Modern Economy, 2022, 13, 223-240
https://www.scirp.org/journal/me
ISSN Online: 2152-7261
ISSN Print: 2152-7245

# Earnings Thresholds in Chinese High-Tech Enterprises: The Role of Corporate Income Tax Incentives

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**How to cite this paper:** Liu, Z. J. (2022). Earnings Thresholds in Chinese High-Tech Enterprises: The Role of Corporate Income Tax Incentives. *Modern Economy, 13,* 223-240.
https://doi.org/10.4236/me.2022.133014

**Received:** January 5, 2022
**Accepted:** March 7, 2022
**Published:** March 10, 2022

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## Abstract

To encourage corporate investment in innovation or R & D and to foster innovative firms, the Chinese government established standards for the certification of high-tech enterprises in 2008. Business entities that meet these standards are entitled to tax deductions. The criteria include the proportion of R & D expenses to sales exceeding a certain percentage in the prior 3 years among different sales in the current year. The purpose of this paper is to investigate whether this criteria influence management's preferences for an earnings threshold. This study collects data from 2008 to 2018 from the CSMAR database. All of the 1932 listed high-tech enterprises are included, with a total of 7547 samples. The results indicate: sales of 50 - 200 million yuan in the current year and a proportion of R & D expenses to sales in the prior 3 years before manipulating sales or R & D expense; sales above 200 million yuan in the current year, and that most of these firms' proportion of R & D expenses to sales before manipulating sales or R & D expenses achieved the required ratio to qualify as a high-tech enterprise. Specifically, the results suggest that 88.83% of the listed high-tech enterprises in China focus on R & D activities or innovations, regardless of whether they qualify as a high-tech enterprise according to the Chinese government. However, a few of the samples' proportion of R & D expenses to sales are below 3% in the prior 3 years when their sales exceed 200 million yuan in the current year before the manipulation of sales or R & D expenses. Of these firms, half have a proportion of R & D expenses to sales exceeding 3% after the manipulation of sales or R & D expenses. Overall, the results also support the presence of prospect theory in Chinese-listed high-tech enterprises, because mangers tend manipulate earnings by adjusting sales or R & D expenses to obtain tax benefits.

**Keywords**

Earnings Thresholds, Chinese High-Tech Enterprises, Income Tax Incentives

## 1. Introduction

Between 1995 and 2010, the total output value of China's high-tech industry and the proportion of GDP contributed by this industry continued to rise, thereby continually strengthening its impetus function for the national economy (Guo & Wang, 2013). The economic backbone of China is transforming from traditional industries to the high-tech industry. Compared with firms in traditional industries, those in the high-tech industry usually require to strengthen innovation through R & D policy.

Governments support private R & D investment through R & D policy, which either directly allocates public R & D resources through grants or procurement (i.e., government R & D grants) or provides indirect support through tax incentives (i.e., tax deductions or credits). Under Chinese corporate income tax law, high-tech enterprises have a 15% tax rate, and the statutory tax rate is 25%. In China, high-tech enterprises must meet the standards for certification as a high-tech enterprise as established in 2008 by the Ministry of Science and Technology, the Ministry of Finance, and the State Administration of Taxation. The related requirements are as follows: 1) An enterprise in China must have obtained intellectual property (i.e., technology) for a product through transfer, purchase, independent R & D, or a contribution in the past 3 years or must have obtained a franchise more than 5 years ago. 2) The related technology or service of major product is related with electronic and telecommunications, aircraft and spacecraft, materials, medicine and pharmaceuticals, energy, technology services and advanced technology, or environmental protection. 3) The proportion of employees conducting R & D activities or technology innovation to total staff is not below 10% in any year. 4) The proportion of R & D expenses to sales is not below 6% in the prior 3 years if sales are below 50 million yuan in the current year; the proportion of R & D expenses to sales is not below 4% in the prior 3 years if sales are 50 - 200 million yuan in the current year; and the proportion of R & D expenses to sales is not below 3% in the prior 3 years if sales are more than 200 million yuan in the current year (Each high-tech enterprise certification is valid for a period of up to 3 years. Re-examination is conducted in each year of the certification period; if the proportion of R & D expenses to sales does not meet a given level as specified in a given certification year, no tax deduction is offered in that year). 5) The proportion of sales of advanced technology products or services to total sales is not below 60% in the current year. 6) The enterprise has higher innovation ability and meets the related innovation criteria. However, according to the above rule, items 3, 5, and 6 are not be disclosure strictly; thus, outsiders make obtaining these data more difficult.

