Study on the impact of tax collection on corporate surplus management in the context of big data

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Abstract

Exploring the impact of tax levy on corporate surplus management can better suggest tax policies. This paper takes listed enterprises in Shanghai and Shenzhen A-share markets in China as the research object, and selects a large sample of corporate financial data from 2011 to 2021. The modified Jones model and KLW model are used to measure corporate surplus management, and a multiple regression model of the impact of tax levy on corporate surplus management is constructed. The big data samples were entered into the model, significance was analyzed based on the baseline regression results, and the reliability of the results was verified using robustness tests and correlation analysis. The regression results show that the regression coefficient is -0.025 and significantly negative when regressing tax collection variables on surplus management with fixed effects, as expected. After adding the firm-level control variables, the coefficient is -0.018, which is still significantly negative. The value of the test coefficient significantly decreases by about 0.01 in the year of and after the implementation of the tax levy, indicating that the tax levy project significantly reduces the degree of surplus management of the firm. This paper addresses well the issue of measuring tax levies when studying tax levies on corporate governance and provides evidence for the existence of corporate tax avoidance and surplus management behavior. The paper provides evidence for the existence of corporate tax avoidance and surplus management behavior.

Keywords: Tax administration, financial big data, corporate surplus management, multiple regression analysis, significance.

Introduction

False accounting information resulting from surplus management activities of listed companies has been a common concern among governments, academics and practitioners. In corporate management, managers implement surplus management practices to achieve financing, contractual and political constraints, and other guidelines(Benk, 2013; KE-Li, 2015; Shi-Mei L I, 2017). In China, when listed companies face additional offerings, delistings and IPOs, the management of the company also has a strong incentive to manipulate earnings, but the current research on surplus management focuses on the methods of corporate surplus management, especially in the areas related to corporate governance(De, 2018; De Notaris, Rasmussen, Sørensen, & Olesen, 2018).

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For example, the operation of surplus management in operating activities, investment activities and financing activities, and rarely deals with the cost of surplus management.

Surplus management is an important area of corporate governance research. Surplus management mainly refers to the manipulation of relevant financial information or operating activities by corporate management to achieve specific surplus targets by taking advantage of information asymmetry in the capital market (Afanasiev & Shash, 2020; Ivanov, Neagu, Gavrilas, & Grigoras, 2021). Surplus management behaviors based on motives such as tax avoidance or to accomplish business goals are common among listed companies, but excessive surplus management not only reduces the quality of corporate information disclosure, but also increases information asymmetry, disrupts the national tax order, and is not conducive to the fair and sustainable development of the capital market (Choi, 2021; Zhu Y, 2018).

A growing number of scholars have studied taxation in conjunction with surplus management in the context of big data. The literature (Arachi & Bucci, 2019) explores the role of taxes in earnings management using long-term equity investments, noting that tax-driven opportunistic reporting does not significantly alter a firm's effective tax burden. The literature (Kałdoński & Jewartowski, 2020) found that benchmark beaters have higher average GAAP effective tax rates than their peers. The literature (Zhao, Zhou, Zhao, & Zhou, 2019) studied the impact of revenue management on government tax subsidies using a sample of Chinese utilities.

The literature (Wang, Butterfield, & Campbell, 2017) examines incentive compensation plans for different groups and how the equity of these groups affects the tax planning behavior of Chinese firms, incorporating surplus management, supervisory board and management shareholding into the analysis to provide optimal compensation design for board members, executives and managers. The literature (Kuo & Lee, 2019) explores how firms respond to tax rate reductions under the reductive tax system, using data from Taiwanese firms as an example. The literature (Sánchez-Ballesta & Yagüe, 2021) examines earnings management and tax aggressiveness in SMEs and finds that earnings distribution is discontinuous around zero and that there is an overall negative association between earnings management that increases revenue and noncompliant tax avoidance. The literature (Wibowo, 2020) studied listed companies in the Indonesian Stock Exchange and showed that variables such as deferred tax expense, tax planning, and management ownership affect surplus management simultaneously.

