Research Article

An Empirical Analysis of the Impact of Environmental Protection Tax on Corporate Earnings Management

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The environmental protection tax (EPT) is an important environmental regulation measure in China and an important guarantee for high-quality economic development. An important measure for the construction of ecological civilization is that local governments promote the construction and improvement of EPT in the way of “Fee-to-Tax.” The EPT regulates pollution control, protects and improves the environment through taxation, and forms an effective mechanism for polluters to promote ecological civilization. This study made use of the data collected from different listed companies in Shanghai and Shenzhen provinces from 2010 to 2019, discussing the impacts of EPT on enterprise earnings management. An enterprise analysis model based on IoT-edge computing is suggested to decrease the processing time. The results of the empirical analysis completed in this study showed a significant positive correlation between EPT and enterprise earnings management. Moreover, there is heterogeneity in the driving force of EPT on enterprise earnings management. For example, we observed that state-owned enterprises are significantly higher than non-state-owned enterprises. Moreover, pollution-intensive enterprises are significantly higher than non-pollution-intensive enterprises, and economically developed areas are significantly better than economically underdeveloped areas. In order to give better play to the effectiveness of EPT in modern environmental governance, the government should continue to improve the construction of EPT and speed up the construction process of ecological civilization in the republic of China.

1. Introduction

The EPT regulates pollution control, protects and improves the environment through taxation, and forms an effective mechanism for polluters to promote ecological civilization. The EPT is an important environmental regulation measure in China and an important guarantee for high-quality economic development. Since the 18th anniversary of the Communist Party of China, the thought of ecological and environmental protection has been recognized more deeply. However, the intensity of pollution control has never been greater, and the frequency of system introduction has not been higher. Similarly, the scale of supervision and law enforcement has never been higher, as well as the speed of environmental improvement [1]. Ecological and environmental protection has undergone a historic turning point and overall changes from the recognition to the practice. The 5th plenary meeting of the 19th principal group of China’s communist party deliberated and implemented the suggestion of the principal committee on articulating the 14th 5-year plan for Social Development and National Economics along with the long-term goals for 2035. The proposal clarifies the goals and tasks for ecological progress and environmental protection in the 14th 5-year plan period and even in 2035. As an important measure of ecological civilization construction and environmental protection, EPT regulates pollution control, protects and improves the environment through taxation rules and regulations, and forms an effective constraint and incentive mechanism for polluters to promote ecological civilization construction. China’s EPT system can be divided into two stages: (i) the EPT system based on pollutant discharge fees before 2018...
and (ii) the EPT system after the implementation of the Environmental Protection Law of the People’s Republic of China on 1 January 2018. In the process of “Changing Fees to Taxes,” local governments follow the principle of “Shifting Tax Burden,” this study takes sewage fees and EPT as the taxes,” local governments follow the principle of “Shifting Tax Burden,” this study takes sewage fees and EPT as the research object.

This study takes the earnings management of different listed companies as the research perspective and uses the data model to discuss the impact of EPT on the earnings management of enterprises. First, this study analyzes the effect of EPT and earnings management. Then, we study and develop a significant positive correlation between EPT and earnings management. In other words, the collection of EPT promotes the motivation of earnings management of enterprises, but this effect will gradually weaken as time goes by. Secondly, considering the strong heterogeneity of EPT, this study discusses the heterogeneity of the impact of EPT on corporate earnings management from the nature of property rights, industry nature, and regional differences. The study finds that the impact of EPT on earnings management is somehow interesting and could be summarized into three statements: (i) state-owned initiatives are more momentous than non-state-owned initiatives, (ii) pollution-intensive enterprises are more significant than non-pollution-intensive enterprises, and (iii) economically developed areas are more significant than economically underdeveloped areas. Finally, we provide a reference for EPT to stimulate high-quality financial development and initiatives to optimize management strategies to accomplish ecological growth.

The possible research contributions of this manuscript are as follows. First, the micro effect of EPT is investigated from the perspective of corporate earnings management. The EPT is an important environmental regulation measure in China and an important guarantee for high-quality economic development. There are relatively few studies on the EPT and earnings management of enterprises. We further believe that this research area is relatively ignored in the previous literature. In order to comprehensively investigate the effect of EPT collection, this study takes earnings management of listed companies as the starting point to enrich the micro effect of EPT collection from the perspective of EPT development and enterprise surplus management research perspectives. In fact, enterprises are important participants in the market, and their development quality is related to the development quality of the whole economy (especially listed companies). Earnings management is an important measure of corporate profit management, whereas the investigation of the relationship between EPT and earnings management can expand the influencing factors of corporate earnings management. From the results of this study, we observed a substantial positive correlation between corporate earnings management and EPT, and the impact of EPT on corporate earnings management is refined from the dimensions of property rights, industry heterogeneity, and external environmental conditions. The major contributions of this study are as follows:

First, the micro effect of EPT is investigated from the perspective of corporate earnings management. This study takes earnings management of listed companies as the starting point to enrich the micro effect of EPT collection.

