the call of the green concept, how to realize the effective coexistence of "environment" and "economy" is a problem that enterprises must solve in the current

complex and changing environment, and at the same time, it is also in response to the call of the state and in line with the people's willingness to protect the environment. Chen Y (2021) studied environmental regulation with manufacturing enterprises as the object, and found that environmental regulation has a forcing effect, i.e., environmental regulation can improve the core competitiveness of enterprises by prompting them to carry out technological innovation behavior<sup>[7]</sup>. Ya K et al. (2022) explored the environmental orientation of corporate technological innovation from the perspective of the environmental benefits of corporate innovation, compared with enterprises in areas of weak environmental regulation, enterprises with strong environmental regulation reduce the cost of corporate pollution control and satisfy corporate environmental legitimacy intentions through technological innovation; both of which help enterprises to obtain environmental benefits and fulfill their social responsibilities<sup>[8]</sup>. Therefore, the following hypothesis is proposed:

H5: Environmental regulation positively regulates the impact of technological innovation on corporate performance.

H6: Environmental regulation regulates the process by which social responsibility affects firm performance through technological innovation.

### 3 Research Design

#### 3.1 Data Sources and Indicator Measurement

Sample selection principles are as follows: (1) Companies with incomplete sample data are excluded; (2) ST, \*ST and financial companies within the sample period are excluded; and (3) enterprises with negative social responsibility level are excluded. In order to avoid the damage of extreme values to the regression results, 1% tailing treatment is carried out for continuous variables. The CSR index data comes from the total social responsibility rating score of listed companies published by Hexun, and the internal and external CSR indicators in Hexun are clear, which can meet the data collection requirements of this paper. The measurement indicators of ER were taken from the National Bureau of Statistics and the statistical yearbooks of provinces and regions, and the research data of other variables were taken from the CSMAR database.

The enterprise performance of the explained variable is represented by CFP, and the return on assets is used to evaluate the enterprise performance. Explanatory variables corporate social responsibility is represented by CSR and internal social responsibility is represented by Incsr; External social responsibility is represented by Excsr; and the natural logarithm of all CSR scores is taken. Technological innovation is represented by Innov, which measures technological innovation capacity using the ratio of R&D investment to operating income. Environmental regulation is represented by ER, and the ratio of the annual industrial pollution control investment and the annual industrial added value of the province where the enterprise is located is used to measure environmental regulation. In this paper, the following control variables are selected: enterprise size, enterprise age, enterprise growth, asset-liability ratio, cash ratio, industry effect and annual effect.

### 3.2 Model Setting

To test the relationship between heterogeneous CSR and performance, the mediating role of technological innovation and the moderating role of environmental regulation, this paper constructs the following regression models in turn.

$$CFP_{it} = \alpha_1 + \alpha_2 INCSR_{it}/EXCSR_{it} + \alpha_3 Controls_{it} + Industry + Year + \varepsilon_{it} \quad (1)$$

$$INNOV_{it} = \alpha_4 + \alpha_5 INCSR_{it}/EXCSR_{it} + \alpha_6 Controls_{it} + Industry + Year + \varepsilon_{it} \quad (2)$$

$$CFP_{it} = \alpha_7 + \alpha_8 INCSR_{it}/EXCSR_{it} + \alpha_9 INNOV_{it} + \alpha_{10} Controls_{it} + Industry + Year + \varepsilon_{it} \quad (3)$$

$$CFP_{it} = \alpha_{11} + \alpha_{12} INNOV_{it} + \alpha_{13} ER_{it} + \alpha_{14} TJ1 + \alpha_{15} Controls_{it} + Industry + Year + \varepsilon_{it} \quad (4)$$

$$CFP_{it} = \alpha_{16} + \alpha_{17} CSR_{it} + \alpha_{18} ER_{it} + \alpha_{19} TJ2 + \alpha_{20} Controls_{it} + Industry + Year + \varepsilon_{it} \quad (5)$$

In testing the moderating effect of environmental regulation, the interaction term is centered in order to make the regression model more explanatory. Where C-Innovit, C-ERit, and C-CSRit are the results after centering the technological innovation data, environmental regulation data and social responsibility data, respectively,  $TJ1 = C-Innovit * C-ERit$  and  $TJ2 = C-CSRit * C-ERit$  are the results after centering the interaction terms.

