



Examining the behaviour of Chinese high-tech firms throughout their lifecycle of certification: A microeconomic perspective

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Abstract

This study examines whether the behaviour of high-tech firms (earnings management) differs between the period immediately before certification and the period during certification. Additionally, the influence of the Chinese government's equity ownership on the earnings management tendencies of high-tech firms is examined. This study is focused on Chinese companies that are listed on the Chinese stock exchange from 2009 to 2020. Empirical analyses, including descriptive statistics, correlation analysis, and regression analysis, were conducted to obtain the results. The two main findings are as follows: First, during the certification period, high-tech firms tend to engage in earnings-minimising activities, due to the continuous supervision and management required to meet and maintain the certification requirements imposed by the Chinese government. Second, firms with higher equity ownership by the Chinese government tend to engage in more earnings management immediately before achieving high-tech firm certification than during the certification period. This behaviour can be attributed to the differential taxation of high-tech firms and the Chinese government's intensive supervision, management, and regulation of firms. This study contributes to the literature on the impact of government supervision, management, and/or regulations on the level of earnings management activities by high-tech firms. It examines the effect of government ownership of firms and the corporate structure of high-tech firms on earnings management. It also provides foreign investors with information about how high-tech firms and the Chinese government behave in terms of certification.

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1. Introduction

In 2008, China introduced a new corporate income tax law that reduced the corporate tax rate from 33% to a flat 25% and shifted region-specific tax incentives for both foreign and domestic firms to industry-based incentives (Yoo & Park, 2008). The law imposed differential taxation on general and high-tech firms, taxing general firms at a rate of 25% and taxing high-tech firms that meet certain criteria are taxed at a rate of 15%.

To adapt to changes in the tax rates, firms use earnings management through managerial discretion as an internal strategy. Scholes and Wolfson (1992) suggested that as tax rates fall, managers have an incentive to

change the timing of income recognition in order to minimize the firm's tax burden. Accordingly, high-tech firms are expected to adjust their earnings management strategies differently depending on the certification status of the firms. Managers should specifically reduce reported earnings immediately before high-tech certification and delay reported earnings during the certification period.

In China's centralized socialist market economy, state ownership plays an important role in corporate governance. [Xiao and Cooke \(2020\)](#) argued that the government exerts considerable control over corporate decision-making through government supervision and regulation. China's corporate landscape consists of state-owned enterprises, which are wholly state-owned, and private firms, which have become increasingly important since market reforms. Although private firms have greater managerial autonomy with the aim of enhancing competitiveness, the government retains ownership stakes in these firms, which creates agency problems between the government and the management of private firms.

As a result, the choice of corporate structure therefore has a significant impact on the role of government in managerial decisions. Different levels of government ownership are expected to be associated with different levels of government monitoring, supervision, and regulation, influencing earnings management strategies.

Consequently, this study investigates whether the level of earnings management by high-tech firms differs between the periods immediately before and during high-tech certification due to the strict criteria imposed by government supervision. Furthermore, the study examines how government ownership influences the earnings management tendencies of these high-tech firms.

Whereas previous studies evaluated the impact of China's 2008 corporate income tax law on firms' overall tax rates, this study focuses on the unique tax benefit (15% tax rate) granted to high-tech firms compared to general firms and analyses the earnings management dynamics during the periods before and during high-tech certification.

The remainder of this study is structured as follows: Section 2 provides the theoretical background by discussing China's high-tech certification system and formulating the research hypotheses. Section 3 develops the research model to test the hypotheses, outlines the measurement of the variables, and describes the sample selection process. Section 4 presents the empirical results, including descriptive statistics, correlations, and regression results. Finally, Section 5 summarizes the study and presents conclusions.

2. Theoretical Background and Research Hypotheses

2.1. China's High-Tech Enterprise Certification System and Tax Support

With the release of the "National Medium-and Long-term Plan for Science and Technology Development (2006-2020)" in 2006, China initiated a strategic policy to promote the high-tech industry and the industry's development goals from the 11th Five-Year Plan (2006-2010) onwards. The high-tech industry development policy continued in the 12th Five-Year Plan (2011-2015), in which the promotion of seven strategic emerging industries, including the high-tech sector, became a central goal and was accompanied by substantial investment in research and development (R&D) and industrial restructuring ([Park & Sung, 2016](#)).