In this paper, we use big data to conduct the study, and the research subjects are listed enterprises in Shanghai and Shenzhen A-share markets in China, and the research interval is from 2011 to 2021. The data of enterprises used are obtained from the CSMAR database, and 2245 samples are obtained after excluding financial listed companies and other sample processing operations. For the measurement of corporate surplus management, the modified Jones model is used to determine the explanatory and explanatory variables, and the KLW model is used to measure the moderating and control variables. Once the variables are identified, a multiple regression analysis model can be

constructed, in which OLS + heteroskedasticity robust standard error correction for heteroskedasticity is used in this model. Finally, the obtained data were analyzed based on the established model, and the baseline regression results were obtained using double difference analysis, and significance tests were performed based on parallel trends and variable correlations.

Tax Administration and Corporate Surplus Management Hypothesis

Influence mechanism

The main feature of modern enterprises is the separation of ownership and operation, which provides an opportunity for managers to transfer resources for private benefit. Excessive tax planning and surplus management will increase the opacity of enterprises' financial information, disrupt the national taxation order, and is not conducive to the healthy and sustainable development of the capital market. "The "Golden Tax Project III" relies on big data and cloud computing platform to track enterprises' tax-related information in real time, and unites taxation authorities with social security, customs, and industry and commerce departments, so that the data of taxation terminal, third party, Internet and enterprises can be interoperated. In addition, "Golden Tax Phase III" has been developed to provide the enterprises with the information on taxation. In addition, the "Golden Tax III" has developed a decision support system to compare the data and logic of key financial indicators of enterprises, which is helpful to discover the existence of tax risks and enhance tax collection and management. Stricter tax collection and control will reduce the opportunistic behavior of managers, improve the tax information of enterprises, reduce tax evasion, and finally curb the surplus management behavior of enterprises. The impact mechanism is shown in Figure 1.
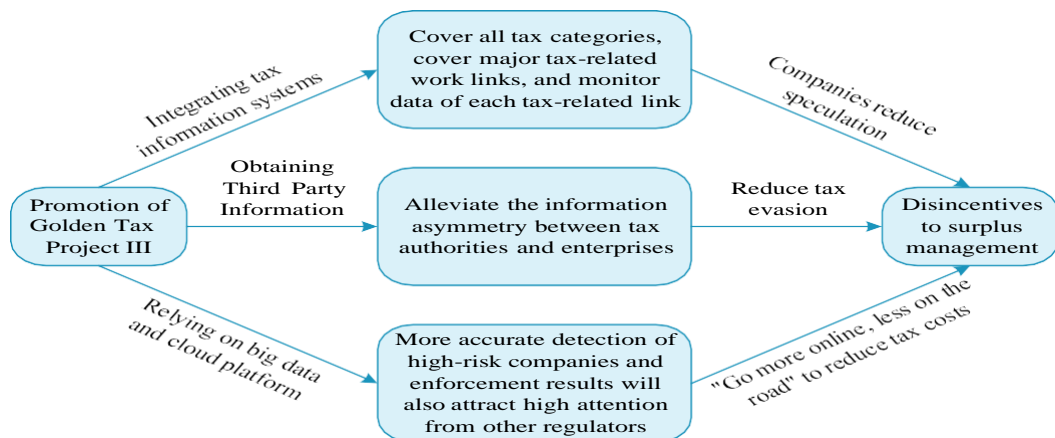