Empirical literature has investigated the effects tax incentives on firm earnings management (Mulyadi & Anwar, 2015; Mulyadi et al., 2013; Kapoutsou et al., 2015; Maydew, 1997). The purpose of this paper is to examine whether managers at these companies manage earnings by manipulating sales or R & D expenses in order to qualify as a high-tech enterprise (i.e., the proportion of R & D expenses to sales is not below 6%, 4%, 3%) and receive the associated tax benefits. Previous research has provided mixed evidence on the relative importance of three earnings thresholds that managers seek to achieve: avoiding losses, avoiding earnings declines and avoiding negative earnings surprises. We established the earnings thresholds by examining the meet the standards for certification as a high-tech enterprise as established in 2008 (i.e., the proportion of R & D expenses to sales is above 6%, 4%, 3%) and examined managers make decisions by focusing on the value from gains (i.e., tax incentives) with a certain reference point (i.e., the prospect theory).

This paper contributes to the literature on the criteria influence management's preferences for an earnings threshold and adopts the aforementioned theories (i.e., prospect theory). The results indicate that the listed high-tech enterprises in China are 88.83% firms and included with 6704 samples, pre-managed R & D expenses to pre-managed sales above 4%, 3% in the prior 3 years among different sales in the current year (include proportion of R & D expenses to sales was above 4% in the prior 3 years when sales from 50 million to 200 million in the current year before manipulating sales or R & D expenses). The empirical results also suggest that 843 samples' proportion of R & D expenses to sales was below 3% in the prior 3 years when sales were above 200 million yuan in the current year before manipulating sales or R & D expenses, and half of them exhibited a proportion of R & D expenses to sales above 3% after manipulating sales or R & D expenses to obtain tax credit. The article is organized as follows. Section 1 presents a brief review of the introduction. Section 2 presents a brief review of the related literature. Section 3 details the research design, sample selection procedure, and model development. Section 4 presents our empirical findings. Section 5 contains a summary and conclusion.

## 2. Literature Review

### 2.1. Earnings Management

The literature shows that managers can manage earnings in two ways. First, managers can exercise discretion over accrual choices to reach a desired level of earnings (referred to as accrual-based earnings management; AEM). Accrual-based earnings management includes discretionary accrual items (Dechow et al., 1995), discretionary current accruals (Louis, 2004), and discretionary working capital accruals (Matsumoto, 2002). The method measures discretionary accruals by examining some firm-specific characteristics.

Second, managers can manage earnings by real operating decisions (referred to as real-based earnings management; REM). These actions deviate from nor-

mal business practices, with the primary objective of misleading stakeholders on underlying economic performance. Other researchers argue that to change reported earnings, managers do not necessarily resort to playing around with accounting methods and estimations, and instead may change real operation decisions such as cash flow from operations, production costs, discretionary expenditure (Roychowdhury, 2006; Gunny, 2010); R & D expenditure (Seybert, 2010), and sales manipulation (Ge & Kim, 2014; Stubben, 2010).

Generally, real-based earnings management is viewed more negatively than is accruals-based earnings management (Roychowdhury, 2006; Cohen & Zarowin, 2010) because distorting cash flow through real operation-manipulating activities (Kim & Sohn, 2013) and causes increases noise or errors in earnings, reduces investor expectations on future cash flow levels (Graham et al., 2005; Roychowdhury, 2006; Cohen & Zarowin, 2010). In addition, this approach deviates from optimal business operations, hides a firm's unmanaged earnings, and can be detrimental to a firm's long-term profitability and competitive advantages (Cohen & Zarowin, 2010; Zang, 2012). More seriously, REM is opaque to outside stakeholders (Graham et al., 2005; Zang, 2012) and internal monitors, such as the board and audit committee; accordingly, REM is difficult to detect because it might not be curtailed by good governance mechanisms, and external investors experience difficulty when evaluating firm performance (Kim & Sohn, 2013).

Substantial evidence suggests a significant discontinuity (i.e. a kink) in the distribution of various earnings measures. Degeorge et al. (1999) note that "distribution approach" is effective in detecting earnings management at the relevant thresholds.

Furthermore, empirical studies find that firms engage earnings management to meet earnings benchmarks through accrual items or real activities (Burgstahler & Eames, 2006; Cohen et al., 2010; Hansen, 2010; Sun & Rath, 2012; Mitra et al., 2013). Hansen (2010) suggests that firms with small losses may profit through earnings management. Chen et al. (2010) report that more firms manage earnings to avoid earnings decreases. Chen et al. (2010) show that firms attempt to meet analyst earnings forecasts. An et al. (2014) showed that corporate managers have incentives to report earnings that surpass analyst forecasts, because these benchmark-beating earnings elicit both a positive stock market response and several benefits for managers, whereas earnings that miss forecasts can cause a negative stock market response, with damaging consequences for managers and the firm itself.