To qualify as a high-tech firm in China, firms must meet strict certification criteria set out in the 2008 High-Tech Firm Certification and Management Law. These criteria include ownership of intellectual property rights, a research and development (R&D) personnel ratio of at least 10%, a domestic R&D investment ratio of at least 60%, an advanced technology-driven sales ratio of at least 60%, compliance with prohibitions on safety and quality incidents, significant environmental degradation, and related actions. In the current context of China, high-tech firms should engage in production and business activities, and their R&D sector should align with the state designated advanced technology sectors. To generate the profit, these firms must engage in continuous R&D and innovation efforts and secure independent intellectual property rights for their core technologies. Under China's current corporate income tax law, high-tech firms must strictly comply with these certification requirements in order to benefit from the substantial tax incentives.

Under China's Corporate Income Tax Law, certified high-tech firms benefit from substantial tax incentives. The corporate income of these firms is 15%, whereas that of ordinary firms is 25%. In addition, special provisions allow high-tech firms to deduct up to 8% of total personnel expenses as employee training expenses when calculating taxable income. Any amount exceeding 8% of total personnel expenses can be carried forward as a deduction for next tax year.

To obtain certification, high-tech firms must meet a certain level of investment in research and development (R&D). More than 60% of total R&D expenditure must be invested domestically in China, and R&D investment must be equivalent to 5%, 4%, or 3% of revenue, depending on the level of revenue. The Chinese government also incentivizes R&D investment by high-tech firms through subsidies and tax breaks.

As shown in [Figure 1](#), the scale of subsidies and tax incentives for R&D in China has expanded greatly since 2009. Since 2009, China has also provided tax incentives, while the previous focus was on subsidy-based incentives. In summary, with extensive tax incentives available for high-tech firms, firms in China have a significant inventiveness to become high-tech certified.

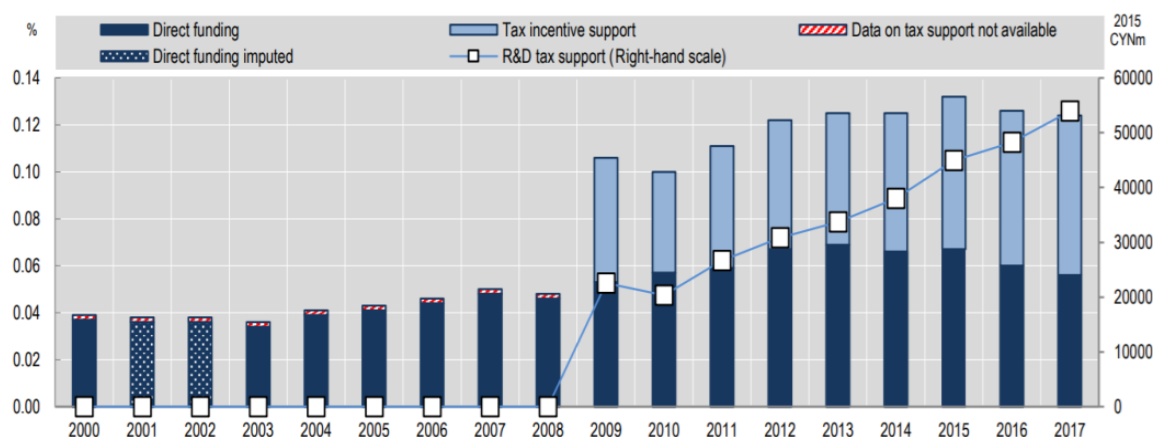


Figure 1. Development of China's R&D-related subsidies and tax incentives.

Source: OECD (2021).

2.2. Review of Previous Research and Research Hypotheses

There is a lack of research on earnings management tendencies in response to high-tech firms' certification in China. Therefore, prior research on earnings management in the context of corporate tax cuts is reviewed to provide a foundation for hypothesis development.

Scholes and Wolfson (1992) analyzed whether managers deferred income into the lower tax rate period in response to the tax rate reduction resulting from the 1985 TRA, managers could defer income by accelerating the recognition of expenses, such as research, advertising, and promotion, in order to minimize the tax burden, and such income deferral incurs costs for firms to restate their earnings and tax costs for trading partners. The results showed that US firms shifted part of their income to the quarter with the lower tax rate in response to the reduced corporate tax burden.

Guenther (1994) analyzed differences in managers' discretionary accruals to minimize corporate taxes in response to the TRA 86 tax rate reductions as a function of fiscal year-end by analyzing managerial discretion for different fiscal year-ends (May, June, July, December). Only firms with a December fiscal year-end had significantly lower discretionary accruals for the months immediately before the tax rate cut than during the tax rate cut period, according to the results.

Lopez, Regier, and Lee (1998) adopted the tax incentive used by Wilkie (1992) to examine whether managers adjusted their earnings management behaviour according to the size of the tax incentive during the TRA 86 period. The results indicated that firms with larger tax benefits reduced discretionary accruals in the year before the tax rate reduction period compared to firms without significant benefits.