An enterprise analysis model based on IoT-edge computing is suggested.

The study finds a significant positive correlation between corporate earnings management and EPT.

The rest of this study is structured as follows. In section 2, we discuss the literature review. The theoretical analysis of the research hypothesis is described in section 3. In section 4, sample selection and study design are discussed in more detail. In section 5, empirical results and analysis are demonstrated in terms of regression and heterogeneity. Based on the obtained results and conclusions, the policy implications essential to protecting and improving the environment through taxation are summarized in section 6. Finally, conclusions and future research directions are discussed in section 7.

2. Literature Review

Earnings management is an accounting treatment method for managers to transmit future cash flow information of enterprises [2]. Within the scope of laws, regulations, and accounting standards, management selects accounting policies based on their own interests or corporate profits to ensure the realization of goals and objectives [3]. From the perspective of accounting report information transparency, earnings management can be divided into three categories: valuable, neutral, and harmful [4]. According to the manipulation methods of earnings management, it can be divided into three classes: (i) accrued earnings management, (ii) real earnings management, and (iii) classified earnings management [5]. At present, studies on earnings management mainly focus on external and internal governance factors. External governance factors include business environment [6], accounting standards orientation [7], institutional investor research [8, 9], network media attention [10], and intelligent supervision [11]. Internal governance factors include corporate governance [12, 13], enterprise informatization [14], and assessment and incentive [15].

Before the EPT is levied, it includes consumption tax, resource tax, urban construction and maintenance tax, vehicle and vessel tax, vehicle purchase tax, and pollution discharge fee [16]. After levy, the main ring bonded. The research on EPT can be divided into two dimensions: (i) theoretical level and (ii) practical level. The theoretical level includes basic theory [17, 18], tax rate [19–21], implementation dilemma [22], tax collection and management [23, 24], and tax incentives [25]. The practical level can be further divided into macro and micro levels. At the macro level, the emission reduction and pollution control effect of EPT is analyzed mainly from the regional perspective [26–29]. At the micro level, the impact of EPT on enterprise
performance is studied from the perspective of enterprises [30, 31], enterprise technology innovation [32, 33], and the transformation of heavily polluting enterprises [34].

There are a few studies on EPT and corporate earnings management. However, there are studies on corporate earnings management from the perspective of environmental regulation policies with similar effects on EPT. For example, Rongbing and Huifen [35], under the political cost hypothesis, adopted the differential-difference model to test the earnings management of heavily polluting enterprises in the Environmental Protection Law and believed that heavily polluting enterprises were more inclined to choose earnings management to convey the signal of good enterprise development than nonpolluting enterprises. Furthermore, Yiguang and Siyuan [36] studied the impact of environmental regulations on corporate earnings management and concluded that environmental regulations have a significant inhibitory effect on corporate earnings management. Similarly, Kuang and Long [37] used the fixed effect model to analyze the effects of environmental regulation on earnings management and financial performance. They believed that environmental regulation enhanced the effects of earnings management on financial performance.

The literature review found that enterprise surplus management and EPT research has achieved fairly good results, but there is almost no effect of the relationship between studies. This article will be a reference for the environmental regulation effect on the enterprise surplus management research results, combined with the effect of tax revenue and earnings management. Moreover, this will put forward the theoretical hypothesis and test and then get the potential effects of the EPT and earnings management. Finally, this will also help enrich the research perspective of EPT and expand the influencing factors of earnings management.

3. Theoretical Analysis and Research Hypothesis

3.1. EPT and Corporate Earnings Management. Due to the lack of literature on the relationship between EPT and corporate earnings management, this study presents a theoretical analysis and puts forward scientific hypotheses from the perspectives of tax on earnings management and environmental regulation on earnings management. It should be noted that the work presented in this study will also help enrich the research perspective of EPT and expand the influencing factors of earnings management.

3.1.1. From the Perspective of Earnings Management of Taxation. Through literature review, it is found that scholars’ research on the relationship between tax and earnings management can be divided into tax cost [38], tax rate [39], tax burden [40], tax collection and administration [41, 42], and tax avoidance [43, 44]. Therefore, this study attempts to analyze the impact of EPT on corporate earnings management from the above perspective.

