

The Influence of Central Ecological and Environmental Protection Supervision on the Performance of Environmental Protection Enterprises

-- Based on analysis of listed companies

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Abstract: Based on the semi-annual financial data of China's listed enterprises from 2017 to 2022, this paper divides the sample enterprises into environmental listed enterprises and other general listed enterprises in the industry of environmental listed enterprises, and evaluates the impact and mechanism of the "Regulations on the Supervision of Central Ecological and Environmental Protection" on the performance of environmental listed enterprises through the difference-difference method. This paper finds that the Regulation reduces the performance level of environmental listed enterprises. The strengthening of regulatory effect and the reduction of innovation input are the important mechanisms. From the perspective of heterogeneity effect, the Regulation has greater inhibitory effect on the performance of private environmental protection enterprises, but has no significant effect on the performance of state-owned environmental protection enterprises. Compared with small-scale environmental protection enterprises, the "Regulations" have less inhibitory effect on the performance of large-scale environmental protection enterprises. After a variety of robustness tests, the conclusions of this study are still valid, which can provide important reference for relevant government departments to formulate appropriate environmental policies and promote the stable and healthy development of environmental protection enterprises.

Keywords: Central environmental supervision, Enterprise performance, Environmental regulation, Compliance, Cost, Innovation and investment.

1. Introduction

With the rapid development of China's economy, ecological and environmental problems have become increasingly prominent. In order to improve the environmental governance efficiency of local governments and solve ecological environmental problems, the central environmental protection supervision system came into being. In terms of actual results, the first round of central environmental protection inspectors through filing penalties, interviews, detention, accountability and other accountability methods, effectively promoted the local party committee's attention to environmental protection work, and local environmental governance departments have made a series of substantive environmental governance work. However, in the process of carrying out the work of the first round of central environmental protection inspectors, there is still a lack of some more detailed work regulations and work requirements, and it is necessary to further strengthen the legal basis of supervision work. To this end, the "Central Ecological Environmental Protection Work Regulations" (hereinafter referred to as the "Regulations") was officially issued and implemented on June 6, 2019, the "Regulations" clarify more detailed work regulations and requirements, consolidate the legal basis of supervision work, aimed at better guiding the second round of environmental protection supervision work, compacting ecological environmental responsibility, and strengthening ecological environmental protection work. In the process of promoting ecological civilization construction and strengthening ecological environmental protection, environmental protection enterprises are important participants. Environmental protection enterprises not only

practice new development concepts for other enterprises, explore the establishment and improvement of ESG internal system and management framework, and accelerate green and low-carbon transformation, but also accumulate a lot of experience and practices. It also provides services and solutions for the whole life cycle of environmental protection projects for other enterprises. The Party's 20th National Congress also put forward a series of new ideas, new requirements, new goals, and new deployments for the construction of ecological civilization, clearly requiring strengthening the green transformation of the development mode, further promoting environmental pollution prevention and control, increasing ecosystem protection, actively and steadily promoting carbon to peak carbon neutrality, and taking "strengthening the environmental protection industry" as an important starting point for promoting green development. It can be seen that the study of the impact of environmental protection enterprises on the central ecological environmental protection supervision has important practical significance for modern environmental governance and green development.

As environmental governance has attracted more and more attention from the state, many scholars have also studied the implementation effect of the central environmental protection supervision. The existing literature research mainly focuses on the pollution control effect of the central environmental protection supervision and its impact on the environmental governance behavior of enterprises. Wang Ling et al. (2019), Liu Zhangli and Wu Jiannan (2019), Jia et al. (2019), Zhou Xiaobo and Ma Tianming (2020) analyzed the impact of the first round of central environmental protection inspectors on air quality, and the results all showed that central