Kim and Park (2003) found that firms reduced earnings in the year immediately preceding a tax rate reduction (1993) and increased reported earnings during periods of lower tax rates.

Lee and Yang (2015) examined the role of government regulations as a determinant of firms corporate social responsibility (CSR) activities, and found that the impact of government regulations on firms CSR activities was significant, implying that the level of CSR activities may change depending on the level of enforcement of government regulations: if government regulations are relaxed, the level of firms CSR activities may decline or corporate irresponsibility may increase, and if government regulations are enhanced, like mandatory disclosure of non-financial information related to CSR activities, firms tend to be more active in CSR activities.

Wang and Cai (2019) examined whether earning managements using discretionary accrual or real earnings management exist for listed firms in the process of publicly increasing capital and its relationship with the supervision and management variables by the government policy, and found that there is earnings management activity by listed firms during the application period of government policy for listed firms with publicly increasing capital, and firms earnings management activities tend to be more cautious due to the improvements in relevant government regulations and capital markets.

Chen, Li, Sun, and Yang (2016) examined the effect of regulatory environment on earnings management activities and found that the perfect regulatory environment helps suppressing listed firms to perform earnings management activities, and such listed firms tend to use real earnings management method from earnings management using discretionary accrual.

Liu (2015) showed that earnings management activities using discretionary accrual decrease when firms face pressures from government's regulation, when the chairman serves as the president, or when the size of the board of directors expands.

Ruan and Zhao (2017) showed that government's audit and monitoring activities may suppress real earnings management activities of centralized listed firms, but they may not affect the earnings management activities using discretionary accruals.

In summary, many previous studies have shown that firms tend to shift earnings from the year before a tax rate reduction to the years after the reduction. Thus, this study expects that, in line with the substantial tax benefits for high-tech firms, these firms will defer income from the year before the tax rate reduction to the years after the reduction, giving rise to the following hypotheses:

Hypothesis 1: The level of earnings management differs between the period immediately before and during high-tech firm certification.

Depending on the Chinese government's ownership percentage, firms in China can be either state-owned or privately owned. In state-owned firms, the government owns more than 50% of the shares, which corresponds to China's socialist form of firm, in which the government owns every asset. Since the era of reform and opening-up, private management and capital have established and operated privately owned firms (Xiao & Cooke, 2020). To enhance national and industrial competitiveness, privately owned firms have considerable managerial autonomy, but government influence on managerial decisions still remains significant. According to Wang, Wang, and Gong (2009) firms subject to lower corporate tax rates after the 2008 tax reform significantly adjusted their earnings, while firms subject to higher tax rates did not make significant adjustments. Moreover, higher government ownership is correlated with higher discretionary accruals and higher levels of earnings management by firms (Xu, Kong, & Huang, 2023). Thus, the level of earnings management may differ depending on the percentage of government ownership in both regular and high-tech firms. Considering the different corporate tax rates in the period immediately before high-tech certification and the certification period, the following research hypothesis is formulated:

Hypothesis 2: The ratio of ownership by the Chinese government is correlated with the level of earnings management in the period immediately before high-tech firm certification.

3. Research Models and Data

3.1. Research Models

For the measurement of earnings management, discretionary accruals (DA) and the absolute value of discretionary accruals ($|DA|$) are calculated using the modified Jones (1991) model of Dechow, Sloan, and Sweeney (1995). DA is measured as the residual (ϵ) of Equation 1, which is used for a year-industry regression analysis; ϵ represents the part not explained by total accruals (TA).

$$\frac{TA_{i,t}}{Assets_{i,t-1}} = \alpha \frac{1}{Assets_{i,t-1}} + \beta_1 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{Assets_{i,t-1}} + \beta_2 \frac{PPE_{i,t}}{Assets_{i,t-1}} + \epsilon_{i,t} \quad (1)$$

TA is total accruals measured by the difference between net profit and cash flow from operating activities. $Assets$ denotes total assets. ΔREV and ΔREC are the changes in revenue and account receivable, respectively, compared to the previous year. PPE denotes property, plant, and equipment, excluding land and assets under construction.

The primary variable of interest, PRE , takes a value of 1 if it is the year before high-tech certification, or 0 if the firm is currently undergoing high-tech certification. Otherwise, it is marked as missing. The ratio of the number of government shares to the total shares issued in China measures the government ownership ratio (GOV_Ratio).