The first is the cost of taxation. The tax cost in this study is defined from the perspective of enterprises, including the tax cost and indirect cost in the process of paying EPT. As an in-price tax, EPT is bound to increase the cost of tax payments in the short term and reduce the profits of enterprises in the current period. In order to achieve the profit goal, enterprises may choose earnings management to reduce the tax burden. For example, in order to achieve an upward surplus, enterprises will first increase income tax items and avoid the earnings management of VALUE-ADDED tax items [38]. After “Replacing Business Tax with VAT,” enterprises operate surplus for tax avoidance to reduce the turnover tax burden [39]. Therefore, the existence of EPT will definitely increase the tax cost of enterprises and then increase the earnings management tendency of enterprises.

The second is the tax burden and tax rate level. Reducing the tax burden is the direct motivation for earnings management, and the change in the tax rate directly affects the tax burden level [39, 45]. This study selects discharge as environmental taxes and environmental taxes as an investigation object. The environmental tax, in the process of following the principle of “tax and fee burden of translation,” namely, the tax changes little, is not simply from the perspective of tax analysis enterprise tax burden level. However, the discharge system enforcement rigid deficiencies and lack of administrative intervention are mandatory and more normative [34]. The environmental tax has a more rigid impact on the tax burden level of enterprises than sewage charges. From the perspective of time series, the impact of EPT on the corporate tax burden is gradually increased. Therefore, it can be inferred from the previous statement that the impact of EPT on corporate earnings management is also gradually rigid.

The third is tax collection. Previous studies on the impact of tax collection and management on earnings management show that the conclusions are basically the same. Strong tax collection and management can reduce the level of earnings management of enterprises [41, 42]. Particularly, in the downward earnings management behavior of enterprises, the intensity of high collection and management is significantly positively correlated with earnings management [41]. The EPT also can promote the downward surplus of enterprises, so it is inferred that the strong tax collection of EPT has a significant positive correlation with the earnings management of enterprises.

In addition, EPT belongs to relevant information that enterprises need to disclose. In order to maintain corporate reputation or meet the needs of social responsibility [46], enterprises may be inclined to choose earnings management to reduce the transmission of adverse information. For example, from the perspective of political cost, oil companies choose earnings management to reduce profits and avoid possible government intervention when oil prices soar [47]. In other words, this means that the promotion effect of EPT on earnings management can still be determined from the perspective of relevant information transmission after the collection of EPT.
3.1.2. From the Perspective of Earnings Management by Environmental Regulation. Environmental regulation can be divided into three types: (i) “command-and-control,” (ii) market incentive, and (iii) voluntary agreement [46]. EPT is an environmental regulation policy with strong mandatory characteristics. As the intensity of environmental regulation increases, earnings management becomes one of the important ways to reduce the tax burden of enterprises [48]. In order to achieve the goal of compulsory environmental regulation, enterprises will increase their investment in green technology, improve the production process, and/or replace production equipment. Subsequently, this might result in a substantial increase in operating costs. In order to maintain the fundamentals of stable profit growth, enterprises will adopt earnings management to adjust profits [36]. Therefore, from the perspective of the relationship between environmental regulation and corporate earnings management, we can assume the “mandatory” character of EPT, which may potentially increase the operation of corporate earnings management.

From the perspective of the impact of EPT on corporate earnings management and the role of environmental regulation on earnings management, this study puts forward the following hypotheses.

Hypothesis 1. There is a significant positive correlation between EPT and earnings management, and EPT promotes earnings management to regulate corporate profits.

3.2. Heterogeneity of EPT and Corporate Earnings Management

3.2.1. The Nature of Property Rights. Enterprises with different property rights are subject to different levels of government intervention. For example, state-owned enterprises have natural advantages in obtaining government information, and their policy prediction and adaptation are stronger than non-state-owned enterprises [49]. Furthermore, the political relevance of state-owned enterprises reduces their tax inspection risks [50]. According to the results of existing research literature, environmental regulation reduces the tax burden of state-owned enterprises significantly less than that of non-state-owned enterprises [46]. Therefore, it has a higher inhibitory effect on the earnings management of state-owned enterprises than that of non-state-owned enterprises [36]. On the contrary, non-state-owned enterprises are less sensitive to mandated environmental regulations, and state-owned enterprises undertake more national policy-oriented tasks [51]. They have more considerations on EPT, and the effect between state-owned enterprises and EPT is more significant than that of other enterprises. Based on this observation, the following hypotheses are proposed.

Hypothesis 2. Compared with non-state-owned enterprises, EPT plays a more significant role in promoting the earnings management of state-owned enterprises.

