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Outgoing Audits of Natural Resource Assets, Environmental Regulation and Environmental Investment in Heavily Polluting Enterprises

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Abstract: Based on the event of outgoing audits of natural resource assets pilot, this paper selects the data of listed A-share companies from 2011-2018 to empirically test the environmental governance effect of outgoing audits of natural resource assets at the level of heavily polluting enterprises. The study finds that outgoing audits of natural resource assets significantly increase the environmental protection investment of heavily polluting firms in the jurisdiction of pilot cities. It is further found that jurisdictions with stronger environmental regulations weaken the positive effect of outgoing audits of natural resource assets on environmental investments of heavily polluting firms relative to jurisdictions with weaker environmental regulations. The above findings remain robust to parallel trend tests and the inclusion of macro control variables. The findings of the article test the governance effect of outgoing audits of natural resource assets, but the strength of environmental regulation can weaken this effect. This study provides empirical evidence for the environmental governance effect of outgoing audits of natural resource assets.

1. Introduction

Since the reform and opening up, China's rapid development of the market economy, in the harvest of economic fruits at the same time also brought negative sequelae, in the face of the global resource scarcity of the grim situation, in order to the country's long-term stability and sustainable development, heavily polluting enterprises have become an important object of the promotion of sustainable development and reform, and the reform and development of the heavily polluting enterprises cannot be separated from the government supervision. China's government officials performance audit for economic responsibility audit, local governments and officials by the impact of the assessment system, gradually formed to emphasize the regional economic development as the premise of the "Championship" performance[1] , local officials focus on economic growth and ignore the construction of ecological civilization, but also caused environmental pollution, resource tightening, ecological function degradation and other environmental issues[2]. In order to deal with the increasingly serious environmental pollution problem, the concept of natural resource asset

outgoing audit (hereinafter referred to as "outgoing audit") for leading cadres was first proposed in November 2013, and a series of pilot work was subsequently launched.. The implementation of outgoing audits has had a tremendous impact on corporate environmental governance, and there is no doubt that outgoing audits are playing an increasingly important external supervisory role in the environmental governance of pilot cities.

Heavily polluting enterprises, as the source enterprises causing environmental pollution, are the important objects of environmental protection transformation, and strengthening the environmental protection behavior of polluting enterprises is the primary task of environmental protection governance, which takes environmental protection investment as the main body. Analyzing from the perspective of investment motivation, most studies believe that companies lack the initiative to invest in environmental protection, and that companies are for-profit institutions, and that environmental protection investment is a mandatory involuntary behavior under the guideline of following the maximization of profits[3] . It can be seen that if there is no external environmental policy pressure, companies will not actively make environmental governance behavior. Therefore, this paper argues that enterprises actively make environmental protection investment is due to the relevant environmental policy constrains the investment behavior of enterprises, in this perspective, environmental protection investment can be regarded as a reaction brought by the government's environmental protection policy.

2. Literature Review

2.1. Studies related to Outgoing audits of natural resource assets

First, the impact on environmental governance effects. Some scholars' studies have tested that the outgoing audit has played a non-negligible economic effect in increasing corporate environmental protection investment[4] , improving air quality[5] , and promoting the improvement of the ecological civilization institutional system[6] , which has contributed to the development of a green economy. Second, the impact on corporate environmental responsibility. Government environmental auditing significantly improves the level of environmental responsibility information disclosure and the quality of environmental responsibility information disclosure of heavily polluting enterprises[7][8]. Third, the impact on corporate capital. Scholars have found that exit auditing increases the cost of equity capital of enterprises[9] , and also increases the cost of debt capital of enterprises thus leading to the reduction of corporate financing[10]. Fourth, other effects. Scholars have found that corporate surplus management behavior and corporate tax avoidance are subject to the supervision of outgoing audits[11] [12] .

2.2. Research on factors affecting corporate environmental investments

Most studies on the factors influencing corporate environmental protection investment focus on environmental policy aspects. As China gradually pays attention to environmental protection, scholars have found that provincial environmental competition[13], loose monetary policy[14], consumption tax[15], environmental protection tax[16] , tax reduction incentives[17] , environmental protection inspections[18] , governmental environmental audits[19] and so on have contributed to the level of corporate environmental investment.