Various control variables affecting DA are included based on previous studies (Qi, Lin, Tian, & Lewis, 2018; Zhang, 2019) including firm size ($SIZE$), leverage (LEV), cash flow from operations (CFO), sales growth rate (SGR), return on assets (ROA), and industry dummy variables ($\sum IND$). Firm size ($SIZE$) is a variable related to earnings management according to the political cost hypothesis. It is measured as the natural logarithm of initial total assets. Leverage (LEV), measured by the ratio of the total debt to initial total assets, is related to interest costs and is expected to influence earnings management based on studies related to the debt covenant hypothesis. Operating cash flow (CFO) is considered a control variable because it creates incentives to minimize cash inflows and outflows through earnings management. CFO is standardized by calculating the ratio of operating cash flow to initial total assets. A higher sales growth rate (SGR) indicates a higher probability of earnings management for firms with high growth potential. It is denoted as the percentage change in sales compared to the previous year. Return on assets (ROA) is considered relevant to earnings management because of its association with a firm's profitability and activity indicators. An industry dummy variable ($\sum IND$) is included to control for the potential impact of differences in industry characteristics on changes in the level of earnings management.

$$|DA_{i,t}| = \alpha_0 + \beta_1 PRE_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CFO_{i,t} + \beta_5 SGR_{i,t} + \beta_6 ROA_{i,t} + \sum IND + \epsilon_{i,t} \quad (2)$$

$$|DA_{i,t}| = \alpha_0 + \beta_1 PRE_{i,t} + \beta_2 GOV_Ratio_{i,t} + \beta_3 PRE_{i,t} \times GOV_Ratio_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CFO_{i,t} + \beta_7 SGR_{i,t} + \beta_8 ROA_{i,t} + \sum IND + \epsilon_{i,t} \quad (3)$$

$$DA_{i,t} = \alpha_0 + \beta_1 PRE_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 CFO_{i,t} + \beta_5 SGR_{i,t} + \beta_6 ROA_{i,t} + \sum IND + \epsilon_{i,t} \quad (4)$$

$$DA_{i,t} = \alpha_0 + \beta_1 PRE_{i,t} + \beta_2 GOV_Ratio_{i,t} + \beta_3 PRE_{i,t} \times GOV_Ratio_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 CFO_{i,t} + \beta_7 SGR_{i,t} + \beta_8 ROA_{i,t} + \sum IND + \epsilon_{i,t} \quad (5)$$

Here,

DA: Discretionary accruals, which is an earnings management measure calculated using the modified Jones model from Dechow et al. (1995).

PRE: Measured as 1 if it is the year before high-tech firm certification, and 0 if the firm is currently undergoing high-tech certification (missing if certification is not successful).

GOV_Ratio: Share ratio owned by the Chinese government = Number of state-owned shares ÷ Total number of issued shares.

SIZE: Natural logarithm of the beginning total assets as the firm size.

LEV: Debt ratio = Total liabilities ÷ Total assets at the beginning of the period.

CFO: Cash flow from operating activities ÷ Total assets at the beginning of the period.

SGR: Sales growth rate = (Current sales – Previous sales) ÷ Total assets at the beginning of the period.

ROA: Return on assets.

ΣIND : Industry dummy.

3.2. Data

For this study, data on Chinese firms listed on the Chinese stock market from 2009 to 2020 were extracted from the China Stock Market & Accounting Research (CSMAR) database. The final analytical sample was constructed by selecting firms meeting the following conditions:

- Firms listed in the A-share market.
- Business that conclude their fiscal year in December.
- Firms in non-financial sectors.
- Firms without negative equity.
- Firms with financial information available for analysis.

The final analytical sample consisted of 15,957 firm-year observations, as shown in Table 1. The industry with the largest share of the sample was the manufacturing sector (63.25%).

Table 1. Distribution of the sample by industry (Unit: Firm–years).

Industry	Freq.	Percent
Farming, forestry, animal husbandry, and fishery	108	0.68
Mining	204	1.28
Manufacturing	10,093	63.25
Utilities	86	0.54
Construction	310	1.94
Transportation and warehousing	60	0.38
Information technology	1,460	9.15
Wholesale and retail trade	38	0.24
Real estate	27	0.17
Social services	238	1.49
Communication and cultural industries	86	0.54
Conglomerates	79	0.50
Others	3,168	19.85
Total	15,957	100.00

4. Empirical Analysis Result

4.1. Descriptive Statistics and Correlation Analysis

Table 2 shows the descriptive statistics of the major variables. The mean of discretionary accruals (*DA*), the proxy for earnings management, is 0.0029, with a distribution ranging from -0.4773 to 0.6806. The variable of primary interest, *PRE*, which represents whether a high-tech firm has passed the certification process, has a mean of 0.1657, indicating that certified high-tech firms account for 16.57% of the total analytical sample.