3.2.2. The Nature of the Industry. Traditional welfare economics believes that environmental tax can internalize external costs of enterprises and reduce corporate profits to some extent from the perspective of costs. In the traditional economic development model, heavily polluting enterprises are pillar industries of the local economy for a long period of time [52]. The introduction of EPT may directly affect the level of economic development of local governments. Heavy pollution enterprise possibility and total emissions exceed a bid larger [52], making the enterprise tax burden of heavy pollution industry EPT ratio significantly heavier than nonpollution enterprises. Moreover, heavily polluting enterprises, in response to public pressure, tend to choose earnings management behavior to reduce the public attention to the enterprise [46]. In addition, heavily polluting enterprises bear higher political costs than nonpolluting enterprises and are more motivated to carry out earnings management [35]. In order to convey positive stock price information to the public for social image, heavily polluting enterprises tend to choose earnings management to improve their corporate image [35]. EPT has different impacts on enterprises from pollutant emission density and degree. Therefore, the following hypothesis is proposed.

Hypothesis 3. The effect of EPT on the earnings management of enterprises is more significant in pollution-intensive industries than in other industries.

3.2.3. Degree of Economic Development. The purpose of EPT is to force enterprises to make green transformations by means of environmental regulation. However, the transformation requires large-scale investment and has high risk [53]. Due to the differences between tax collection standards and regional tax constraint mechanisms, enterprises may choose to follow the “Pollution Shelter” effect to carry out the spatial transfer. The EPT policy follows the path of “Central Decision-Making–Local Implementation,” and policy implementation mainly depends on local governments [53]. It should be noted that the regional economic development level and development goals promote local governments to make policy choices. In addition, economically developed regions have higher awareness of green technology innovation [54]. From the perspective of long-term economic development, regional economic development goals will become an important factor affecting the implementation of EPT. There is heterogeneity in the level of regional economic development in the intensity of EPT collection and enforcement. Therefore, the following hypothesis is proposed.

Hypothesis 4. The promotion effect of EPT on the earnings management of enterprises is more significant in economically developed regions than in economically underdeveloped regions.

3.2.4. Edge Computing for Earning Management. Data processing, profitability analysis, and analysis of the asset structure are the three categories into which the model can
be separated. The study of the asset structure and its analysis is separated into many enterprise management indicators. Similarly, the profitability analysis is also distributed into two different subsections: (a) financial indicator and (b) nonfinancial indicator. Data processing is based on cloud and edge computing models. Based on the input data, an appropriate analysis model is built, and the findings of the enterprise analysis can then be generated [55]. This model can decrease the processing time by implementing the earnings management system over the edge while the data are collected at the client level through sensors and other IoT devices. When needed, data can be moved to the cloud for long-term storage and prediction. In fact, we account for large-scale companies and use machine learning methods, such as convolutional neural networks (CNN), to improve and generalize the finding. In such scenarios, the training may happen on the cloud servers, while the prediction tasks could be accomplished over the edge servers.

4. Sample Selection and Study Design

4.1. Sample Selection and Data Sources. In order to study the impact of EPT on corporate surplus management, this study selects two different datasets: (i) from 2010 to 2017, data on sewage charges, and (ii) from 2018 to 2019, data on environmental taxes [56, 57]. Moreover, these datasets offer various EPT data variables for the following reasons:

- The official implementation date of China’s environmental protection fee to tax change was 1 January 2018. The institutional framework and content of sewage charges were still retained.
- The local tax amount was determined in general following the overall determination of local tax amounts, which follows the principle of “tax burden shifting.”
- The tax amounts around the country basically do not change too drastically [Research Group of “New-Era Public Finance and Tax Policy Reform Promoting Green Development,” 2021] [58].

Moreover, A-share listed companies in China’s Shanghai and Shenzhen markets, from 2010 to 2019, were selected as the initial sample. Before data analysis, in the preprocessing phase, the “ST and ST*” samples in the sample period were excluded. Similarly, the samples with missing data on relevant variables were also excluded due to insufficient details. Finally, 23,014 observations were obtained and considered for evaluation.

4.1.1. Data Sources. The datasets belong to three different sources: (i) EPT data from the China Statistical Yearbook, China Environment Reports, and Annual Reports of some enterprises; (ii) industry breakdown data (classification of pollution-intensive industries and non-pollution-intensive industries) from the Guide to Environmental Information Disclosure for Listed Companies, with reference to the National Economic Classification of Industries (GB/T4754-2011) and the guidelines on Industry Classification for Listed Companies (2012); and (iii) all other data from the CSMAR database [59].

In order to reduce the effect of extreme values on the results, the article applies tailoring at the 1% and 99% quartiles to all continuous variables. Note that the p-value is kept as 0.05, denoting the 95% confidence interval. Data processing and analysis were done using Stata15 and Excel application software.