3. Theoretical Analysis and Research Hypotheses

As an important supplier of production resources, the environmental behavior of enterprises has received increasing attention. Earlier studies by scholars have found that local officials have a great

influence on corporate environmental behavior[20]. According to the tournament theory of political promotion, China's political promotion model is an economy-centered model dominated by the "GDP promotion tournament", and under this promotion model dominated by economic goals, local officials do not have a strong sense of environmental protection, and even harm the environment in order to increase GDP[4].After the implementation of the audit, the fulfillment of environmental responsibility has become one of the important references for the promotion of government officials, thus urging the official cadres to change the concept of only developing the economy and neglecting the environment. Secondly, the departure audit of natural resource assets has implemented a strict penalty system, and the environmental risks faced by government officials have increased [21]. Therefore, in order to reduce the risk of being held accountable, the most direct manifestation of government officials is to increase the environmental investment of enterprises in their jurisdictions.

Enterprises are essentially for-profit organizations and will not take the initiative to invest in environmental protection. According to Porter's hypothesis[22], if the strength of environmental regulation is low, the government requires enterprises to make environmental protection behavior, when the cost of punishment is less than the benefit of environmental protection investment loss, enterprises are likely to choose to accept the punishment directly. When the intensity of environmental regulation is high, the cost of environmental penalties and the cost of environmental protection investment are high, and enterprises will improve technological innovation to replace environmental protection investment for the sake of economic efficiency [23]. Therefore, this paper argues that the intensity of environmental regulation will weaken the positive effect of the audit on the environmental protection investment of heavily polluting enterprises. Based on the above analysis, this paper proposes the following hypotheses:

H1: Compared to non-pilot cities, natural resource asset outgoing audits are positively associated with environmental investments in heavily polluting firms under the jurisdiction of pilot cities.

H2: Relative to jurisdictions with weaker environmental regulations, jurisdictions with stronger environmental regulations weaken the positive effect of natural resource asset outgoing audits on environmental investments by heavily polluting firms.

4. Research design

4.1. Sample selection and data sources

Table 1: List of variable definitions.

Type	Name	Code	Definition
explanatory variable	environmental investments	EPI	Corporate environmental investment / total assets.
explanatory variable	Natural resource assets outgoing audit	Treat Post	1 for the pilot city sample, 0 otherwise. Take 1 for the post-pilot sample and 0 otherwise.
moderator variable	environmental regulation	EI	Regional investment in pollution control/GDP. Greater than the median take 1, otherwise take 0.
control variable	gearing	Lev	Total liabilities / total assets.
	return on net assets	Roe	Net profit/total net assets.
	Company size	Size	Total assets at the end of the year.
	Shareholding ratio of major shareholders	Top1	Shareholding ratio of the largest shareholder.
	Nature of property rights	Soe	Dummy variable, property rights are state-owned take 1, otherwise take 0.
	Industry Variables	Ind	Dummy variables to control for industry effects.
	Annual variables	Year	Dummy variables, controlling for year effects.

Since 2014, some regions have implemented the pilot work of outgoing audit, so the sampling interval of this paper is 2011-2018, with 2011-2014 as the pre-pilot, and 2015-2018 as the post-pilot, in order to compare the status of changes in corporate environmental protection investment in the three years before and after the pilot. This paper mainly uses manual collection to obtain the data of the pilot region of the departure audit. In this paper, the heavy polluting companies listed in A-share from 2011-2018 are selected as samples. And the samples of ST and the samples of financial anomalies or missing samples are excluded. This paper uses stata15 software to process the sample data, and all continuous variables are Winsorize at 1% and 99% level.

The data were obtained through the following ways: (1) China Stock Market Accounting Research database; (2) China Statistical Yearbook and China Environmental Statistical Yearbook.(ii) Definition of variables. The sample of this paper was analyzed by correlation coefficient analysis and descriptive statistics. The table 1 shows the definition of variables.

4.2. Modeling

Based on the theoretical analysis and variable definitions, this paper constructs the double difference model (1) and model (2) using the panel data collected above:

$$EPI = \alpha_0 + \alpha_1 Treat \times Post + \alpha_2 Treat + \alpha_3 Post + \sum \alpha_j Controls + \sum Ind + \sum Year + \varepsilon_{i,t} \quad (1)$$

$$EPI = \beta_0 + \beta_1 Treat \times Post + \beta_2 Treat + \beta_3 Post + \beta_4 Treat \times Post \times EI + \beta_5 EI + \beta_6 Treat \times EI + \beta_7 Post \times EI + \sum \beta_j Controls + \sum Ind + \sum Year + \mu_{i,t} \quad (2)$$

Model (1) was used to test hypothesis H1. Model (2) cross-multiplier terms of environmental regulation (EI) and explanatory variables (Treat and Post) are used to test the moderating effect of environmental regulation (EI), where ε and μ are random disturbance terms.