With respect to the control variables, firm size (*SIZE*) has a mean of 21.802 and a standard deviation of 1.137, while leverage (*LEV*) has a mean of 49.15% with a range from 0.74% to 6030.82%. The sample also includes firms with negative operating cash flow, as the mean operating cash flow (*CFO*) ranges from -1.481 to 6.410. The mean sales growth rate (*SGR*) is 0.123 with a standard deviation of 0.928 and ranges from -6.316 to 64.167. The average return on assets (*ROA*) is 0.056, with a range from -9.281 to 19.698, indicating the presence of firms with negative growth rates in the sample.

Table 3 presents the results of the Pearson correlation analysis of key variables. For *DA* representing earnings management level, the period immediately before the certification of high-tech firms (*PRE*) is not statistically significant.

In addition, *DA* is not significantly correlated with the government ownership ratio (*GOV_Ratio*). However, performing a regression analysis undermines reliability by considering significance without taking control variables into account. Among the control variables, *DA* is significantly negatively correlated with leverage (*LEV*) and operating cash flow (*CFO*), and significantly positively correlated with sales growth rate (*SGR*) and return on assets (*ROA*).

Table 2. Descriptive statistics of major variables (N=15,957).

Variable	Mean	Std.	Min.	Q1	Median	Q3	Max.
DA	0.003	0.186	-0.477	-0.040	0.001	0.042	0.681
PRE	0.166	0.372	0.000	0.000	0.000	0.000	1.000
GOV_ratio	0.024	0.094	0.000	0.000	0.000	0.000	0.898
SIZE	21.802	1.137	17.551	20.966	21.657	22.452	27.686
LEV	0.492	0.852	0.007	0.264	0.436	0.622	60.308
CFO	0.059	0.131	-1.481	0.011	0.053	0.099	6.410
SGR	0.123	0.928	-6.316	-0.001	0.064	0.153	64.167
ROA	0.056	0.206	-9.281	0.018	0.047	0.085	19.698

Note: The definitions of the variables are as follows in Equations (2)~(5).

Table 3. Pearson correlation analysis.

Variable	DA	PRE	GOV_ratio	Size
DA	1.000			
PRE	-0.006	1.000		
GOV_ratio	0.011	0.108***	1.000	
SIZE	-0.009	0.089***	0.118***	1.000
LEV	-0.180***	0.033***	0.076***	0.074***
CFO	-0.214***	0.027***	0.031***	-0.005
SGR	0.015*	0.006	0.064***	-0.034***
ROA	0.525***	-0.001	0.011	-0.070***
Variable	LEV	CFO	SGR	ROA
LEV	1.000			
CFO	0.334***	1.000		
SGR	0.626***	0.525***	1.000	
ROA	-0.023***	0.357***	0.258***	1.000

Note: * and *** indicate significance at 10% and 1% levels, respectively. Refer to the note in Table 2 for the definitions of the variables.

4.2. Univariate T-Test Analysis

Table 4 presents the results of t-tests of differences in the level of earnings management and other relevant variables with respect to the period of high-tech firm certification. The level of earnings management (*DA*) does not differ significantly between the periods before and during high-tech firm certification. After being classified as high-tech firms, firms tend to improve their level of earnings management. By contrast, the government ownership ratio (*GOV_Ratio*) differs significantly between the period before and during high-tech firm certification.

Among the control variables, both firm size (*SIZE*), leverage (*LEV*), and operating cash flow (*CFO*) decreased during the period of high-tech firm certification. The sales growth rate (*SGR*) does not differ significantly before and during high-tech firm certification, whereas return on assets (*ROA*) seems to have increased during the period of high-tech firm certification, albeit not significantly.

Table 4. Univariate t-test analysis.

Variable	Before and after certified			
	PRE=1	PRE=0	Mean difference	t-stat.
DA	0.003	0.006	0.003	0.631
GOV_ratio	0.048	0.020	-0.028***	-12.201
SIZE	21.890	21.631	-0.250***	-10.072
LEV	0.548	0.468	-0.080***	-3.713
CFO	0.066	0.056	-0.009***	-3.088
SGR	0.138	0.125	-0.013	-0.715
ROA	0.059	0.060	0.001	0.153

Note: *** indicate significance at 1% levels. Refer to the note in Table 2 for the definitions of the variables.

4.3. Regression Results

The results of the analysis on earnings management by firms prior to high-tech firm certification are presented in Tables 5 and 6. These tables present the results of the regression using discretionary accruals (*DA*), measured using the modified Jones (1991) model proposed by Dechow et al. (1995) or its absolute value $|DA|$ as the dependent variable.