### 2.2. Tax and Earnings Management

Corporate tax avoidance influences on taxable income and earnings (Desai & Dharmapala, 2006). Hu et al. (2015) confirm that tax is closely related to firms' earnings management activities. Several studies report that company earnings are manipulated to minimize income tax expenditure (Goncharov & Zimmermann, 2006; Mulyadi & Anwar, 2015; Mulyadi et al., 2013) or reduce earnings to near zero (Marques et al., 2011). Research on tax-induced earnings management

examines both accruals-based (Mulyadi & Anwar, 2015; Mulyadi et al., 2013; Kapoutsou et al., 2015) and real activities-based earnings manipulation for tax purposes (Maydew, 1997).

### 2.3. Earnings Thresholds through Manipulate R & D Expenditure and Sales

Under Chinese corporate income tax law, high-tech enterprises have a 15% tax rate, and the statutory tax rate is 25%. In China, high-tech enterprises must meet the standards for certification as a high-tech enterprise as established in 2008 by the Ministry of Science and Technology, the Ministry of Finance, and the State Administration of Taxation. The standards for the certification of a high-tech enterprise stipulate that the proportion of R & D expenses to sales is not below 6%, 4%, or 3% in the prior 3 years for firms with sales below 50 million yuan, of 50 - 200 million yuan, or more than 200 million yuan in the current year, respectively.

Other researchers argue that to change reported earnings, managers may change real operation decisions such as sales manipulation (Ge & Kim, 2014; Stubben, 2010). R & D expenses are an income statement account because they are subtracted as an expense from the fiscal year's earnings and therefore their magnitude can have an immediate effect on the level of earnings. Researchers also show that R & D expenses are used to manipulate earnings (Gunny, 2010; Guidara & Boujelbene, 2014a, 2014b). Kahneman and Tversky (1979) pointed that managers making decisions focus on the value according to a certain reference point (i.e., prospect theory). Thus, if a firm in China wants to be recognized as a high-tech enterprise and obtain tax benefits, it should meet one of the aforementioned ratios (i.e., earnings thresholds).

Since in international literature the inference about earnings management of results, and that in earnings management studies to assess the earnings of meet certain targets or thresholds results have indicated this practice for listed firms. This study adds to the limited research on earnings management in China. This article tries to answer these enterprises assessed the earnings of meet certain targets or thresholds with manipulate R & D expenditure or sales follow the Chinese government established standards for the certification of high-tech enterprises in 2008. Accordingly, we proposed the following hypothesis:

H1: Managers of high-tech companies listed in China tend to manipulate earnings reports by adjusting sales or R & D expenditures to meet earnings thresholds. This is to secure tax benefits by ensuring that R & D expenses do not fall below 6%, 4%, or 3% of sales in the prior 3 years (for firms with sales of less than 50 million, 50 - 200 million, or more than 200 million yuan, respectively), between 2008 and the current year.

## 3. Methodology

This study collected data from 2008 to 2018 from CSMAR database. All 1932 listed high-tech enterprises are included, for a total of 7547 samples. Firms

whose annual reports include such statements as "certification (along with a specific certification number)" and "subject to 15% income tax" are recognized as high-tech enterprises. These listed high-tech enterprises in China are classified as being in the following sectors: electronics and telecommunications, biotechnology and pharmaceuticals, aircraft and spacecraft, materials, technology services, energy, resources and environmental protection, and advanced technology.

R & D expenses are calculated from financial statements; if these numbers are not presented in financial reports, R & D expenditure is capitalized plus R & D expenditure belonging to general and administrative expenses such as R & D expenses or technological development expense minus development expenditure are expensed. Variables and research model of this research are as follows:

### 3.1. Sales Manipulation

To investigate firms engaging in sales manipulation, it is sufficient to measure abnormal levels of operating cash flows (Tabassum et al., 2015). To measure abnormal CFO level, the following model proposed by Dechow et al. (1998) is used. We estimate a version of the sales manipulation model as follow as

$$\frac{CFO_{i.t}}{TA_{i,t-1}} = \alpha_0 + \alpha_1 \frac{SALES_{i.t}}{TA_{i.t-1}} + \alpha_2 \frac{\Delta SALES_{i.t}}{TA_{i,t-1}} + \varepsilon_{i.t} \tag{1}$$

where $CFO_{i.t}$ is the cash flow from operations for year $t$; $TA_{i,t-1}$ is the assets for year $t-1$; $SALES_{i.t}$ is the sales for year $t$; $\Delta SALES_{i.t}$ is the change in sales for year $t$; Abnormal levels of operating cash flows ($\varepsilon_{it}$) are calculated as the difference between reported and expected operating cash flows, wherein the latter are estimated to use the coefficients from model (1). However, this model only reflects the proportion of $\varepsilon_{it}$ to assets in year $t-1$; therefore, we use $\varepsilon_{it}$ times assets in year $t-1$ to measure discretionary items correctly. In addition, if $\varepsilon_{i.t}$ form model (1) is positive indicating that enterprises have adopted abnormal levels of operating cash flows to earnings management to increase their adjusted income (i.e., increased sales) ; negative indicating that enterprises have adopted abnormal levels of operating cash flows to earnings management to decrease their adjusted income (i.e., decreased sales);

### 3.2. R & D expenses Manipulation (Liu et al., 2014)

$$RD_{it}/TA_{it-1} = \alpha_0 + \alpha_1 \left(1/TA_{it-1}\right) + \alpha_2 \left(S_{it-1}/TA_{it-1}\right) + RDLIU_{it} \tag{2}$$

where $RD_{it}$ is the R & D expenditure of year $t$; $TA_{it-1}$ are the assets for year $t-1$; $S_{it-1}$ is the sales for year $t-1$; and $RDLIU_{it}$ is $\varepsilon_{it}$, thus denoting discretionary R & D for year $t$. We use $\varepsilon_{it}$ to the measure earnings management. However, this model only reflects the proportion of $\varepsilon_{it}$ to assets in year $t-1$; therefore, we use $\varepsilon_{it}$ times assets in year $t-1$ to measure discretionary items correctly. In addition, if $\varepsilon_{i.t}$ form model (2) is positive indicating that enterprises have adopted discretionary R & D expenses to earnings management to decrease their adjusted income(i.e., increase R & D expenses); is negative indi-

cating that enterprises have adopted discretionary R & D expenses to earnings management to increase their adjusted income (i.e., decrease R & D expenses).

### 3.3. Earnings Thresholds

We use $\varepsilon_{it}$ to measure earnings management. However, this model only reflects the proportion of $\varepsilon_{it}$ to assets in year $t-1$; thus, we use $\varepsilon_{it}$ times assets in year $t-1$ to measure discretionary items correctly. Therefore, pre-managed R & D expenses can be expressed as the R & D expenses for year $t$ minus discretionary R & D for year $t$; pre-managed sales can be expressed as the sales for year $t$ minus discretionary sales for year $t$.

A firm in China seeking to be recognized as a high-tech enterprise should meet the related requirements. Managers in listed firms in China may manipulate earnings through sales, R & D expenses, or both to satisfy these criteria and obtain the tax benefits. Thus, we define "earnings thresholds" as follow: 1) the proportion of pre-managed R & D expenses to managed sales is 6%, 4%, or 3% in the prior 3 years for firms with different sales amounts in the current year and which managed earnings only through sales, 2) The proportion of managed R & D expense to pre-managed sales is 6%, 4%, 3% in the prior 3 years for firms with different sales amounts in the current year and which managed earnings only through R & D expense, and 3) the proportion of managed R & D expenses to managed sales is 6%, 4%, or 3% in the prior 3 years for firms with different sales amount in the current year and which managed earnings through both sales and R & D expenses.

### 3.4. Model

We examined the frequency distribution of earnings by using the approach of Burgstahler and Dichev (1997). In this case, if "managed earnings" such as proportion of pre-managed R & D expenses to managed sales, the proportion of managed R & D expenses to pre-managed sales, the proportion of managed R & D expenses to managed sales is above 6%, 4%, or 3% in the prior 3 years among firms with different sales amounts in the current year, namely managed earnings as been exceeding earnings thresholds.

### 3.5. Robustness Test

In China, high-tech enterprises must meet the standards for certification as a high-tech enterprise as established in 2008 by the Ministry of Science and Technology, the Ministry of Finance, and the State Administration of Taxation. The core idea is that high-tech firms whether have adjusted their R & D intensity above the certain percent threshold to qualify for high-tech status since the 2008 reform. These enterprises may have had different accounting strategies before and after 2008. We used data from before 2008[1] to determine how much these enterprises focused on R & D activities or innovation and to examine whether

[1]In China, the financial accounting standards for research and development activities were established in 2006 by the Ministry of Finance and have been effective since 1/1/2007 (namely, Intangible Assets, No. 6).

high-tech enterprises had met the requirements to be recognized as such.

