How Environmental Protection Tax Affect Corporate Earnings Management——Evidence from Chinese Manufacturing Industry Enterprises

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Abstract. This paper empirically explores the influence of environmental protection tax on corporate earnings management and the underlying mechanism based on the data of manufacturing enterprises listed on A-shares in China from 2007 to 2021. The results show that environmental protection tax has a remarkable inhibitory effect on corporate earnings management, and the positive moderating effect of green innovation and the negative moderating effect of media attention are examined through mechanism analysis. The heterogeneity analysis finds that this effect can differ significantly depending on the nature of ownership, social responsibility, and environmental pollution, and through further research, it is discovered that the environmental protection tax has a more significant inhibitory influence on upward earnings management.

Keywords: Environmental Protection Tax, Earnings Management, Green Innovation, Media Attention.

1. Introduction

China's rapid development over 40 years has made it the world's second largest economic unit, but the development model of "speed over quality" runs counter to the concept of "sustainable development" which puts environmental protection under unprecedented pressure [1]. To further adapt to the new requirements of the contemporary environmental governance system, China formally levied the environmental protection tax on January 1, 2018.

It is well documented that environmental tax, as a market-incentive environmental regulatory instrument, has a "green dividend" effect of combating environmental pollution and improving the ecological environment [2], and a "social dividend" effect of promoting socioeconomic development [3]. Compared to sewage charges, environmental tax is a highly enforceable, compulsory and supervised environmental regulation instrument. The expenditure of pollution control and supervision stress will push enterprises to carry out environmental treatment [4]. At the micro level, enterprises, in order to reduce their tax burden, will improve their total factor productivity through technological innovation [5], and realize a green shift of the enterprise [6]. However, the beneficial effects of environmental tax on enterprises are not absolute. According to Long et al. (2022), it was found that environmental tax significantly reduces the business performance of heavy polluting enterprises [7]. This may be due to the increase in tax burden, which causes additional production costs and thus has a negative influence on financial performance. Faced with the potential loss of profits caused by tax burden pressure, there is little literature on whether enterprises will adopt specific accounting methods to modify earnings.

Earnings information can reflect the current operating conditions and future development potential of enterprises, and is a true reflection of the intrinsic value of enterprises. However, management can falsify and manipulate financial reports through earnings management for the purpose of improving business distress or to meet the expectations of third parties [8].

After combing through the existing framework of factors influencing earnings management, there is little paper examining the influence of environmental regulation on corporate earnings management. As a market-incentive environmental regulatory instrument, does the environmental tax promote or inhibit corporate earnings management? To address this question, this paper tests the influences of

environmental tax and its underlying mechanisms on corporate earnings managemen empirically based on China's current environmental governance system.

The potential marginal contributions of this paper are listed below: (1) Enriching the study of the economic consequences of environmental protection tax, revealing an impact mechanism of environmental protection tax on corporate earnings management. (2) The moderating effects of green innovation and media attention on environmental taxes to inhibit corporate earnings management are further explored, which enriches the relevant literature. (3) Heterogeneity analysis and further research extend the study of factors influencing informal systems in corporate earnings management.

2. Theoretical Analysis and Research Hypothesis

In the context of green development, environmental tax, as a market-incentive environmental regulatory instrument, will affect corporate earnings management in the following two ways.

Firstly, the external environmental regulation is becoming increasingly stringent. Institutional theory holds that policy regulation is a main factor influencing corporate decisions, behavior and performance. According to institutional theory, enterprises will choose matching environmental strategies to cope with external pressures in the face of different environmental regulatory constraints [9]. In recent years, the government has enacted a series of mandatory environmental regulation policies to promote the green transformation of polluting enterprises, so that heavily polluting enterprises will face increasingly stringent regulation. In this context, the enterprises are more concerned about legality and will operate more cautiously to avoid violations and penalties from regulators. As a result, enterprises will reduce earnings management.