Figure 1. Tax administration mechanism

Distortion of accounting information

In order to further elucidate the definition of surplus management, a more detailed comparison

and analysis of financial fraud and surplus management is needed. From the perspective of analyzing procedural rationality and result rationality, the "truthfulness" of accounting information that people pursue in reality should follow the procedural rationality rather than the result rationality. In other words, as long as the procedure of producing accounting information conforms to the contractual arrangement of accounting rule-making authority in each country, the accounting information produced can be considered as "truthful". Rule-based distortion, irregular distortion, and behavioral distortion constitute the "triad" of accounting information distortion. The link between procedural rationality and distortion of accounting information is shown in Figure 2.
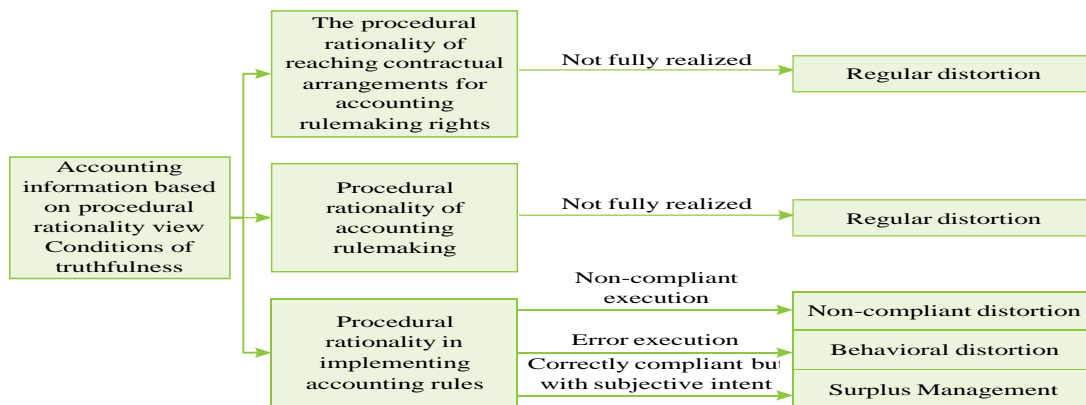

Figure 2. Procedural rationality and distortion of accounting information

Research design

Sample selection and data sources

This paper takes listed companies in China's Shanghai and Shenzhen A-share markets as the research target, and the research interval is from 2010 to 2021, and the actual starting point of the analysis is 2011 because the measure of corporate surplus management will lag total assets by one year. The enterprise data used in this paper are all from the CSMAR database, and the city characteristics data are from the China City Statistical Yearbook. And the target samples and data were screened according to the following criteria: excluding financial listed companies, excluding ST, *ST and PT listed companies, excluding samples with blank main variables, and removing duplicate values. And the continuous variables of the data were subjected to an upper and lower 1.5% tailing process before the analysis, and finally 2245 samples were obtained.

Model design and variable definition

Model design

To test the effect of tax overcharges on corporate surplus management, the following multiple

regression models were constructed separately, and to avoid the disturbance of the heteroskedasticity of the disturbance term, the heteroskedasticity was corrected using OLS + heteroskedasticity robust standard errors:

$$EM = \beta_0 + \beta_1 \times Over\_tax + \beta_2 \times SOE + \beta_3 \times FC + \beta_4 \times Size$$
$$+\beta_5 \times Lev + \beta_6 \times MBRG + \beta_7 \times Cash + \beta_8 \times CR_1 + \beta_9 \times MGT$$
$$+\beta_{10} \times CR_{10} + \beta_{11} \times Big4 + \sum Year + \sum Firm + \varepsilon \tag{1}$$

To provide further support for the hypothesis, in the extended study, EM (corporate surplus management) is replaced with Sub_{t+1} (next period government subsidy) and $Year$ (year), IND (industry), and $City$ (city) fixed effects are controlled for, with the remaining variables defined as above, and the model is as follows:

$$Sub_{t+1} = \beta_0 + \beta_1 \times Over\_tax + \beta_2 \times SOE + \beta_3 \times FC + \beta_4 \times Size$$
$$+\beta_5 \times Lev + \beta_6 \times MBRG + \beta7 \times Cash + \beta8 \times CR_1 + \beta_9 \times MGT$$
$$+\beta_{10} \times C_{10} + \beta_{11} \times Big4 + \sum Year + \sum IND + \sum City + \varepsilon \tag{2}$$

β_1 should be significantly positive if the tax overcharge is related to government subsidies in the next period.