4.2. Model Design and Variable definition. In order to test the positive relationship between the EPT and surplus management, we construct the following econometric model that essentially focuses on the impact of EPT on corporate surplus management, which is illustrated as follows:

\[ DA_{it} = \alpha_0 + \alpha_1 ET_{it} + \sum_{j=1}^{n} \alpha_{is} x_{it} + \epsilon_{it}. \] (1)

In the above model, \( DA_{it} \) denotes corporate surplus management, and \( ET_{it} \) represents the difference between the company’s earnings profit and net cash flow from management activities. This study draws on relevant research on surplus management and uses the industry subannual modified Jones model, given by equation (2). The Jones model is used to estimate manipulative accrued profits as a measure of surplus management, modeled as follows:

\[ \frac{TA_{it}}{A_{i,t-1}} + \beta_1 \left( \Delta REV_{it} - \Delta REC_{it} \right) \frac{PPE_{it}}{A_{i,t-1}} + \epsilon_{it}. \] (2)

In the above equation, \( TA \) represents the difference between the company’s earnings profit and net cash flow from operating activities. Similarly, \( \Delta REV \) is the difference between the operating income in the current period and that in the previous period, and \( \Delta REC \) is the difference between accounts receivable at the end of the current period and accounts receivable at the end of the previous period. Moreover, \( PPE \) is the value of the company’s fixed assets, \( A_{i,t-1} \) is the company’s total assets in period \( t-1 \), and \( \epsilon \) is the residual of the model. Regressions of the root modified Jones model by industry and year yield residuals as a proxy variable for surplus management (i.e., \( DA \)), where we take its absolute value. The main variables in the article are defined and described as follows:

- EPT (ET): the existing literature on the definition of EPT is divided into two categories: (i) the insurance-related taxes and fees, including consumption tax, resource tax, urban maintenance and construction tax, vehicle tax, vehicle purchase tax, and sewage charge (Xia Yangfan, 2020) [16], and (ii) the EPT after 1 January 2018. Considering the relatively short period of time since the introduction of EPTes, the article defines sewage charges and EPTes as EPTes (ET) because they are basically the same in terms of institutional design and taxation content, and the principle of “tax and fee equalization” is followed in the local EPT collection practice (ET).
Earnings management (DA): earnings management is mainly divided into three types: (i) accrued earnings management, (ii) real earnings management, and (iii) classified transfer earnings management [7]. Accrued earnings management uses specific accounting methods to change corporate earnings, whereas real earnings management is based on the manipulation of corporate earnings in real business activities [60]. The classified transfer earnings management is based on profit classification manipulation of the income statement [5]. This paper considers the existing studies on the impact of tax on corporate earnings management, mainly reflected in accrued earnings management [36, 38, 39]. We select accrued earnings management as the research variable for the results because they have no significant impact on real earnings management.

Control variable (): on the basis of existing research, the following variables were selected as control variables: enterprise size (Sizew), asset-liability ratio (Levw), net cash flow from operations (Cfow), return on assets (Roaw), growth rate of revenue (Growthw), enterprise year (Agew), shareholding ratio of the largest shareholder (Shrcrlw), proportion of independent directors (Indepw), board size (Lnboa), dual, and state property rights (State). The main variables and brief descriptions are defined in Table 1.

4.3. Descriptive Statistics. The descriptive statistical results, as shown in Table 2, show that, among the 23,014 samples, the mean value and standard deviation of accrued earnings management of enterprises are 0.0603 and 0.066, respectively. The values indicate that many listed companies do not use accrued earnings management to manipulate profits, and only a few listed companies have low financial quality reports. The maximum and minimum values of accrued earnings management are 0.0007 and 0.356, respectively. The values illustrate that the degree of accrued earnings management varies greatly in the samples. Other variables are basically consistent with the results of existing research literature, ensuring the stability of sample selection.

5. Empirical Results and Analysis

5.1. Analysis of Regression Results. Table 3 outlines the regression analysis results of EPT and corporate earnings management. The results in column (1) show that, without any control variables, the regression coefficient of EPT (ET) on earnings management (DAW) is approximately 0.001 and is significant at the level of 10%. Similarly, the results in column (2) show that, with the addition of existing control variables, the regression coefficient of EPT (ET) on earnings management (DAW) is approximately 0.001, which is significant at the level of 5%. The latter situation indicates a significant positive correlation between EPT and earnings management. The empirical results show that the EPT encourages listed companies for choosing earnings management to achieve the operation and management purposes of cost reduction, reputation maintenance, and social responsibility. These results are consistent with the expectation of hypothesis 1.

5.2. Heterogeneity Analysis of EPT and Earnings Management. In order to test the heterogeneity of the impact of EPT on earnings management, based on model (2), group regression was conducted. In fact, group regression was conducted on the samples according to the nature of enterprise property rights, industry nature, and economic development degree. Moreover, the difference analysis of the impact of EPT on enterprises with different property rights, industry nature, and different regions was tested. The property rights grouping divides listed companies into state-owned enterprises and non-state-owned enterprises.