Secondly, the environmental protection tax will exert a push-back influence on corporate innovation. Based on Porter's hypothesis, rationally designed environmental regulations will inspire corporate innovation. Due to the environmental tax levy significantly increases the cost of compliance, enterprises are forced to accelerate the pace of change from traditional to green production processes [10]. The improvement in production technology and process optimization also leads to a more efficient allocation of resources and lower production costs, resulting in "innovation compensation" and "first mover advantage", thus offsetting the negative influence of the excessive environmental protection tax on corporate performance. With the reduction of tax burden pressure, reform and innovation will further promote the improvement of business performance, as a result, the incentive of corporate earnings management will then be reduced.

Based on the analysis above, this paper presents the hypothesis:

H1: Environmental protection tax exerts a remarkable inhibitory influence on corporate earnings management behavior.

It is easy to see that the green innovation is an important part of the environmental tax to inhibit corporate earnings management from the above analysis. Green innovation in raw materials, processes and management not only solves the problems of pollution prevention and waste of resources, but also highlights the sense of social responsibility of enterprises and shapes the image of an environmentally friendly enterprise, which to a certain extent will attract environmentally conscious consumers. In addition, the green products produced by enterprises cater to the value orientation of consumers [11], and the difference in their product quality will prevent potential competitors from entering, thus improving the competitiveness of enterprises [12]. Finally, enterprises can also enjoy tax incentives for green innovation. As a result, enterprises will achieve double growth in production capacity and profitability through green innovation for technological upgrading, which reduces the tax burden while incorporating environmental costs into product costs. According to the analysis, this paper presents the hypothesis:

H2: Green innovation positively moderates the inhibitory influence of environmental protection tax on corporate earnings management.

It has been found that media attention can influence corporate earnings management behavior, but this influence is not uniform. The effective monitoring hypothesis assumes that the media can

effectively play the role of an external regulator, forcing enterprises to regulate their behavior [13], and the degree of earnings management by firms is subsequently reduced. The market pressure hypothesis assumes that media coverage will influence investors' decisions and cause stock price volatility. In the face of tremendous market pressure, management tends to manage earnings to meet market expectations [14], stabilize investor and consumer sentiment, and mitigate the impact of public pressure on the enterprise. However, in China, media coverage is somewhat biased and does not effectively play a monitoring role, so the assumption of market pressure by the media is more pronounced. Under the high-pressure environmental protection environment, the media tends to focus on enterprises with serious pollution, and the market pressure caused by their reports on corporate pollution accidents and emission penalties will affect the short-term performance of enterprises, accordingly, this paper presents the hypothesis:

H3: Media attention negatively moderates the inhibitory influence of environmental protection tax on corporate earnings management.

3. Study design

3.1. Sample selection and Data source

Listed enterprises in China's A-share manufacturing industry from 2007 to 2021 were selected for this study, with data collected from CSMAR database, CNRDS database, State Intellectual Property Office and Hexun.com. The manufacturing industry, as the main body of the real economy, is the foundation and pillar of the national economy. Among the 14 heavily polluting industries in China, the manufacturing industry has the largest proportion, and it is more necessary and urgent to study the connection between environmental tax and earnings management of manufacturing enterprises. This paper screens the manufacturing-level data according to the process below: (1) Remove the samples of enterprises that were *ST, ST and compulsorily delisted during the sample period; (2) Remove the samples with missing or significantly abnormal financial indicator data; (3) In order to avoid the adverse effects of extreme values on the experimental findings, this paper applies tailoring at the 1% and 99% percentiles. The final firm-annual unbalanced panel data set composed of 4016 observations is acquired.

3.2. Variable definition and Model construction

3.2.1 Variable definition

(1) Dependent variable

Referring to Aboody et al. (2005) [15], this paper uses the accrued earnings management calculated by the modified Jones model to measure the extent of manipulation of corporate earnings management.

(2) Independent variable

The data of environmental tax refer to the amount disclosed in the annual reports of listed companies. China officially starts collecting environmental tax after 2018, so the data for 2018-2021 are the amount of environmental tax after the official start of the levy. Due to the principle of "tax burden shifting" in converting environmental protection fees to taxes, and the objects, scope, and taxation principles determined by the "sewage charges", the data from 2007-2017 are derived from the sewage charges of enterprises. In this paper, the above data are logarithmicized to reduce the effect of heteroskedasticity.