In robustness test 1, in order to exclude the interference of camp reform on the results, the regression of model (1) is used after excluding the service industry, and if the results are robust, β_1 should be significantly negative. In robustness test 2, in order to avoid missing important variables, local characteristics factors including $PERGDP$, $PSIGDP$, $PTIGDP$ are introduced, and the rest of variables are defined as above, and the model is as follows:

$$EM = \beta_0 + \beta_1 \times Over\_tax + \beta_2 \times SOE + \beta_3 \times FC + \beta_4 \times Size + \beta_5 \times Lev$$
$$+\beta_6 \times MBRG + \beta_7 \times Cash + \beta_8 \times CR_1 + \beta_9 \times MGT + \beta_{10} \times CR_{10} + \beta_{11} \times B_{ig}$$
$$+\beta_{12} \times PERGDP + \beta_{13} \times PSIGDP + \beta_{14} \times PTIGDP + \sum Year + \sum Firm + \varepsilon \tag{3}$$

Similarly, if the results are robust, β_1 should be significantly negative. Stricter tax collection will reduce managers' opportunistic behavior, improve firms' tax information, reduce tax evasion, and ultimately curb corporate surplus management behavior.

Explained variables

The modified Jones model and the KLW model are used to measure corporate surplus

management, respectively.

(1) Modified Jones model:

$$TA_t / A_{t-1} = \alpha_1 \left(1/ A_{t-1} \right) + \alpha_2 \left(\Delta REV_t / A_{t-1} \right) + \alpha_3 \left(PPE_t / A_{t-1} \right) + \varepsilon_t \qquad (4)$$

$$NDA_t = \alpha_1 \left(1/ A_{t-1} \right) + \alpha_2 \left(\Delta REV_t - \Delta REC_t \right) / A_{t-1} + \alpha_3 \left(PPE_t / A_{t-1} \right) \qquad (5)$$

$$DA_t = TA_t / A_{t-1} - NDA_t \qquad (6)$$

This model first substitutes the explanatory variables related to total accrued profit per unit of asset into (4) for regression by year by industry, substitutes the derived coefficient $\alpha_1, \alpha_2, \alpha_3$ into (5) for calculation, and finally substitutes the obtained results of non-manipulated accrued surplus into (6) to obtain manipulated accrued surplus, i.e., corporate surplus management. In this paper, we use EM_1 to denote the results calculated by the modified Jones model.

(2) KLW model

α_0 (intercept term) and ROA (return on assets) are introduced on the basis of the previous model, and the rest of the steps are the same. Finally, EM_2 is used to represent the results calculated using the KLW model:

$$TA_t / A_{t-1} = \alpha_1 \left(1/ A_{t-1} \right) + \alpha_2 \left(\Delta REV_t / A_{t-1} \right) + \alpha_3 \left(PPE_t / A_{t-1} \right) + \varepsilon_t \qquad (7)$$

$$NDA_t = \alpha_1 \left(1/ A_{t-1} \right) + \alpha_2 \left(\Delta REV_t - \Delta REC_t \right) / A_{t-1} + \alpha_3 \left(PPE_t / A_{t-1} \right) \qquad (8)$$

$$DA_t = TA_t / A_{t-1} - NDA_t \qquad (9)$$

Explanatory variables

The idea of measuring tax overcollection in this paper is similar to that of measuring corporate surplus management above. The potential tax burden is first measured by regression equation, and then the residuals are used to replace the tax overcharge. The model is constructed as follows:

$$S\hat{\ } \tan\_tax = \beta_0 + \beta_1 \times Base + \beta_2 \times X + dum + \varepsilon \qquad (10)$$

$$Over\_tax = Tax - S\hat{\ } \tan\_tax \qquad (11)$$

Where, $S\hat{\ } \tan\_tax$ indicates the potential tax liability level of the company in period t. *Base*

corresponds to the tax basis of corporate income tax, VAT, and business tax of the company in period t, i.e., operating income, total profit, etc. X and dum include various control variables and dummy variables related to the tax burden, such as the year of establishment, size of the company, the level of leverage (total assets/total liabilities), the strength of the ability to obtain loans (financial expenses/total liabilities), management expenses, taxing bodies, tax benefits, etc. Tax indicates various taxes paid. First, each variable is substituted into (10), and the potential tax payment level of enterprises is regressed by year by industry, and then using the idea shown in (11), the difference between the actual value of tax burden and the potential tax burden level is used to indicate the tax overcharge, and since the tax overcharge refers to the tax paid by enterprises more than the potential tax burden level, the samples with results less than 0 are excluded, and the unit of calculation results is taken as billion yuan.