The classification of industry nature draws on the research of [61] and [62] to construct the pollution density evaluation index (EPI) from the emission intensity and emission scale of taxable air pollutants, taxable water pollutants, taxable solid waste, and taxable noise:

\[
EPI_{i,t} = \sqrt{E_{i,t}} \times P_{i,t},
\]

\[
EPI_i = \frac{\sum_{t=0}^{t_{\text{max}}} EPI_{i,t}}{t_{\text{max}}}
\]

In the above equation, \(EPI_{i,t}\) is the evaluation index of pollution intensity of industry \(i\) in the \(t\) year and \(\alpha_{i,t}\) is the pollution emission intensity of industry \(i\) in the \(t\) year, that is, pollutant emission per unit industrial output value. Furthermore, \(\alpha_{i,t}\) is the pollution emission scale, that is, the proportion of pollutants discharged by industry in the total emission of such pollutants in China. In the other part of (3), \(EPI_i\) is the average pollution intensity index of industry \(i\) during the study period. In order to make the data have comparability, the normalization method was adopted. Approximately, thirteen pollution-intensive enterprises with an EPI index over 15 were selected, including paper and paper making, textile industry, chemical raw material and chemical products manufacturing industry, and agricultural and sideline food processing industry. For these industries, the value was 1; however, the value of other enterprises was 0.

The degree of economic development was divided into different regions. The main classification refers to regional GDP, per capita GDP, main industrial output value, ecological infrastructure construction, and other aspects. The area was divided into the developed area (Beijing, Shanghai, Tianjin, Jiangsu, Zhejiang, Fujian, Guangdong, Hebei, Jilin, Heilongjiang, Anhui, Chongqing, Sichuan, Jiangxi, Shanxi, Liaoning, Shaanxi) and developed regions (Hainan, Inner Mongolia, Xinjiang, Tibet, Gansu, Guangxi, Guizhou, Yunnan, Qinghai, Ningxia). Note that the developed regional assignment was 1, whereas undeveloped regions were assigned a value of 0.

According to the grouped regression analysis results, as shown in Table 4, the significance of EPT on earnings management is greater for state-owned enterprises than for non-state-owned enterprises. This can be inferred that under
the same conditions, the tendency of EPT to motivate enterprises to generate earnings management motivation is greater for state-owned enterprises than for non-state-owned enterprises. The EPT on earnings management of significant pollution-intensive industries was noted to be larger than the pollution-intensive industries in the same conditions. Similarly, the EPT to promote the enterprise earnings management motivation of pollution-intensive industries is larger than the pollution-intensive industry. We observed that including non-pollution-intensive industries is 0, the influence of the EPT impact on nonpolluting industries is very small, and that can approximate to 0. The significance of the EPT on earnings management is greater in economically developed areas than in less developed areas. Under the same conditions, EPT is more likely to motivate enterprises in economically developed areas to generate earnings management motivation than in economically less developed areas.

5.3. Robustness Test. In order to verify the robustness of the empirical results, this study reduces the sample period from 2010–2019 to 2016–2019 by shortening the sample period. Moreover, we adopt the method of differential difference analysis. Similarly, to reduce noise interference, we use the technique offered by Yu Lian Chao et al. (2021) to build a differential difference model. The specific model is as given as

\[ DA_{it} = a_0 + a_1 ET_{it} + t + \sum \beta_j CV_{si,t} + e_{it}. \]  

(4)

In the above equation, CVs represent the control variable, whereas all other variables are predefined. The regression results show (Table 5) that EPT has a significant positive correlation with the corporate earnings management; therefore, hypothesis 1 is still valid. Note that the p-value is kept as 0.05, which denotes the 95% confidence interval, as described in an earlier section.
5.4. Policy Mechanisms. Based on the above results and conclusions, the policy implications essential to protect and improve the environment through taxation are as follows:

Increasing the disclosure degree of taxable pollutant information of corporate EPT: although earnings management is not good or bad, its operation increases the information asymmetry of market participants and may lead to misleading information users. Increasing the disclosure of taxable pollutant information can reduce the possibility of earnings management to a certain extent, enhance the liquidity of market information, and reduce the risk of misjudgment of market participants \[56,63\].

The establishment of the EPT rate shall fully consider the nature of the industry and the level of regional economic development. The tax rate is the direct withdrawal of tax burden level, and the scientific and reasonable tax rate can ensure the realization of the tax collection purpose. The purpose of EPT is to reduce the emission of pollutants by market participants and promote the high-quality development of the regional economy while protecting the ecological environment. The current EPT mainly considers the shift of tax burden without fully considering emission reduction, energy saving, and governance efficiency. China's regional natural endowment and economic development level differ greatly. As a local tax, how can EPT give full play to its efficiency and define effective tax rate level become the key. This will also be the focus of our research group's next step: optimizing the EPT system.