(3) Moderating variables

In this paper, green innovation and media attention are chosen as moderating variables. Referring to Amore & Bennedsen (2016) [16], green patents are used to measure green innovation, specifically the sum of the number of green patent applications (including green inventions and green utility models) plus one is taken as the natural logarithm. Taking into account the authority of traditional

newspapers and the timeliness of online news, the natural log of the sum of times the company was reported in newspapers and online news plus one was taken as the measure of media attention.

(4) Control variables

Following existing studies, this paper controls for the following factors that may affect corporate earnings management: enterprise size (Size), asset-liability ratio (Lev), return on equity (ROE), cash flow ratio (Cashflow), growth rate of revenue (Growth), whether loss (Loss), duality of COB and CEO (Dual), Book-to-market (BM), Tobin's Q value (TobinQ), year of establishment (FirmAge), and whether audited by the Big Four (Big4). The specific definitions of each variable are shown in Table 1.

Table 1. Study variables

Variable Type	Variable	Symbol	Variable Definition
Dependent variable	Earnings Management	ABS_DA	Calculated from the modified Jones model and taken in absolute value
Independent variable	Environmental protection tax	EPT	2007-2017 is the Sewage charges, 2018-2021 is the environmental tax, all do logarithmic treatment
Adjustment variables	Green Innovation	CGI	Ln (green invention applications + green utility model applications + 1)
	Media attention	Media	Ln (the number of times the enterprise is reported in newspapers and online news + 1)
Control variables	Enterprise size	Size	Ln (the total assets)
	Asset-liability ratio	Lev	Total liabilities / Total assets
	Return on equity	ROE	Net income / Average balance of shareholders' equity
	Cash flow ratio	Cashflow	Net cash flow / total assets
	Growth rate of revenue	Growth	(Sales income for the year / Sales income for the previous year) - 1
	Whether loss	Loss	Net profit for the year less than 0 is taken as 1, otherwise it is taken as 0
	Duality of COB and CEO	Dual	COB and CEO are the same person as 1, otherwise 0
	Book-to-market	BM	Book value / Total market value
	Tobin's Q value	TobinQ	Ratio of market capitalization to total assets of a company
	Year of establishment	FirmAge	Ln (the statistical year - the year of establishment of the listed company)
	Whether audited by the Big Four	Big4	The enterprise is audited by the Big 4 as 1, otherwise it is 0

3.2.2 Model construction

Firstly, in order to examine the influence of environmental protection tax on corporate earnings management, the following model was constructed to test hypothesis 1:

$$ABS_DA_{i,t} = \alpha_0 + \alpha_1 EPT_{i,t} + \sum_k \gamma_k \, Control_{k,i,t} + Year, Industry\ fixed\ effects + \varepsilon_{i,t} \quad (1)$$

In equation (1), $ABS_DA_{i,t}$ denotes the extent of earnings management of firm i in year t, $EPT_{i,t}$ denotes the amount of environmental protection tax paid by firm i in year t, $Control_{k,i,t}$ is the control variables, $Year, Industry$ denote year and industry fixed effects respectively, and $\varepsilon_{i,t}$ is the error term of the model. If the regression model is statistically significant and the coefficient of EPT α_1 is negative, it indicates that environmental protection tax has an inhibitory influence on earnings management.

Secondly, to examine the important part of green innovation and media attention in the influence of environmental protection tax on corporate earnings management, in this paper, the following moderating effect model is built to test hypotheses 2 and 3 by adding moderating variables and interaction terms of moderating and independent variables to equation (1):

$$ABS_DA_{i,t} = \delta_0 + \delta_1 EPT_{i,t} + \delta_2 EPT_{i,t} * CGI_{i,t} + \delta_3 CGI_{i,t} + \sum_k \gamma_k Control_{k,i,t} + Year, Industry\ fixed\ effects + \varepsilon_{i,t} \quad (2)$$

$$ABS_DA_{i,t} = \beta_0 + \beta_1 EPT_{i,t} + \beta_2 EPT_{i,t} * Media_{i,t} + \beta_3 Media_{i,t} + \sum_k \gamma_k Control_{k,i,t} + Year, Industry\ fixed\ effects + \varepsilon_{i,t} \quad (3)$$

The variables $Media_{i,t}$ and $CGI_{i,t}$ represent the media attention and green innovation of firm i in year t. In the equation, if the coefficient of the interactive term is significant and has the same sign as the coefficient of $EPT_{i,t}$, it means that the moderating variable has a positive moderating effect on the relationship between environmental protection tax and corporate earnings management, on the contrary, if the sign is opposite, it is a negative moderating effect.