environmental protection inspectors can effectively improve air quality, but there are disputes on the sustainability of improvement. The research on the influence of central environmental supervision on enterprises' environmental governance behavior mainly focuses on enterprises' green innovation and enterprises' environmental protection investment. For the former, some scholars concluded that the first round of central environmental protection supervision improved the level of green innovation of enterprises in pollution-intensive industries (Li Yihegao, 2021; For the latter, Yang Liuyong, Zhang Zeye and Zheng Jianming (2021) found that the first round of central environmental protection supervision has a sustained and significant promoting effect on enterprises' environmental protection investment. Only a small number of scholars have studied the impact of central environmental protection inspectors on the economic benefits of enterprises. Chen Renjun and Xiao Qinglan (2019) found that the first round of central environmental protection inspectors can improve the performance of industrial enterprises through innovation. To sum up, most scholars in the past used the first round of central environmental protection inspectors as the impact point of environmental policies to study the pollution control effect of central environmental protection inspectors, the impact on enterprises' environmental governance behavior and the impact on enterprises' economic benefits, while few studied the implementation effect of the second round of central environmental protection inspectors. In addition, the main objects of previous studies were mostly high-polluting enterprises, and few literatures studied the impact of central environmental protection supervision on the economic benefits of environmental protection enterprises. In the process of ecological environment governance and green and low-carbon transformation, the resource-saving and environment-friendly products and services provided by environmental protection enterprises are particularly critical. Environmental protection enterprises play a vital role in improving ecological environment governance and achieving green development. Therefore, under the background of the requirements of ecological and environmental governance in the new era and the green transformation of development mode, this paper makes a pioneering study on the impact of the second round of central environmental protection supervision on the performance of listed environmental protection companies and the mechanism principle. It helps us to understand the development status of environmental protection enterprises, understand the problems encountered in the operation of environmental protection enterprises, and provide good environmental policy suggestions for the healthy development of environmental protection enterprises in the future, so as to better strengthen the supporting role of environmental protection industry in building a modern environmental governance system and achieving green development.

Based on this, this paper takes the "Regulations on the Supervision of Central Ecological and Environmental Protection" formulated and promulgated on June 6, 2019 as a quasi-natural experiment, takes China's A-share environmental protection listed companies and non-environmental protection general listed companies in their industries as research objects, and uses the differential method to investigate the impact of the second round of central environmental protection supervision on the performance of environmental protection listed companies.

Compared with existing literatures, the possible research contributions of this paper are as follows: First, based on the micro-enterprise level, this paper reveals the impact and mechanism of central environmental protection inspectors on the performance of environmental protection enterprises, expands and enriches the research on the policy effect of central environmental protection inspectors and the performance of environmental protection enterprises, and helps to understand the role of local governments and micro-enterprises in environmental governance. Second, this paper makes a pioneering study of the impact of the second round of environmental protection inspectors on the performance of environmental protection enterprises, and conducts a heterogeneity analysis from three aspects: enterprise ownership, scale and regional investment in environmental protection governance. The research conclusion is timely and innovative. Third, central environmental protection inspectors with "supervision" as the core is a major institutional innovation in China's ecological civilization construction. This paper provides empirical evidence on vertical environmental protection management by examining the environmental governance effects of the second round of central environmental protection inspectors, and provides policy inspiration for the subsequent promotion of environmental protection inspectors, the construction of environmental governance system and the implementation of other areas of supervision work.

2. Research Hypothesis

2.1. Central Environmental Supervision and the Performance of Environmental Listed Companies

In the context of the second round of central environmental inspection work launched, high-polluting enterprises will inevitably increase the demand for products and services provided by environmental protection enterprises. The normalization of environmental protection "supervision high pressure" and the continuous improvement of environmental management mechanism have spawned the transformation of potential environmental protection market demand. As a result, overconfident managers may develop the illusion that expanding the size of the enterprise can improve the performance and value of the enterprise. Overconfidence, as a kind of psychological cognitive bias, usually causes managers to overestimate income, underestimate risk and cost during project evaluation, generate the illusion of control, overestimate their ability to control the situation and operation and management, and then adopt radical investment strategies (Ye Ling, 2013). Based on this psychological cognitive deviation, managers will expand the scale of enterprises in a short period of time, thus making the factor input mix of enterprises deviate from the optimal level. As a result, the asset operation efficiency of enterprises becomes low due to the expansion of scale, resulting in diminishing returns to scale, and thus reducing the performance of environmental protection listed companies. On the other hand, compliance costs believe that environmental regulation is equivalent to imposing additional constraints on the decision-making process of enterprises (Palmer et al., 1995), and enterprises in areas with high environmental regulation intensity will increase the difficulty and cost of production, sales and management. Ghosal et al. (2019) point out that environmental regulation can lead to improvements in