## 4 Empirical Analysis

### 4.1 Main effects regression as well as mediation effects regression results

The above regression models (1)-(3) are tested, and the results are shown in Table 1. Column (1) tests hypothesis H1, and the regression coefficient of 0.002 for INCSR on CFP, which is significant at the 1% level, indicating that INCSR has a positive effect on CFP; this conclusion is consistent with Lee & Choi's view that the fulfillment of internal social responsibility by corporations can enhance corporate value<sup>[9]</sup> and improve corporate performance. Column (4) illustrates that hypothesis H2 does not hold because the regression coefficient of EXCSR on CFP is -0.000 and significant at the 1% level, which indicates that the resource cost paid by enterprises to fulfill external social responsibility is larger, thus producing a crowding-out effect on corporate performance.

Columns (2) and (5) are the tests of the effects of EXCSR and INCSR on INNOV, and the results show that INCSR is significantly negatively correlated with INNOV, and EXCSR has an inhibitory effect on INNOV, but it is not significant; Hypothesis H3 does not hold, and the conclusion responds to a certain degree to the study by Hull & Rothenberg's research<sup>[10]</sup>; that is, from the perspective of resources, the scarcity of resources makes the investment of enterprises to fulfill their social responsibility crowds out the R&D investment used by enterprises for technological innovation, which has a negative effect on technological innovation. Column (3) tests the medi-

ing effect of INNOV on INCSR and CFP, and the regression coefficient is significant at 1% level. Column (6) tested the mediation effect of INNOV on EXCSR and CFP, the regression coefficient is significant at 1% level, the hypothesis H4 is valid, i.e., technological innovation mediates the relationship between CSR (internal and external) and firm performance.

**Table 1.** Main effects & Intermediary effect regression results

Variable	(1) CFP	(2) INNOV	(3) CFP	(4) CFP	(5) INNOV	(6) CFP
INCSR	0.002*** (0)	-0.000*** (0)	0.002*** (0)			
EXCSR				-0.000*** (0)	-0.000*** (0)	-0.000*** (0)
INNOV			-0.179*** (0.017)			-0.206*** (0.018)
control	Yes	Yes	Yes	Yes	Yes	Yes
N	15106.000	15106.000	15106.000	15106.000	15106.000	15106.000
r2_a	0.085	-0.163	0.093	-0.058	-0.164	-0.047
Id/Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### 4.2 Moderating effect regression results

Table 2 analyzes the moderating effect of environmental regulation. The results show that the higher the degree of environmental regulation, the less the inhibition effect of technological innovation on firm performance; Hypothesis H5 is verified; It supports the Strong Porter hypothesis, which holds that strict environmental regulations can lead to innovation.

Aiming at the regulating effect between environmental regulation and social responsibility, it is found that environmental regulation can negatively regulate the relationship between social responsibility and corporate performance. In other words, the more strict the government's environmental control, the effect of technological innovation brought by enterprises to fulfill social responsibility will be reduced into the economic benefits of enterprises, which is not conducive to the improvement of enterprise performance. Hypothesis H6 is not verified.

**Table 2.** Regression results of moderated effects

	(7) CFP	(8) CFP	(9) CFP	(10) CFP
INNOV	-0.205*** (0.018)	-0.196*** (0.018)		
ER	0.424** (0.216)	0.522** (0.219)	0.355* (0.211)	0.414** (0.211)
TJ1		14.101*** (5.143)		
CSR			0.001*** (0)	0.001*** (0)
TJ2				-0.092*** (0.012)
control	Yes	Yes	Yes	Yes
N	15106.000	15106.000	15106.000	15106.000
r2_a	-0.048	-0.047	0.001	0.006
Id/Year	Yes	Yes	Yes	Yes

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5 Conclusions

Based on the data of A-share main board listed companies in Shanghai and Shenzhen from 2014 to 2020, we analyze the mechanism of internal and external CSR and corporate performance under environmental regulation and the mediating role of technological innovation; with a view to realizing a win-win situation between the external goals of the enterprise and the internal goals of the enterprise. The results of the study show that: active fulfillment of internal social responsibility has a significant positive effect on corporate performance, and taking external social responsibility is detrimental to corporate performance, partly due to the fact that executives pay more attention to their own reputation when fulfilling their external social responsibility, which makes the resources for external fulfillment of responsibility become their agency costs. CSR will inhibit technological innovation; Technological innovation plays an intermediary role between corporate responsibility and performance improvement. Environmental regulation positively moderates the impact of technological innovation on corporate performance; the greater the intensity of environmental regulation, the lower the corporate performance when taking social responsibility. The results of the study have certain reference value for enterprises to carry out social responsibility management.

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