Moderating variables

If it is a state-owned enterprise, the nature of ownership is denoted by $SOE = 1$, otherwise it is denoted by $SOE = 0$. The financing constraint is constrained by using SA index with the following formula:

$$SA = -0.737 \times Size + 0.043 \times Size \times Size - 0.04 \times Age \qquad (12)$$

$Size$ corresponds to the size of the enterprise, and according to the calculation requirement of the SA index, the size of the enterprise in this formula is only measured by dividing the total assets by one million and then taking the natural logarithm.

Age corresponds to the age of the enterprise, the calculation result in formula (12) is all negative, and the larger the absolute value of the amount, the stronger the financing constraints suffered by the enterprise, the absolute value of FC is used below to indicate SA.

The natural logarithm of the total assets is used to measure the size of the firm.

Control variables

Referring to previous studies, gearing ratio (Lev), growth rate of main business income ($MBRG$), cash intensity ($Cash$), shareholding ratio of top shareholder (CR_1), shareholding ratio of executives (MGT), shareholding ratio of top ten shareholders (CR_{10}), and auditor type (Big_4) were selected as control variables.

In addition, year ($Year$) and firm ($Firm$) fixed effects were controlled for.

The specific variable meanings are shown in Table 1.

Table 1. Variable definition

Variable name and symbol	Meaning
Corporate Surplus Management EM_1	Modified Jones model measurement results
Corporate Surplus Management EM_2	KLW model measurement results
Corporate Surplus Management	Potential tax level regression residuals, retaining only non-negative values
Nature of ownership	State-owned enterprises take 1, otherwise take 0
Financing constraints	SA index measurement results are taken as absolute values
Enterprise size	Natural logarithm of total assets
Gearing ratio	Measured using total liabilities/total assets
Growth rate of main business revenue	Measured using the difference between the current period's main operating income and the previous period's main operating income / the previous period's main operating income
Cash Intensity	Measured using cash and cash equivalents/total assets
Shareholding Ratio of the First Major Shareholder	Measured using the number of shares held by the largest shareholder/total share capital
Shareholding ratio of senior executives	Measured using the sum of executive shareholdings/total share capital
Shareholding ratio of top ten shareholders	Measured using the number of shares held by the top ten shareholders/total share capital
Type of auditor	Take 1 for the top four accounting firms, otherwise take 0

Analysis of empirical results

Descriptive statistics for the overall sample

Table 2 shows the descriptive statistical structure of the variables of interest. The mean value of corporate surplus management is 0.027, the maximum value is 0.447, the minimum value is -0.203, and the standard deviation is 0.118, indicating that there are significant differences in the surplus management of the sample firms and that in general the sample firms adopt positive surplus management behavior. The mean value of corporate turnover tax burden is 0.066, the minimum and maximum values are 0.014 and 0.158, respectively, and the standard deviation is 0.032, which indicates that the overall turnover tax burden of the sample is low and the difference is small. The mean value of external audit opinion is 0.977, indicating that 97.7% of the sample enterprises can