environmental conditions, but may increase unnecessary production costs, thereby limiting business productivity. The second round of central environmental protection inspectors will implement the new development concept and promote high-quality development as an important content of the inspectors, and put forward higher requirements for the operation and development of enterprises. In order to meet the needs of the government, the market and the public for environmental protection and ecological civilization, environmental protection enterprises should not only strengthen the compliance of the internal production mode, but also monitor the changes in the external environment in real time, and timely release the social responsibility report, sustainable development report or environmental report to the public. Under the high pressure of the second round of environmental protection supervision, environmental protection enterprises need to bear higher compliance costs. Higher compliance costs make enterprises reduce capital investment in technology research and development and productive investment activities, thus reducing the performance of environmental protection enterprises. Therefore, hypothesis H1b is proposed.

H1: The central environmental protection supervision has a inhibiting effect on the performance of environmental protection enterprises.

3. Strategy for Research

3.1. Sample Selection and Data Description

Based on the data of Shanghai and Shenzhen A-share listed companies from 2017 to 2022, this paper conducts an in-depth analysis of how central environmental inspectors affect the performance of listed companies in the environmental protection category. Considering that the central environmental protection inspectors have a greater impact on high-polluting enterprises, non-environmental high-polluting enterprises are eliminated, and finally ST enterprises are eliminated, and 92 environmental listed enterprises and 793 non-environmental listed enterprises are selected. The data of sample environmental protection enterprises are from the Wind database, and the semi-annual financial data of performance indicators and control variables are from the CSMAR database. On this basis, the original data were processed as follows: abnormal or seriously missing observations were eliminated, and 1% and 99% indentation were performed on relevant continuous variables, and 7509 valid samples were finally obtained.

3.2. Research Design

Based on the "Regulations on the Supervision of Central Ecological and Environmental Protection" issued by the General Office of the Communist Party of China Central Committee and The General Office of the State Council on June 6, 2019, as the standard natural experiment, environmental protection listed companies and non-environmental protection listed companies from 2017 to 2022 were selected as the research objects. This article sets the Central Environmental Protection Inspection (CEPS) as an interactive item of Postt and treati. If the enterprise is an environmental protection listed enterprise, treati is 1, and the rest is 0. Postt takes into account the center

Environmental inspectors aim to establish a "party and government responsibility" long-term governance mechanism in the field of environmental management, so the

central environmental inspection team will still have a far-reaching impact after the departure, so we set the half year on December 31, 2019 and after 1, and the half year before December 31, 2019 is set to 0. The difference-difference method is used to test the impact of central environmental protection inspectors on the performance of listed environmental protection enterprises:

$$ROA_{it} = \alpha_0 + \beta_1 CEPS + \beta_2 X_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

Among them, the explained variable is enterprise performance. Referring to the research of Xu Feng et al. (2022), this paper adopts return on total assets ROA. Measured as the ratio of net profit for the rolling 12 months to the average balance of total assets. According to the research of Chen Zhigang (2022) and Xu Feng (2022), select the control variables $X_{i,t}$. μ_i and γ_t represent individual fixed effects and time fixed effects, respectively, and $\varepsilon_{i,t}$ represent random disturbance terms. In this paper, clustering standard error (cluster) is carried out at the industry level.

3.3. Descriptive Statistics

Table 1 reports the results of statistical analysis of the main variables. Among them, the explained variables and control variables are semi-annual data variables. The mean value of ROATTM is 0.041, the standard deviation is 0.082, the minimum value is -0.745, and the maximum value is 0.816, indicating that there are great differences in ROATTM among different enterprises. The mean value of Treat is 0.117, indicating that 11.7% of the enterprises in this paper are environmental protection enterprises.