5. Empirical results and analysis

Table 2 presents the test results of the benchmark regression with EPI as the explanatory variable. column (1) In the full sample, the coefficient of Treat×Post is 1.818 and is significant at 5% level of significance, hypothesis H1 is valid. In the test of the cross-multiplier term in column (2), the regression coefficient of EI is significantly negative at the 10% level, which tests that the strength of environmental regulation has a dampening effect on the environmental investment of heavy polluters. The regression coefficient of the cross-multiplier term Treat×Post×EI is -5.073 and is significant at 1% level, which suggests that after the pilot of the outgoing audits, compared to the jurisdictions with weaker environmental regulation, the jurisdictions with stronger environmental regulations will inhibit the positive effect of hypothesis H1. So hypothesis H2 is tested.

Table 2: Results of regression analysis of the main hypothesis.

variant	EPI	
	(1) Full sample	(2) Cross-multiplier test
Treat×Post	1.818**[2.024]	4.130**[2.407]
Treat×Post×EI		-5.073***[-3.471]
EI		-1.009*[-1.755]
controls	yes	yes
Ind/Year	yes	yes
Constant	-45.475***[-9.543]	-44.953***[-9.423]
R2	0.143	0.231
Observations	4,020	4,020

Note: *** p<0.01, ** p<0.05, * p<0.1, respectively, with t-values in parentheses, below.

6. Robustness Tests

6.1. Parallel trend test

In order to test that the double-difference model in this paper satisfies the parallel trend assumption, this paper takes the Treat×Post in the three years before and after the pilot of the outgoing audit policy for regression, and use of 2013 as the base period, the results are shown in Figure 1. The regression results of the explanatory variables Before2 (2012) and Before3 (2011) are not significant, which indicates that at least in the 3 years prior to the implementation of the exit audit, the data on enterprises' environmental investment did not differ significantly between the treatment and control groups, basically satisfying the parallel trend hypothesis.

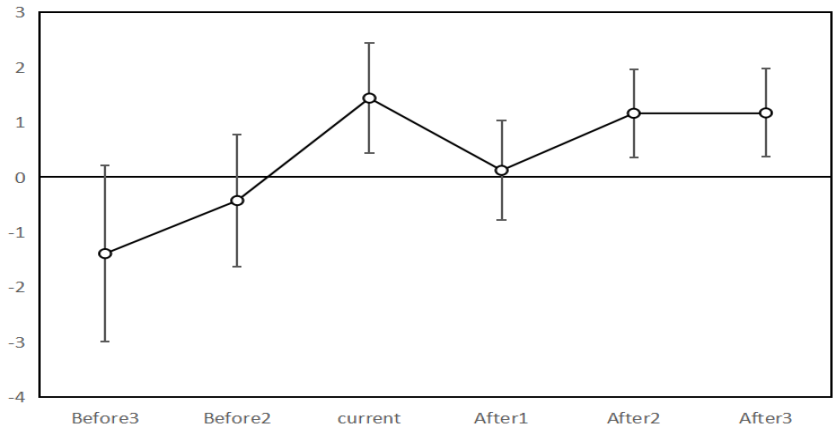

Figure 1: Results of the analysis of the dynamic effects of the parallel trend test.

7. Conclusions

Using the DID model, this paper has empirically demonstrated the effective improvement of this audit policy on the level of environmental remediation in the pilot cities. At the same time, this paper also points out that the environmental level of the pilot areas has indeed been improved through the audit of natural resource assets. Specifically, compared with non-pilot cities, the environmental protection investment of heavy polluters in the pilot cities rises significantly, implying that local officials in the pilot cities have introduced more specific environmental measures and played an effective regulatory function. In addition, this paper finds that high environmental regulation weakens the positive effect of natural resource asset outgoing audits on the environmental protection investment of heavy polluters.

The findings of this paper aim to provide some lessons and empirical evidence for heavy polluters. For heavy polluting enterprises, as the key object of environmental protection governance in the new era, the implementation of natural resource asset outgoing audits leads to the need for enterprises to bear additional costs in environmental protection governance (e.g., the opportunity cost of giving up other production and the cost of increased investment in environmental governance, the cost of forfeiture). Therefore, listed companies need to pay timely attention to the relevant environmental protection policies and systems of the government regulatory authorities, and strive to cooperate with government departments to do a good job in environmental protection improvement, to ensure maximum protection of the interests of enterprises, in order to minimize the adverse impact of environmental protection investment on the enterprises themselves.

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