Table 5 presents the results of the analysis conducted using absolute value of discretionary accruals $|DA|$. In Equation 2, the coefficient on *PRE*, which represents the pre-certification period of high-tech firms, is positively significant at the 5% level. This suggests that firms are more likely to engage in earnings management

before the certification period than during it. This interpretation implies that applying for certification leads management to exercise discretion in earnings management to meet the certification requirements imposed by the Chinese government. During the certification period, firms may be subject to continuous monitoring and supervision by the government to ensure compliance with the certification criteria, resulting in less earnings management.

Furthermore, the coefficient on $PRE \times GOV_Ratio$ in Equation 3 is positively significant at the 10% level. This implies that as the government ownership ratio in China increases, the incentive for earnings management prior to the certification of high-tech firms increases relative to that during the certification period. This interpretation is based on the notion that as government ownership increases, firms are subject to stricter government supervision and regulation, which may motivate greater earnings management efforts prior to the high-tech firm certification period.

Table 5. Results of the analysis of earnings management before high-tech firm certification $|DA|$

$ DA $	Equation 2		Equation 3	
	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.428***	17.08	0.426***	16.93
PRE	0.006**	2.19	0.005	1.62
GOV_ratio	-	-	-0.021	-1.51
$PRE \times GOV_ratio$	-	-	0.040*	1.72
SIZE	-0.018***	-17.74	-0.018***	-17.53
LEV	0.149***	93.43	0.149***	93.42
CFO	-0.372***	-38.11	-0.371***	-38.11
SGR	-0.099***	-49.52	-0.099***	-49.51
ROA	0.673***	126.74	0.637***	126.75
$\sum IND$	Included		Included	
F-Value	2037.35***		1698.25***	
Adj. R ²	0.616		0.616	
N	12,675		12,675	

Note: *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively. The definitions of the variables are as follows in Equations (2)–(5). $|DA|$: The absolute value of DA .

Table 6 presents the results of the analysis conducted using discretionary accruals (DA), which indicates the direction of earnings management. In Equation 4, PRE has a significant positive coefficient, suggesting the existence of an upward earnings management phenomenon prior to the certification of high-tech firms. In other words, there is an incentive for managers to discretionarily increase earnings before high-tech firm certification, especially for high-tech firms that receive substantial tax benefits or government subsidies. However, $PRE \times GOV_Ratio$ is not significant. This means that the government ownership ratio in China does not significantly impact earnings management prior to high-tech firm certification.

Table 6. Earnings management direction results using discretionary accruals (DA).

DA	Equation 4		Equation 5	
	Coef.	t-stat.	Coef.	t-stat.
Intercept	-0.279***	-25.90	-0.276***	-25.48
PRE	0.003**	2.45	0.003**	2.14
GOV_ratio	-	-	0.019***	2.87
$PRE \times GOV_ratio$	-	-	-0.004	-0.38
SIZE	0.012***	28.71	0.012***	28.13
LEV	-0.004***	-6.39	-0.004***	-6.49
CFO	-0.867***	-207.12	-0.867***	-207.21
SGR	0.021***	24.40	0.021***	24.32
ROA	0.902***	395.14	0.902***	395.21
$\sum IND$	Included		Included	
F-Value	18629.18***		15535.82***	
Adj. R ²	0.936		0.936	
N	12,675		12,675	

Note: **, and *** indicate significance at 5% and 1% levels, respectively. The definitions of the variables are as follows in Equations (2)–(5).

4.4. Additional Analysis

Addition to DA (and $|DA|$). From the research model of Dechow et al. (1995) this study investigates further by using DA_ROA from Kothari, Leone, and Wasley (2005) performance-matched discretionary accrual, as an earnings management measure, to see whether same results can be achieved. DA_ROA is measured as the

residual (ϵ) of Equation 6, which is used to perform a year-industry regression analysis; ϵ represents the part not explained by total accruals (TA).

$$\frac{TA_{i,t}}{Assets_{i,t-1}} = \alpha \frac{1}{Assets_{i,t-1}} + \beta_1 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{Assets_{i,t-1}} + \beta_2 \frac{PPE_{i,t}}{Assets_{i,t-1}} + \beta_3 ROA_{i,t-1} + \epsilon_{i,t} \quad (6)$$

Tables 7 and 8 present the results of the regression analysis on the level of earnings management for firms prior to high-tech firm certification, using discretionary accruals (DA_ROA), measured using the performance control model proposed by Kothari et al. (2005) or its absolute value $|DA_ROA|$ as the dependent variable.

Table 7 presents the results of the analysis conducted using absolute value of discretionary accruals $|DA_ROA|$. Equation 2 shows that the coefficient on PRE , representing the pre-certification period of high-tech firms, is positively significant at the 1% level. This indicates that firms are more likely to engage in earnings management before the certification period than during the certification period. This interpretation implies that applying for certification leads management to exercise discretion in earnings management to meet the certification requirements imposed by the Chinese government. During the certification period, firms may be subject to ongoing government monitoring and supervision to ensure compliance with the certification criteria, which may reduce earnings management activities.