Table 1. Descriptive statistics

Variable types	Name	Obs	Mean	S.D	Min	Max
Core independent variables	ROATTM	7509	0.041	0.082	-0.745	0.816
	ROETM	7509	0.062	0.148	-0.998	0.376
Policy variables	Treat	7509	0.117	0.321	0	1
	Post	7509	0.646	0.478	0	1
Control variables	Aslbrt	7509	0.420	0.181	0.072	0.885
	Far	7509	0.157	0.103	0.002	0.810
	Size	7509	22.03	1.102	19.780	26.430
	MB	7509	1.961	0.870	1.078	8.689
	Finpro	7509	0.156	0.496	-1.005	3.306
	Fratio	7509	2.427	1.892	0.564	13.810
	CashT	7509	0.084	0.219	-5.100	4.083

4. Empirical results and analysis

In this paper, we estimate the benchmark model by controlling industry fixed effect, time fixed effect and standard error clustering to industry level.

Table 2. Benchmark analysis

Variable	(1)	(2)	(3)
	ROATTM	ROATTM	ROATTM
CEPS	-0.0309*** (0.00872)	-0.0173*** (0.00345)	-0.0270*** (0.00784)
Controls	YES	YES	YES
Time fixed effect	YES	YES	YES
Industry fixed effect	YES	NO	YES
Clustering level	industry	No	industry
Observations	7,509	7,509	7,509
R-squared	0.035	0.199	0.207
***, ** and * indicate significant levels at 1%, 5% and 10% respectively, and robust standard errors are reported in parentheses			

Table 2 reports the differential empirical results of the enactment of the Regulations on the Supervision of Central Ecological and Environmental Protection affecting the performance of listed environmental protection enterprises. Column (1) controls the industry fixed effect and time fixed effect without adding control variables, and column (2) controls the time fixed effect with adding control variables. Column (3) controls industry fixed effects and time fixed effects, and adds control variables. All the estimated results show that the coefficient of CEPS is significantly negative regardless of whether control variables are added or not and whether the fixed effects of the industry are controlled, indicating that the enactment of the Regulations significantly reduces the performance of listed companies in the environmental protection category, and hypothesis H1b is established.

4.1. Robustness test

4.1.1. Parallel trend test

An important premise for the use of the differential method is that the experimental group and the control group should have a parallel trend before the implementation of the policy, otherwise the estimated results will be biased. Therefore, this paper uses the event study method to select the performance difference of environmental protection enterprises and non-environmental protection enterprises in different semi-years to conduct parallel trend test. With reference to the method of Serfling (2016), we selected the first half year before the development of the Regulations (the first half of 2019) as the base period to analyze whether the environmental enterprise performance of the experimental group and the control group had a parallel trend before the development of the Regulations. The model is as follows:

$$Y_{i,t} = \alpha_0 + \sum_{m=2017}^{2022} \beta_m \times Treat_{i,t} + \beta_n X_{i,t} + \mu_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

This paper takes the first period before the implementation of the policy as the base period to test the dynamic trend change of environmental protection enterprises in the two periods before the promulgation of the Provisions to the last four periods, and Treat represents the interaction term between the virtual variables of the experimental group and the control group and the virtual variables of the year. Figure 1 reports the regression results of parallel trends. The results show that there is no significant difference between the enterprises in the experimental group and the control group before the promulgation of the Regulations on the Supervision of Central Ecological and Environmental Protection before the implementation of the green and low-carbon transformation policy, which well satisfies the parallel trend hypothesis.