4. Empirical Results and Analysis

4.1. Descriptive statistics

The results of descriptive statistics are shown in Table 2. The mean value of absolute value of earnings management (ABS_DA) is 0.057 and the standard deviation is 0.048, which is similar to the mean value, indicating that the degree of earnings management varies widely among different company. The difference between the minimum value of 2.193 and the maximum of 18.88 for Environmental Protection Tax (EPT) is large, as is the standard deviation of 3.227, indicating that there is a remarkable difference in the environmental tax levied by enterprises. The minimum of green innovation (CGI) is 0 and the average is 0.85, indicating that the overall degree of green innovation of manufacturing enterprises is low, and the maximum is 4.394, reflecting that some enterprises actively engage in green innovation. The average of media attention (Media) is 5.394 and the maximum value is 10.93, indicating that enterprises generally receive high media attention.

Table 2. Results of descriptive statistics

Variables	Obs.	Mean	Std.	Min	Med	Max
ABS_DA	4106	0.057	0.048	0.001	0.045	0.324
EPT	4106	12.13	3.227	2.193	12.46	18.88
CGI	4106	0.850	1.092	0.000	0.000	4.394
Media	4106	5.609	1.328	2.944	5.394	10.93
Size	4106	22.30	1.185	19.97	22.10	26.17
Lev	4106	0.428	0.195	0.050	0.421	0.985
ROE	4106	0.063	0.141	-1.112	0.068	0.618
Cashflow	4106	0.058	0.063	-0.208	0.055	0.283
Growth	4106	0.181	0.434	-0.579	0.116	8.036
Loss	4106	0.111	0.314	0.000	0.000	1.000
Dual	4106	0.269	0.443	0.000	0.000	1.000
BM	4106	1.125	1.094	0.098	0.776	8.868
TobinQ	4106	1.937	1.209	0.786	1.541	9.386
FirmAge	4106	2.919	0.314	1.386	2.944	3.638
Big4	4106	0.032	0.177	0.000	0.000	1.000

4.2. Baseline regression results

The results of the benchmark regression of the influence of environmental tax on corporate earnings management are shown in Column (1) of Table 3. The data indicates that the regression

coefficient of environmental protection tax and the corporate earnings management is -0.001 and the t-value is -3.124, which is significantly correlated at the 1% level. This result shows that the degree of corporate earnings management decreases significantly when the intensity of environmental protection tax is higher, which verifies the research hypothesis H1 proposed in the previous section. This result was tested for robustness by changing the dependent variable, changing the independent variable, and lagging the independent variable by one period, all of which resulted in a substantial change. Specific results are available from the authors upon request.

Table 3. Results of main effects test

Variables	ABS_DA		
	(1)	(2)	(3)
EPT	-0.001***	-0.001*	-0.004***
	(-3.124)	(-1.902)	(-3.997)
EPT*CGI		-0.001***	\
		(-2.794)	
ERT*Media		\	0.001***
			(2.821)
CGI		0.007**	\
		(2.360)	
Media		\	-0.001
			(-0.598)
Size	0.004***	0.004***	0.002
	(3.233)	(3.195)	(1.421)
Lev	0.010*	0.009	0.008
	(1.768)	(1.591)	(1.510)
ROE	-0.018	-0.018	-0.022*
	(-1.388)	(-1.348)	(-1.667)
Cashflow	-0.055**	-0.055**	-0.057***
	(-2.539)	(-2.562)	(-2.668)
Growth	0.016***	0.016***	0.016***
	(5.292)	(5.293)	(5.331)
Loss	0.023***	0.023***	0.022***
	(5.313)	(5.377)	(5.119)
Dual	-0.001	-0.001	-0.001
	(-0.646)	(-0.543)	(-0.728)
BM	-0.003***	-0.003***	-0.003***
	(-3.037)	(-2.736)	(-2.941)
TobinQ	0.003***	0.004***	0.003***
	(3.798)	(3.913)	(3.026)
FirmAge	-0.012***	-0.012***	-0.011***
	(-3.757)	(-3.885)	(-3.656)
Big4	-0.003	-0.002	-0.005
	(-0.743)	(-0.533)	(-1.181)
Year	Y	Y	Y
Industry	Y	Y	Y
_cons	-0.038	-0.046*	0.022
	(-1.448)	(-1.660)	(0.815)
Number	4,106	4,106	4,106
Adjust R^2	0.0354	0.0356	0.0368