Optimizing tax collection and management to reduce the cost of EPT collection: another important indicator associated with tax effectiveness is the efficiency of tax collection and management. EPT can use the rapid development of the Internet and big data to actively build an information sharing platform, reduce information asymmetry, and reduce the cost consumption in the circulation process.

Table 3: EPT and earnings management.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Earnings management (DA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>ET</td>
<td>0.0001*</td>
</tr>
<tr>
<td></td>
<td>−0.0001</td>
</tr>
<tr>
<td>Size</td>
<td>−0.0067***</td>
</tr>
<tr>
<td>Lev</td>
<td>0.0332***</td>
</tr>
<tr>
<td>Roa</td>
<td>−0.2134***</td>
</tr>
<tr>
<td>Growth</td>
<td>0.0313***</td>
</tr>
<tr>
<td>Cfo</td>
<td>−0.0662***</td>
</tr>
<tr>
<td>Age</td>
<td>0.0037**</td>
</tr>
<tr>
<td>Shr1w</td>
<td>0.0001***</td>
</tr>
<tr>
<td>Independ</td>
<td>−0.0101</td>
</tr>
<tr>
<td>Boardw</td>
<td>−0.0075***</td>
</tr>
<tr>
<td>Dual</td>
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</tr>
<tr>
<td>State</td>
<td>−0.0058***</td>
</tr>
<tr>
<td>_cons</td>
<td>0.0752***</td>
</tr>
<tr>
<td></td>
<td>−0.0039</td>
</tr>
<tr>
<td>adj R2</td>
<td>0.03</td>
</tr>
<tr>
<td>F</td>
<td>19.859</td>
</tr>
<tr>
<td>N</td>
<td>23014</td>
</tr>
</tbody>
</table>

Note: *p < 0.10, **p < 0.05, *** p < 0.01.
drives earnings management of state-owned enterprises more efficiently. EPT promotes earnings management. Furthermore, the EPT fosters a significant positive correlation with corporate earnings management. Therefore, we choose 2019 as the research sample to analyze the impacts of EPT on corporate earnings management. From the perspective of corporate earnings management, in this study, we selected the data of listed companies from 2010 to 2019 as the research sample to analyze the impacts of EPT on corporate earnings management. Through empirical evaluation, our obtained results demonstrated that the EPT has a significant positive correlation with earnings management; that is, EPT promotes earnings management. Furthermore, the EPT drives earnings management of state-owned enterprises more efficiently than that of non-state-owned enterprises. Similarly, the EPT-pollution-intensive. We also observed that the level of economic development is one of the influencing factors of the earnings management of enterprises in different regions.

In the future, we will account for large-scale companies and use machine learning methods to improve and generalize the finding of this study. As a local tax, how can EPT give full play to its efficiency and define effective tax rate level become the key. This will also be the focus of our research group's next step: optimizing the EPT system. EPT can use the rapid development of the Internet and big data to actively build an information sharing platform, reduce information asymmetry, and reduce the cost consumption in the circulation process.