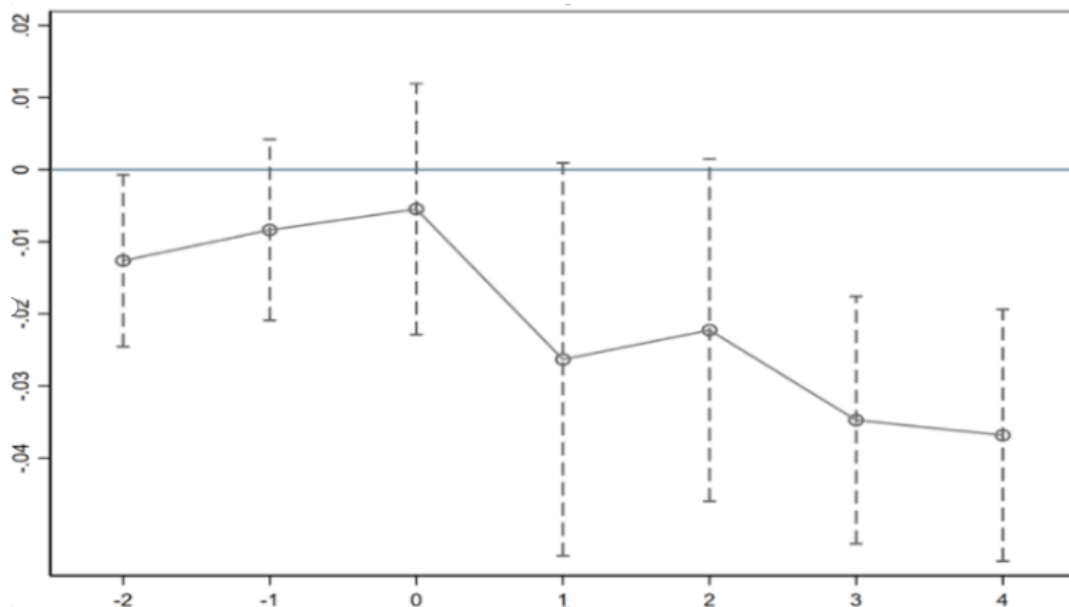


Figure 1. Parallel trend test

4.1.2. Placebo test

Referring to the method of Shi Daqian et al. (2018), this paper selects the occurrence time of the second round of central environmental inspection policy in advance to conduct a counterfactual test. In the time range from the second half of 2017 to the second half of 2020, any half year is randomly

selected as the implementation time of the second round of central environmental inspection policy, and the crossover term is reconstructed for regression. The results are shown in columns (1) to (4) of Table 3. Whether December 31, 2018 or June 30, 2019 is taken as the implementation time point of the policy, the coefficient of CEPS is not significant, that is, advancing the implementation time of the second round of

central environmental inspection policy will not cause significant changes in the impact of central environmental inspection on the performance of environmental protection

enterprises. It shows that "Regulations" is indeed the cause of the performance difference between environmental protection enterprises and non-environmental protection enterprises.

Table 3. Placebo test

Policy Years	2017 second half—2019 second half		2017 second half—2020 second half	
	2018-12-31		2019-06-30	
variant	ROATTM (1)	ROATTM (2)	ROATTM (3)	ROATTM (4)
CEPS	-0.00848 (0.00980)	-0.0111 (0.00746)	-0.0219 (0.01983)	-0.0223 (0.01770)
Controls	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES
Industry fixed effect	YES	YES	YES	YES
Clustering level	industry	industry	industry	industry
Observations	3,369	3,369	4,952	4,952
R-squared	0.037	0.175	0.038	0.196
***, ** and * indicate significant levels at 1%, 5% and 10% respectively, and robust standard errors are reported in parentheses				

4.2. Analysis of the mechanism

Through the above analysis, it can be found that the central environmental protection supervision significantly inhibits the performance of environmental protection enterprises. However, as an environmental protection policy characterized by "supervision", the central environmental protection inspector does not directly focus on the environmental violations of enterprises, but strengthens the motivation of local environmental governance by strengthening the supervision of the implementation of local environmental policies, which further affects the governance behavior of environmental protection enterprises, and finally affects the performance of environmental protection enterprises. In this context, local governments have a large policy space to regulate and guide the environmental governance behavior of enterprises, and the choice of different policy tools will directly affect the environmental governance behavior and production and operation status of enterprises in the future. Therefore, it is of great significance to explore the mechanism of central environmental supervision inhibiting the performance of environmental protection enterprises.