4.3. Impact mechanism test

4.3.1 The moderating effect of green innovation

Column (2) of Table 3 reports the results of the moderating effect of green innovation. It can be seen that the coefficient of the interactive term EPT*CGI is remarkable at the 1% level and is of the same sign as the EPT. This indicates that green innovation positively moderates the connection between environmental tax and corporate earnings management, where the greater the intensity of

corporate green innovation, the stronger the effect of environmental tax to inhibit corporate earnings management, validating the research hypothesis H2.

4.3.2 The moderating effect of media attention

Column (3) of Table 3 reports the results of the moderating effect of media attention. It can be seen that the coefficient of the interactive term ERT*Media is remarkable at the 1% level with opposite sign to EPT. This suggests that media attention negatively moderates the relation between environmental tax and corporate earnings management, where the higher the media attention, the weaker the influence of environmental tax in inhibiting corporate earnings management, verifying the research hypothesis H3.

4.4. Heterogeneity analysis

4.4.1 Heterogeneity analysis based on the nature of ownership

The nature of ownership has always been a crucial characteristic of public companies. Due to differences in social status, business objectives, and external resource constraints, state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs) often differ significantly in the degree of manipulation of earnings management. As subordinate agencies of the Chinese government, SOEs are usually focused on achieving social goals and are also able to receive more financial and political support from the government compared to non-SOEs. In summary, SOEs are less motivated and less degree to engage in earnings management than non-SOEs. Therefore, in the face of environmental pressure, non-SOEs are at a disadvantage in financial subsidies and financial support. When faced with government supervision and declining business performance, the influence of environmental tax in forcing corporate reform and innovation is reflected. Therefore, the inhibitory influence of environmental tax on corporate earnings management is mainly reflected in non-SOEs.

Based on this, the paper examines the influence of environmental tax on corporate earnings management under different ownership. Column (1) (2) of Table 4 reports the correlation regression results. It is clear that the coefficient of EPT is remarkably negative at the 1% level in non-SOEs, and in SOEs, the coefficient of EPT is insignificant, in line with expectations, which is consistent with expectations.

4.4.2 Heterogeneity analysis based on social responsibility

Whether enterprises will actively take responsibility for the pollution due to industrial production, take the initiative in green innovation, and provide transparent financial reports to information users will be influenced by corporate social responsibility to a certain extent. Compared to enterprises with low social responsibility, enterprises with high social responsibility will be more motivated to take corporate responsibility out of moral consciousness and reduce the information asymmetry caused by earnings management behaviors [17]. Thus, faced with high environmental tax, enterprises with high social responsibility will have a stronger willingness and motivation to take the initiative to make environmental corrections and will maintain a fair market trading environment. To conclude, the inhibitory influence of environmental tax on corporate earnings management is mainly found in enterprises with high social responsibility.

In this paper, the median of social responsibility is used as the basis for grouping the full sample into two groups of high social responsibility and low social responsibility for regression, and column (3) (4) of Table 4 presents the results. In the high group, the coefficient of EPT is remarkably negative at the 1% level, and in the low group, the coefficient of EPT is not significant, as expected.

4.4.3 Heterogeneity analysis based on environmental pollution

The amount of environmental protection tax is proportional to the pollution level. To examine the influence of different degrees of environmental pollution on environmental tax and corporate earnings management, this paper divides the enterprises into two groups of heavily polluting and non-heavily polluting enterprises. The results are shown in column (5) (6) of Table 4, which indicate that the environmental tax of heavy polluting enterprises significantly reduces the earnings management, and

the inhibitory effect of environmental tax of non-heavy polluting is not remarkable. The explanation may be that heavy polluters will be more strictly regulated by the government than non-heavy polluters because of the severity of their pollution. Hence, heavily polluting enterprises have an urgent need for reform and innovation, both from the perspective of the external regulatory environment and their own sustainable development. In sum, the disincentive influence of environmental tax on corporate earnings management is more pronounced under heavy polluters.