### Table 4: Heterogeneity analysis.

<table>
<thead>
<tr>
<th>Variable</th>
<th>State-owned enterprises</th>
<th>State-owned enterprises</th>
<th>Pollution-intensive industry</th>
<th>Non-pollution-intensive industries</th>
<th>Economically developed area</th>
<th>Economically underdeveloped areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET</td>
<td><strong>0.0002</strong> **</td>
<td><strong>0.0001</strong></td>
<td><strong>0.0003</strong></td>
<td><strong>0.0001</strong></td>
<td><strong>0.0002</strong> **</td>
<td><strong>0.0001</strong></td>
</tr>
<tr>
<td>Sizew</td>
<td><strong>-0.0071</strong> **</td>
<td><strong>-0.0063</strong> **</td>
<td><strong>-0.0071</strong></td>
<td><strong>-0.0069</strong> **</td>
<td><strong>-0.0064</strong> **</td>
<td><strong>-0.0109</strong> **</td>
</tr>
<tr>
<td>Levw</td>
<td><strong>0.0299</strong> **</td>
<td><strong>0.0385</strong> **</td>
<td><strong>0.0243</strong></td>
<td><strong>0.0371</strong> **</td>
<td><strong>0.0327</strong> **</td>
<td><strong>0.0393</strong> **</td>
</tr>
<tr>
<td>Roaw</td>
<td><strong>-0.1408</strong> **</td>
<td><strong>-0.2457</strong> **</td>
<td><strong>-0.2477</strong></td>
<td><strong>-0.2022</strong> **</td>
<td><strong>-0.2078</strong> **</td>
<td><strong>-0.2392</strong> **</td>
</tr>
<tr>
<td>Growthw</td>
<td><strong>0.0327</strong> **</td>
<td><strong>0.0298</strong> **</td>
<td><strong>0.0397</strong></td>
<td><strong>0.0281</strong> **</td>
<td><strong>0.0313</strong> **</td>
<td><strong>0.0301</strong> **</td>
</tr>
<tr>
<td>Cflow</td>
<td><strong>-0.0375</strong> **</td>
<td><strong>-0.0904</strong> **</td>
<td><strong>-0.0323</strong></td>
<td><strong>-0.0837</strong> **</td>
<td><strong>-0.0701</strong> **</td>
<td><strong>-0.0038</strong> **</td>
</tr>
<tr>
<td>Age</td>
<td><strong>0.0088</strong> **</td>
<td><strong>-0.0009</strong> **</td>
<td><strong>0.0042</strong></td>
<td><strong>0.0033</strong> **</td>
<td><strong>0.0042</strong> **</td>
<td><strong>-0.0008</strong> **</td>
</tr>
<tr>
<td>Shrc1w</td>
<td><strong>0.0001</strong> **</td>
<td><strong>0.0001</strong> **</td>
<td><strong>0.0002</strong> **</td>
<td><strong>0.0001</strong> **</td>
<td><strong>0.0002</strong> **</td>
<td><strong>0.0002</strong> **</td>
</tr>
<tr>
<td>Independ</td>
<td>0.001</td>
<td>-0.0113</td>
<td>0.0059</td>
<td>-0.0155</td>
<td>-0.0143</td>
<td>0.0257</td>
</tr>
<tr>
<td>Boardw</td>
<td>-0.0049</td>
<td>-0.0083**</td>
<td>-0.0062</td>
<td>-0.0081**</td>
<td>-0.0098**</td>
<td>0.0178**</td>
</tr>
<tr>
<td>Dual</td>
<td>-0.0036**</td>
<td>0.0001</td>
<td>0</td>
<td>-0.0012</td>
<td>-0.0003</td>
<td>0.0013</td>
</tr>
<tr>
<td>State</td>
<td>0.0001</td>
<td>-0.0062**</td>
<td>-0.0055**</td>
<td>-0.0068**</td>
<td>-0.0012</td>
<td>-0.0011</td>
</tr>
<tr>
<td>_cons</td>
<td>0.1964**</td>
<td>0.2203**</td>
<td>0.1975**</td>
<td>0.2298**</td>
<td>0.2128**</td>
<td>0.2270**</td>
</tr>
<tr>
<td>Adj.R²</td>
<td>0.161</td>
<td>0.187</td>
<td>0.181</td>
<td>0.172</td>
<td>0.17</td>
<td>0.197</td>
</tr>
<tr>
<td>F</td>
<td>26.4662</td>
<td>31.0235</td>
<td>.</td>
<td>36.77</td>
<td>43.1705</td>
<td>.</td>
</tr>
<tr>
<td>N</td>
<td>10281</td>
<td>12733</td>
<td>7856</td>
<td>15158</td>
<td>19804</td>
<td>2271</td>
</tr>
</tbody>
</table>

Note: *p < 0.10, **p < 0.05, ***p < 0.01.

### Table 5: EPT and earnings management.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Earnings management (DA)</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET</td>
<td>0.076**</td>
<td>0.081**</td>
<td>2.01</td>
</tr>
<tr>
<td>_cons</td>
<td>0.0401**</td>
<td>-0.4136**</td>
<td>5.25</td>
</tr>
<tr>
<td>CVs</td>
<td>No</td>
<td>Yes</td>
<td>0.1302</td>
</tr>
<tr>
<td>adj. R²</td>
<td>0.2247</td>
<td>0.2210</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>9210</td>
<td>9210</td>
<td></td>
</tr>
</tbody>
</table>

Note: *p < 0.10, **p < 0.05, ***p < 0.01.

6. Conclusions and Future Work

From the perspective of corporate earnings management, in this study, we selected the data of listed companies from 2010 to 2019 as the research sample to analyze the impacts of EPT on corporate earnings management. Through empirical evaluation, our obtained results demonstrated that the EPT has a significant positive correlation with earnings management; that is, EPT promotes earnings management. Furthermore, the EPT drives earnings management of state-owned enterprises more efficiently than that of non-state-owned enterprises. Similarly, the EPT-pollution-intensive. We also observed that the level of economic development is one of the influencing factors of the earnings management of enterprises in different regions.

In the future, we will account for large-scale companies and use machine learning methods to improve and generalize the finding of this study. As a local tax, how can EPT give full play to its efficiency and define effective tax rate level become the key. This will also be the focus of our research group’s next step: optimizing the EPT system. EPT can use the rapid development of the Internet and big data to actively build an information sharing platform, reduce information asymmetry, and reduce the cost consumption in the circulation process.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest regarding this paper.
Acknowledgments

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