4.2.1. Mediating effect of environmental regulation

Environmental supervision is divided into local government environmental supervision and public opinion supervision. The former means that local governments impose hard constraints on the disclosure of environmental information by increasing penalties for environmental violations, increasing the cost of enterprise violations, and taking laws and regulations as direct means, supplemented by other means such as environmental information disclosure, environmental standards or agreements (Wang Jianming, 2008). The latter means that enterprises' environmental governance behaviors and social responsibilities are influenced by social mechanisms such as media, ngos, and environmental accidents, and these pressures play a role through the supervision mechanism of public opinion. As an important participant in the environmental governance system, environmental protection enterprises will inevitably be subject to more stringent environmental behavior supervision by local governments and more public supervision under the second round of central environmental

protection supervision, mainly reflected in pollution emissions, energy conservation and environmental protection, sustainable development, social responsibility report disclosure and other aspects. Due to strict environmental supervision from local governments and public opinion supervision, environmental protection enterprises are under pressure to commit to the compliance and sustainability of business operations. Environmental regulation is equivalent to imposing additional constraints on the decision-making process of enterprises (Palmer et al., 1995). Enterprises in areas with high environmental regulation intensity will increase the difficulty and cost of production, sales and management. As a result, environmental companies have to bear additional costs, which may inhibit their performance. Referring to the practice of Ye et al. (2022), this paper adopts the management expense ratio (MER) of enterprises to measure the regulatory effect. The higher the MER, the stronger the regulatory effect brought by the central environmental supervision to enterprises.

Table 4. Mediating effects of environmental regulation

Variable	(1)	(2)	(3)
	ROATTM	MER	ROATTM
MER			-0.265*** (0.0423)
CEPS	-0.0275*** (0.00786)	0.0192*** (0.00533)	-0.0224** (0.00841)
Controls	YES	YES	YES
Time fixed effect	YES	YES	YES
Industry fixed effect	YES	YES	YES
Clustering level	industry	industry	industry
Observations	3,768	3,768	3,768
R-squared	0.209	0.189	0.267
***, ** and * indicate significant levels at 1%, 5% and 10% respectively, and robust standard errors are reported in parentheses			

As shown in Table 4, column (1) is the baseline regression, indicating that the enactment of the Regulations has a

inhibitory effect on the performance of environmental protection enterprises; The cross-multiplying coefficient of CEPS in column (2) is 0.0192, indicating that the introduction of the Regulations has increased the rate of management expenses of environmental protection enterprises. In column (3), the MER coefficient is significantly -0.265 and the coefficient of CEPS is -0.0224, indicating that the introduction of the Regulations will inhibit the performance of environmental protection enterprises by increasing the rate of management expenses of environmental protection enterprises. Analyzing the reasons, enterprises in high environmental regulation areas require a large capital cost in equipment procurement, research and development and process upgrading, and enterprises may reduce capital investment in research and development, production and investment activities, thereby losing market share and competitive advantage, and damaging their performance and productivity (Zhang & Vigne, 2021). Under the implementation of the second round of central environmental protection supervision, environmental protection enterprises face stronger environmental supervision by local governments and more supervision by public opinion, and bear additional costs for the compliance and sustainability of business operations, thus reducing the performance of environmental protection enterprises.