Table 4. Results of heterogeneity test

	The nature of ownership		Social responsibility		Environmental pollution	
	(1)	(2)	(3)	(4)	(5)	(6)
	SOEs	Non-SOEs	Low	High	Heavy	Non-heavy
EPT	-0.001	-0.002***	-0.001	-0.002***	-0.001***	-0.001
	(-0.535)	(-3.193)	(-1.521)	(-3.069)	(-2.666)	(-1.562)
Control Variables	Control	Control	Control	Control	Control	Control
Year	Y	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y	Y
_cons	0.002 (0.034)	0.021 (0.589)	0.054 (1.277)	0.033 (0.995)	-0.040 (-1.194)	-0.065 (-1.532)
Number	1,409	2,617	1,761	1,764	2,746	1,360
Adjust R^2	0.0090	0.0742	0.0456	0.1343	0.0731	0.0486

5. Further analysis

The existing literature generally does not consider the direction of corporate earnings management when measuring the degree of manipulation, due to the fact that the quality of corporate earnings decreases whether the earnings are adjusted upward or downward. However, the direction of earnings management not only affects the findings to some extent [18], but also reflects management's motivation to manipulate profits, therefore, it is necessary to explore the connection between the environmental tax and different directions of earnings management. On this basis, the regression analysis is conducted separately for positive and negative earnings management, and the results are presented in Table 5.

The EPT coefficient of column (1) is remarkably negative, indicating that environmental tax inhibits upward earnings management, which is consistent with the previous finding that under the dual influence of external regulation and corporate initiation of innovation, the environmental tax will restrain enterprises from using upward earnings management to increase profits. The EPT coefficient of column (2) is not significant. This may be due to the fact that in a high-pressure environmental protection environment, government will pay stricter attention to and monitor heavily polluting enterprises. Faced with higher political costs, management may engage in downward earnings management to reduce profits to weaken the regulatory pressure faced by firms, so the inhibitory effect on downward earnings management is not significant.

Table 5. Environmental tax and Upward and Downward Earnings Management

	(1) Upward earnings management	(2) Downward earnings management
EPT	-0.001***	-0.001
	(-2.740)	(-1.642)
Control variables	Control	Control
Year	Y	Y
Industry	Y	Y
_cons	0.005	-0.009
	(0.147)	(-0.177)
Number	2,319	1,786
Adjust R^2	0.1119	0.0966

6. Conclusion and Insight

This paper tests the influence of environmental protection tax on corporate earnings management empirically by using China's A-share listed manufacturing enterprises from 2007 to 2021 as a study sample. The main findings are as follows: (1) The environmental protection tax remarkably inhibits the behavior of corporate earnings management. (2) The results of the mechanism test based on the moderating effect model show that: the greater the intensity of corporate green innovation of enterprises, the stronger the effect of environmental protection tax in inhibiting corporate earnings management; the higher the media attention, the weaker the environmental protection tax in inhibiting corporate earnings management. (3) Heterogeneity analysis presents that the inhibitory influence of environmental protection tax on corporate earnings management is significant among non-state-owned enterprises, high awareness of social responsibility, and heavily polluting enterprises. (4) Further analysis illustrates that the inhibitory influence of environmental protection tax on corporate earnings management is manifested as a restraint for enterprises to conduct upward earnings management, while the inhibitory effect on downward earnings management is not significant.

The following inspirations can be derived from the findings of this paper:

First of all, the government and regulatory authorities should take into account the inhibitory influence on corporate earnings management in the formulation of a series of market-based environmental regulatory policies such as environmental protection tax. Secondly, to comply with the green orientation of development, enterprises should actively fulfill their social responsibility and carry out green innovation. Finally, the media should play its role of social supervision, and only when the media improves the reliability of its reports, it can really exert the external supervision mechanism and, ultimately, achieve the purpose of reducing corporate earnings management.

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