obtain a standard audit opinion, and only 2.3% of the sample enterprises have substandard financial reports. The mean value of audits conducted by international Big 4 accounting firms among the sample companies is 11.8%, indicating that only a small number of companies have hired international Big 4 accounting firms to conduct audits. The mean value of profitability is 0.110, the maximum value is 0.326, the minimum value is -0.117, and the standard deviation is 0.087, indicating that the average profitability of the sample enterprises is high and the overall difference in profitability is small, but individual enterprises have a large loss. The maximum value of total assets turnover ratio is 1.340, the minimum value is 0.047, and the standard deviation is 0.303, which reflects the large variability of the turnover speed of total assets. The standard deviation of enterprise size is 1.398, with a maximum value of 26.117 and a minimum value of 19.954, showing that there is a large variability in the size of the sample enterprises. The mean value of gearing ratio is 0.436, the maximum and minimum values are 0.88 and 0.076 respectively, and the standard deviation is 0.228, indicating that the overall debt ratio of the sample enterprises is reasonable, but the debt ratio varies greatly between samples, and the high and low debt ratios are not conducive to the long-term development of enterprises. The mean value of shareholding concentration is 0.542, which indicates that the shareholding ratio of the first largest shareholder of the sample enterprises has significant variability.

Table 2. Descriptive statistics for the overall sample

Variable	Obs	Mean	Std.Dev	Min	Max
EM	2245	0.027	0.115	-0.204	0.457
Over _ tax	2245	0.066	0.042	0.014	0.158
SOE	2245	0.977	0.153	-0.002	0.992
FC	2245	0.118	0.345	0.006	1.004
Size	2245	0.11	0.087	-0.117	0.326
Lev	2245	0.436	0.303	0.047	1.34
MBRG	2245	22.752	1.398	19.954	26.117
Cash	2245	0.542	0.228	0.076	0.88

Regression analysis

Baseline regression results

To examine the effect of tax levy on corporate surplus management, this paper performs a double difference regression on the model, and the regression results are shown in Figure 3. Curve I regresses the tax levy variables on surplus management with fixed effects without adding control variables, and the regression coefficient is -0.025 and significantly negative, as expected. Curve II adds firm-level control variables to I. At this point, the β_1 coefficient is -0.018 and is still significantly negative. Curve III further adds province-level control variables, also adding two-way

fixed effects, and we can see that the coefficient is still significant. The regression results from Curve I to Curve III show that all core explanatory variables have negative coefficients, and all are significant at the 1.2% level.
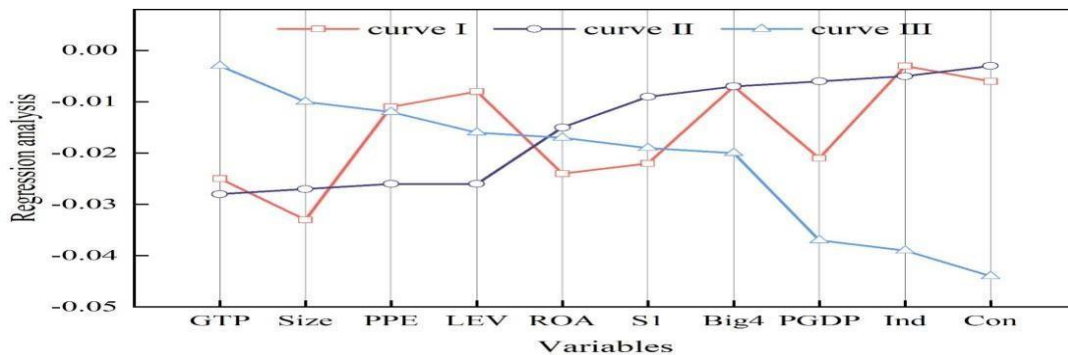

Figure 3. Double difference regression results

In terms of control variables, gearing is significantly and positively related to corporate surplus management, indicating that the higher the gearing of a firm, the stronger the incentive for management to implement surplus management behavior may be in order to reduce the constraints imposed by the terms of debt covenants. The significant positive correlation between return on assets and corporate surplus management indicates that the higher the profitability of a firm, the stronger the incentive for the firm to implement surplus management based on capital market motives, tax avoidance motives, etc. Equity concentration is significantly and positively related to corporate surplus management, indicating that the more concentrated a firm's equity is, the larger shareholders may implement surplus management for their own benefit.