4.2.2. The intermediary effect of technological innovation

Porter's hypothesis holds that although environmental regulations increase production costs in the short term, appropriate environmental regulations are beneficial and can stimulate R&D investment and enterprise innovation. The resulting improvements in technological production processes can compensate for environmental regulatory costs and further improve corporate performance. However, under the second round of central ecological and environmental protection supervision, environmental protection enterprises, as important participants in environmental governance, will naturally receive special attention from local governments and the public. From the empirical analysis above, we can conclude that environmental protection enterprises have increased their management cost rate after the second round of central environmental protection supervision. In other words, environmental protection enterprises face huge pressure of environmental regulation and need to bear more compliance costs. In addition, in the second round of central environmental inspectors on the content of the "Provisions" to implement the new development concept, to promote high-quality development as the content of the inspector, to further enrich the connotation of the inspector. This means that the research and development technology of environmental protection enterprises is facing higher requirements, and the innovation research and development of environmental protection enterprises should not only be limited to the research and development of end treatment and other conventional strategic pollution reduction and reduction technologies, but should pay more attention to the research and development of source control (Liu Jinke, 2022).

As shown in Table 5, column (1) is the baseline regression, indicating that the enactment of the Regulations has a inhibitory effect on the performance of environmental protection enterprises; The cross-multiplication coefficient of CEPS in column (2) is -0.196, indicating that the introduction of the Regulations reduces the R&D investment of environmental protection enterprises; In column (3), the Rd coefficient is significantly 0.0138 and the coefficient of CEPS

is -0.0276, indicating that the introduction of the Regulations will inhibit the performance of environmental protection enterprises by reducing their R&D investment. Analysis of the reasons, under the second round of central environmental protection supervision, environmental protection enterprises will face stronger environmental regulations, which will increase their corresponding compliance costs, and technology research and development has the characteristics of long cycle, high difficulty and high risk, resulting in environmental protection enterprises to reduce the expenditure on research and development investment in the short term, and thus reduce the performance of environmental protection enterprises.

Table 5. Mediating effect of innovation input

Variable	(1)	(2)	(3)
	ROATTM	Rd	ROATTM
Rd			0.0138*** (0.00317)
CEPS	-0.0303*** (0.00853)	-0.196** (0.0814)	-0.0276*** (0.00730)
Controls	YES	YES	YES
Time fixed effect	YES	YES	YES
Industry fixed effect	YES	YES	YES
Clustering level	industry	industry	industry
Observations	5,733	5,733	5,733
R-squared	0.226	0.642	0.242
***, ** and * indicate significant levels at 1%, 5% and 10% respectively, and robust standard errors are reported in parentheses			

4.3. Heterogeneity analysis of the impact of central environmental protection inspectors on the performance of environmental protection enterprises

4.3.1. Heterogeneity analysis of enterprise ownership

The Regulations on the Supervision of Central Ecological and Environmental Protection may have different impacts on enterprises with different property rights. The specific heterogeneity regression results are shown in Table 6. From the regression results of columns (1) and (2) in Table 8, we find that the CEPS coefficient of a private enterprise is -0.0227 and is significant at 5%. The CEPS coefficient of state-owned enterprises is -0.0145, and its absolute value is smaller than that of private enterprises and is not significant, indicating that the provisions of the second round of central environmental protection supervision have a greater inhibitory effect on the performance of private environmental protection enterprises, but have no significant impact on the performance of state-owned environmental protection enterprises. This may be due to the relatively sufficient capital flow of state-owned environmental protection enterprises, which will not significantly reduce their investment in short-term innovative technology research and development because of the increase in compliance costs brought by environmental protection inspectors. On the contrary, in the long run, state-owned environmental protection enterprises will have a competitive advantage in the environmental protection market due to their leading investment in

technology research and development.

4.3.2. Heterogeneity analysis of enterprise size

The Regulations on Central Ecological Environmental Protection Supervision may have different impacts on enterprises of different sizes. In order to test whether the impact of the regulations on enterprise performance of the second round of central environmental protection supervision is related to enterprise size, this paper further divides the sample of enterprises into large-scale enterprises and small-scale enterprises and conducts heterogeneity analysis. The sample is divided according to the median enterprise size. When the enterprise asset size is larger than the median enterprise asset size during the sample period, the enterprise is classified as a large-scale enterprise; when the enterprise asset size is smaller than the median enterprise asset size during the sample period, the enterprise is classified as a small-scale enterprise. From the regression results of columns (3) and (4) in Table 8, we find that the CEPS coefficient of small enterprises is -0.0527, which is significant at the 5% level. The CEPS coefficient of a large-scale enterprise is -0.0156, and its absolute value is smaller than that of a small-scale enterprise and is significant at the level of 1%, indicating that the provisions of the second round of central