Equation 3 shows a positively significant coefficient on $PRE \times GOV_Ratio$ at the 10% level, implying that an increase in the government ownership ratio leads to a relatively larger incentive for earnings management before the high-tech firm certification than during the certification period. This interpretation is based on the assumption that firms are subject to stricter government supervision and regulation as government ownership increases. It may motivate greater earnings management efforts prior to the certification period than during the certification period. This result corresponds to the findings in Table 5.

Table 7. Results of the analysis of earnings management before high-tech firm certification_ $|DA_ROA|$.

$ DA_ROA $	Equation 2		Equation 3	
	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.437***	22.15	0.441***	22.25
PRE	0.012***	5.28	0.010***	4.25
GOV_ratio	-	-	0.009	0.83
PRE×GOV_ratio	-	-	0.034*	1.84
SIZE	-0.018***	-22.96	-0.018***	-
				23.07
LEV	0.010***	79.44	0.100***	79.36
CFO	-0.174***	-22.67	-0.174***	-
				22.69
SGR	-0.049***	-31.00	-0.049***	-
				31.07
ROA	0.155***	37.12	0.155***	37.11
$\sum IND$	Included		Included	
F-Value	762.84***		636.77***	
Adj. R2	0.375		0.376	
N	12,675		12,675	

Note: *, and *** indicate significance at 10% and 1% levels, respectively.

The definitions of the variables are as follows in Equations (2)~(5). $|DA_ROA|$: The absolute value of discretionary accruals, earnings management measure calculated using the research model of Kothari et al. (2005).

Table 8 presents the results of the analysis conducted using discretionary accruals (DA_ROA), which indicates the direction of earnings management.

The significant positive coefficient of PRE in Equation 4 suggests the existence of an upward earnings management phenomenon prior to the certification of high-tech firms. In summary, managers may have an incentive to increase earnings before high-tech firm certification, particularly for the firms subject to significant tax benefits or government subsidies.

However, it is important to note that the $PRE \times GOV_Ratio$ is not significant, indicating that government ownership ratio in China may not have a significant impact on earnings management prior to high-tech firm certification. This result aligns with the findings presented in Table 6.

Table 8. Earnings management direction results using discretionary accruals (DA_ROA).

DA_ROA	Equation 4		Equation 5	
	Coef.	t-stat.	Coef.	t-stat.
Intercept	-0.162***	-9.49	-0.151***	-8.82
PRE	0.011***	5.68	0.011***	5.25
GOV_ratio	-	-	0.057***	6.16
PRE×GOV_ratio	-	-	-0.024	-1.49
SIZE	0.007***	10.90	0.007***	10.06
LEV	-0.050***	-46.14	-0.050***	-46.41
CFO	-0.666***	-100.57	-0.666***	-100.79
SGR	0.066***	48.77	0.066***	48.68
ROA	0.380***	105.25	0.380***	105.34
∑IND	Included		Included	
F-value	2349.42***		1968.09***	
Adj. R ²	0.650		0.651	
N	12,675		12,675	

Note: *** indicate significance at 1% levels.

The definitions of the variables are as follows in Equations (2)~(5). *DA_ROA*: Discretionary accruals, earnings management measure calculated using the research model of Kothari et al. (2005).

5. Conclusions

In 2008, China introduced the new Corporate Income Tax Law, which unified the income tax rules for domestic and foreign-invested firms, and China's corporate income tax rules into a single law. Under the previous corporate income tax rules, the tax rate for both domestic and foreign-invested firms was generally 33%. The new corporate income tax law gradually abolished regional preferential policies and set a basic tax rate of 25%.

In addition to tax incentives for technological innovation and scientific development, the Chinese government has a reduced tax rate of 15% for high-tech firms that require government support and nurturing policies. The Chinese government also provides generous subsidies and tax support to high-tech firms. Given the extensive tax support available to these firms, Chinese firms have a strong incentive to meet the criteria for high-tech firm certification.

This study explored potential differences in the level of earnings management of these firms in response to changes in tax rates before and during the high-tech firm certification period. In addition, the study examined whether the level of government supervision and regulation differentially affects the level of earnings management and investigated the impact of the Chinese government's ownership ratio on the level of earnings management of high-tech firms.

This study's key findings are as follows:

First, firms exhibit a higher propensity to engage in earnings management immediately prior to high-tech firm certification than during the certification period itself, suggesting that firms seeking high-tech firm certification in China are motivated to increase earnings by exercising managerial discretion, such as earnings management.