Robustness test

Parallel trends are an important prerequisite for the use of the double difference method, and before the implementation of the tax collection project in this paper, there should be no significant difference between the trends of surplus management changes in the companies where the treatment and control groups are located. This paper uses event analysis to test whether this paper satisfies the parallel trend. By setting a series of dummy variables to further test the dynamic relationship between tax collection and management of corporate surplus, the resulting parallel trend is shown in Figure 4. The data in this paper are from 2012 to 2019, thus covering the four years before the implementation and the three years after the start of the implementation. The variable of interest in this paper is β_k, which indicates the difference in the degree of surplus management between the treatment group and the control group at the beginning of the k nd year of tax administration. If β_k has a coefficient around 0 in interval $k < 0$, it indicates that the parallel trend hypothesis is met, and if the coefficient has significantly increased or decreased in interval

$k < 0$, it indicates that there is already a significant difference in the level of surplus management between the treatment group and the control group before the introduction of the tax levy, the parallel trend hypothesis is not met. The values of β_k are relatively flat in the two, three and four years before the implementation of tax levy, indicating that there is no significant difference between the companies in the treatment group and the control group before the tax levy. And in the year of tax levy implementation and three years after implementation, β_k starts to decrease significantly and sharply, indicating that the tax levy project significantly reduces the degree of surplus management of companies.
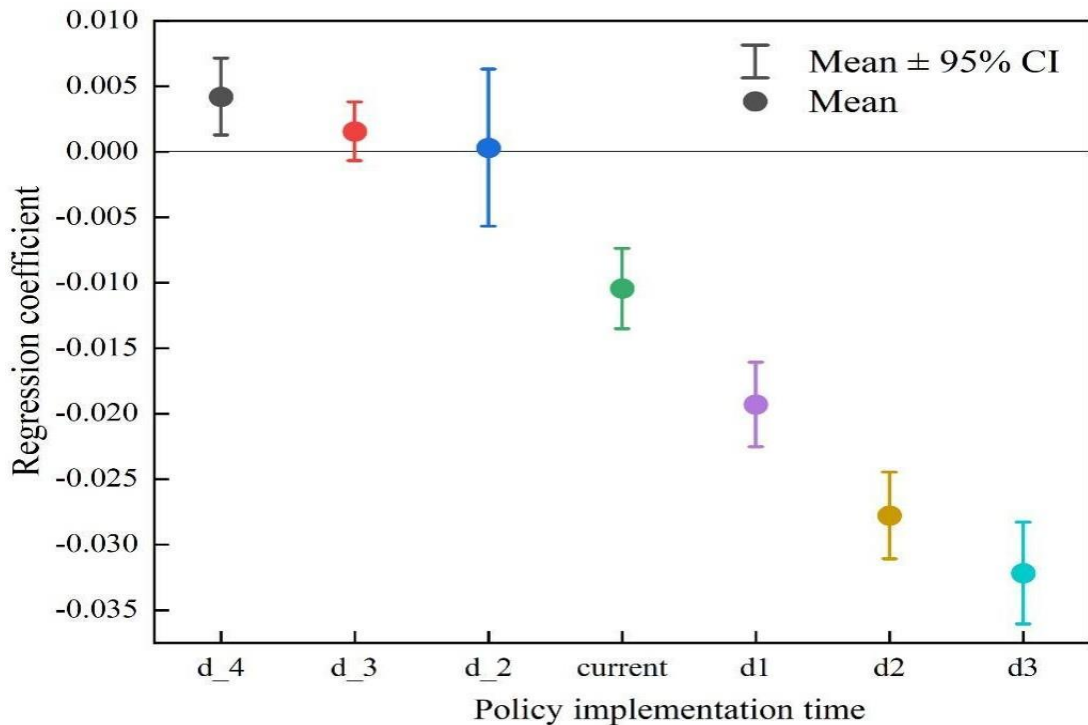