environmental protection supervision have a greater inhibitory effect on the performance of small-scale environmental protection enterprises and a smaller inhibitory effect on the performance of large-scale environmental protection enterprises. This may be due to the Regulations will increase the cost of environmental regulation for enterprises, making it greater than or even far beyond the benefits of extensive development. Under the theoretical framework of the "forced back" effect of Porter's hypothesis, shareholders as clients will more actively encourage managers to carry out green innovation activities (Li Qingyuan and Xiao Zehua, 2020). Faced with the high-pressure normalization of environmental protection inspectors, shareholders have a strong incentive to urge enterprises to carry out green technology research and development to reduce the potential risk of environmental violations; as agents of large enterprises, managers will inevitably strengthen the technological innovation of enterprises and actively carry out green and low-carbon transformation. However, small enterprises may have difficulties in carrying out green technology innovation activities under the background of normalized environmental supervision due to financial constraints and limited technical capability base.

Table 6. Heterogeneity test of environmental protection enterprises in the Regulations

Variable	(1)	(2)	(3)	(4)
	Private enterprise	State-owned enterprise	Small enterprise	Big enterprise
	ROATTM	ROATTM	ROATTM	ROATTM
CEPS	-0.0227** (0.0446)	-0.0145 (0.3343)	-0.0527** (0.0415)	-0.0156*** (0.0067)
Controls	YES	YES	YES	YES
Time fixed effect	YES	YES	YES	YES
Industry fixed effect	YES	YES	YES	YES
Clustering level	industry	industry	industry	industry
Observations	4,936	1,329	3,772	3,737
R-squared	0.209	0.235	0.201	0.235
***, ** and * indicate significant levels at 1%, 5% and 10% respectively, and robust standard errors are reported in parentheses				

5. Conclusions and Policy Recommendations

The purpose of this paper is to study the impact of the second round of central ecological environmental protection supervision on the performance of environmental protection enterprises and its mechanism. Semi-annual data of environmental protection listed companies and some non-environmental protection listed companies in China's A-stock market from 2017 to 2022 are used to study the impact and mechanism of the Regulations on the Work of Central Ecological Environmental Protection Supervision on the performance of environmental protection enterprises by using the difference-difference method. The following conclusions can be drawn: First, the enactment of the Regulations has reduced the performance of environmental protection listed companies; second, the strengthening of regulatory effect and the reduction of innovation input are important mechanisms. Third, from the perspective of heterogeneity, the Regulation

has a greater inhibitory effect on the performance of private environmental protection enterprises, but has no significant impact on the performance of state-owned environmental protection enterprises. The Regulation has less inhibitory effect on the performance of large-scale environmental protection enterprises and more inhibitory effect on the performance of small-scale environmental protection enterprises.

According to the above conclusions and the current background of China's environmental governance, this paper can extend the following countermeasures and suggestions.

First, in the context of the normalization of environmental protection "supervision of high pressure", the relevant local governments should constantly improve the mechanism of environmental supervision, the supervision of environmental governance of enterprises cannot be superficial in form, and it is necessary to go deep into the internal investigation of enterprises to investigate whether the industrial structure of enterprises is reasonable, whether the process is energy-saving, and whether the technology research and development

is in place. Second, under the background of normalizing the high pressure of environmental protection inspectors and building a modern environmental governance system, it is necessary to strengthen the support of the environmental protection industry. We will strengthen independent innovation in key environmental protection technology products, intensify research and development of environmental protection technology products, promote the demonstration and application of major environmental protection technologies and equipment, and accelerate the improvement of technology and equipment in environmental protection industries. Third, improve the financial support for the operation and development of environmental protection enterprises, promote the rapid development of environmental protection enterprises in terms of market opening, technology and equipment, management and operation, and achieve high-quality development.

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