During the certification period, continuous monitoring and management are required to meet and maintain the certification requirements set by the Chinese government, which may lead to a lower level of earnings management.

Second, we find that firms with higher Chinese government ownership have higher levels of earnings management immediately prior to high-tech firm certification than during the certification period. This is the result of the differential taxation of high-tech firms and strict government supervision, management, and regulations.

This paper contributes by providing the policy implications about the impact of supervision, management, and/or regulations by socialist government on the level of earnings management activities by high-tech firms, depending on the government ownership of the firms and corporate structure of high-tech firms. Also, this paper contributes by providing information to foreign investors about how high-tech firms in China and the Chinese government behave regarding the certification.

References

- Chen, K. J., Li, Y. X., Sun, W. Z., & Yang, L. (2016). Institutional constraints or institutional induction? – empirical evidence from the earnings management strategy evolution in Chinese listed companies. *Management Review*, 28(5), 122-136.
- Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. *The Accounting Review*, 70(2), 193-225.
- Guenther, D. A. (1994). Earnings management in response to corporate tax rate changes: Evidence from the 1986 tax reform act. *The Accounting Review*, 69(1), 230-243.
- Jones, J. J. (1991). Earnings management during import relief investigations. *Journal of Accounting Research*, 29(2), 193-228.

- Kim, K. H., & Park, J. I. (2003). Earnings management patterns in response to tax rate reductions. *Korean Accounting Review*, 28(3), 85-120.
- Kothari, S. P., Leone, A. J., & Wasley, C. E. (2005). Performance matched discretionary accrual measures. *Journal of Accounting and Economics*, 39(1), 163-197.
- Lee, G. B., & Yang, E. J. (2015). The determinants of corporate social responsibility: The role of government regulations. *Korea Journal of Business Administration*, 28(9), 2303-2323.
- Liu, X. (2015). Regulation pressure, characteristics of board and choice of earnings management. *Communication of Finance and Accounting*, 15, 49-54. <https://doi.org/10.16144/j.cnki.issn1002-8072.2015.15.012>
- Lopez, T. J., Regier, P. R., & Lee, T. (1998). Identifying tax-induced earnings management around TRA 86 as a function of prior tax-aggressive behavior. *The Journal of the American Taxation Association*, 20(2), 37-56.
- OECD. (2021). *R&D tax incentives: China*. Retrieved from <https://www.oecd.org/en/topics/sub-issues/rd-tax-incentives.html>
- Park, S. D., & Sung, B. S. (2016). An analysis of dynamic co-evolution between private R&D expenditure for inducing innovation and export of new products: An Evidence from Chinese high-tech industry. *The Journal of Northeast Asia Research*, 31(2), 101-126.
- Qi, B. L., Lin, J. W., Tian, G. L., & Lewis, H. C. X. (2018). The impact of top management team characteristics on the choice of earnings management strategies: Evidence of China. *Accounting Horizons*, 32(1), 143-164.
- Ruan, Y., & Zhao, X. (2017). Can government audit supervision restrain earnings management – based on the empirical data of listed companies controlled by central enterprises. *Friends of Accounting*(1), 119-125. <https://doi.org/10.3969/j.issn.1004-5937.2017.01.026>
- Scholes, M., & Wolfson, M. (1992). *Taxes and business strategy: A planning approach*. Englewood Cliff: Prentice-Hall.
- Wang, Y., Wang, L., & Gong, C. (2009). Reform of enterprise income tax, earnings management and its economic consequences. *Economic Research Journal*, 3, 86-98.
- Wang, Z., & Cai, F. (2019). Policy supervision, public issuance and earnings management. *Finance and Accounting Monthly*, 2, 32-40. <https://doi.org/10.19641/j.cnki.42-1290/f.2019.02.004>
- Wilkie, P. J. (1992). Empirical evidence of implicit taxes in the corporate sector. *The Journal of the American Taxation Association*, 14(1), 97-116.
- Xiao, Q. J., & Cooke, F. L. (2020). Towards a hybrid model? A systematic review of human resource management research on Chinese state-owned enterprises (1993-2017). *The International Journal of Human Resource Management*, 31(1), 47-89.
- Xu, W. J., Kong, T. T., & Huang, J. R. (2023). Equity incentives, media supervision, and earnings management. *Friends of Accounting*, 12, 71-79.
- Yoo, H. L., & Park, I. L. (2008). An analysis on the effective corporation tax rate in China. *The Journal of Korean Public Policy*, 10(2), 121-147.
- Zhang, D. N. (2019). Top management team characteristics and financial reporting quality. *The Accounting Review*, 94(5), 349-375.