Figure 4. Parallel Trends

Variable correlation test

Figure 5 shows the results of the Pearson correlation analysis for the explanatory variable turnover tax burden. The coefficient between the effect of tax administration policy and turnover tax burden is negative and passes the significance test at the level of 1.2%. It means that tax administration reduces the turnover tax burden of transportation and some modern service companies. The hypothesis is preliminarily verified. Regarding the control variables, it can be preliminarily seen that the profitability, total asset turnover and gearing ratio of enterprises affect the turnover tax burden of enterprises. The policy effect of corporate surplus management and tax collection, profitability

and total asset turnover pass the significance test at the level of 1.25%, with the gearing ratio at the level of 0.005, and with the size of the enterprise at the level of 0.01. Regarding the explanatory variables policy effect has a correlation coefficient of 0.087 with corporate surplus management, indicating that tax collection policies make transportation and some modern service companies increase their surplus management behavior. Regarding the control variables, it can be preliminarily seen that firm profitability, total asset turnover ratio, gearing ratio and firm size all have an effect on firms' surplus management.
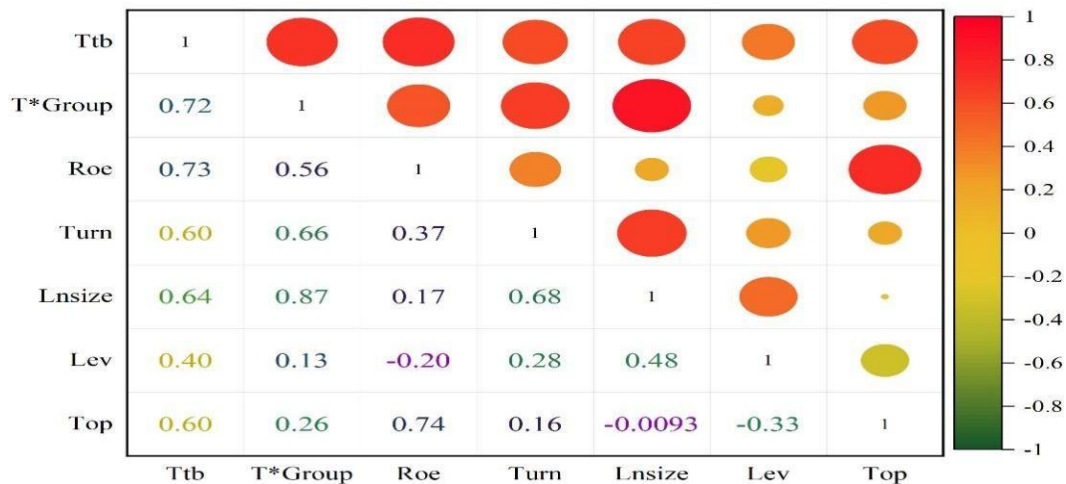

Figure 5. Policy implementation time

Conclusion

This paper constructs a multiple regression model of tax collection and corporate surplus management based on large data of listed companies from 2011 to 2021. The regression test finds that the coefficients of all core explanatory variables are negative and all are significant at the 1.2% level. Accordingly, this paper draws the following policy recommendations:

(1) External governance and internal governance mechanisms should be coordinated and advanced

Enterprises should establish a sound internal management model to monitor the management's tax avoidance activities for their own benefit. Enterprises with low transparency have more room to implement surplus management, so they should improve the transparency of internal financial information and tax-related information disclosure and establish a perfect information disclosure system.

(2) Insist on improving the golden tax system and strengthening the interconnection of tax-related data

Taxation authorities should further improve the ability to guarantee the data security of the information system, do timely maintenance of the taxation information system, improve the

problems in the taxation information system, and strengthen the construction of the "firewall" of the system.

(3) Sound external constraints and strengthen joint supervision of multiple departments

The SFC can strengthen the supervision on the completeness and accuracy of information disclosure for enterprises with high financing needs, and also increase the punishment for companies that have irregularly manipulated surplus management and released false tax information, so as to encourage enterprises to reduce the management's behavior of harming investors' interests and improve the transparency of information.

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