## 4. Empirical Results

### 4.1. Descriptive Statistics

Table 1 showed that the descriptive statistics of sales and R & D expenses model and the estimated cross-section of the discretionary of sales and R & D expenses (all of $\varepsilon_{it}$ is measured by Equation (1) to Equation (2) have been passed T-test), the mean of discretionary sales and discretionary R & D expenses are negative, indicating that high-tech enterprises in china have adopted discretionary sales to earnings management to decrease their adjusted income, however adopted discretionary R & D expenses to earnings management to increase their adjusted income. Overall, discretionary sales of Dechow et al. (1998) model are higher than discretionary R & D expenses model (see **Appendix 1** and **Appendix 2**). Thus, the earnings management behavior regarding sales and R & D expenses in these enterprises was different. Table 2 also shows descriptive statistics, including the

Table 1. Descriptive statistics (2008-2018, $N = 7547$).

| | Max | Min | Avg | standard deviation |
|---|---|---|---|---|
| $\frac{CFO_{i.t}}{TA_{i,t-1}}$ | 2.38 | −3.22 | 0.0476 | 12.26 |
| $\frac{SALES_{i.t}}{TA_{i.t-1}}$ | 22.06 | 0.03 | 0.7193 | 8.36 |
| $\frac{\Delta SALES_{i.t}}{TA_{i,t-1}}$ | 10.65 | −1.48 | 0.1186 | 9.75 |
| $RD_{it}/TA_{it-1}$ | 1.06 | 0.01 | 0.0353 | 8.77 |
| $S_{it-1}/TA_{it-1}$ | 11.42 | 0.03 | 0.6009 | 14.56 |
| $\varepsilon_{it}$ (million) | 11,389 | −70,086 | −204.83 | 11.35 |
| $RDLIU_{it}$ (million) | 15,109.7 | −22,171 | −26.811 | 9.97 |

where $CFO_{i.t}$ is the cash flow from operations for year $t$; $TA_{i,t-1}$ is the assets for year $t-1$; $SALES_{i.t}$ is the sales for year $t$; $\Delta SALES_{i.t}$ is the change in sales for year $t$; where $RD_{it}$ is the R & D expenditure of year $t$; $TA_{it-1}$ are the assets for year $t-1$; $S_{it-1}$ is the sales for year $t-1$; $\varepsilon_{it}$ of the Dechow model for year $t$ (Equation (1)); represents the $RDLIU_{it}$ of the Liu model for year $t$ (equation 2). Source: My primary data source is the CSMAR databases where we calculate yearly observations

Table 2. Descriptive statistics of the ratio of R & D expenses to sales (2008-2018, $N = 7547$).

| | | | |
|---|---|---|---|
| Pre-managed R & D expenses to pre-managed sales | 0.88774 | 0.00432 | 0.06355 |
| Managed R & D expenses to pre-managed sales | 0.99861 | 0.00002 | 0.05475 |
| Pre-managed R & D expenses to managed sales | 0.87615 | 0.00443 | 0.06920 |
| Managed R & D expenses to managed sales | 0.98391 | 0.00002 | 0.05833 |

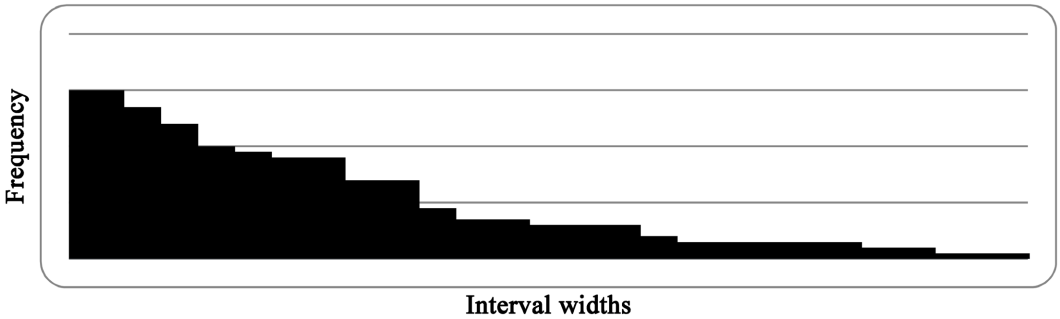
Source: My primary data source is the CSMAR databases where we calculate yearly observations.

ratio of R & D expenses to sales. The average ratios of R & D expenses to sales reveal earnings manipulation.

### 4.2. Empirical Test

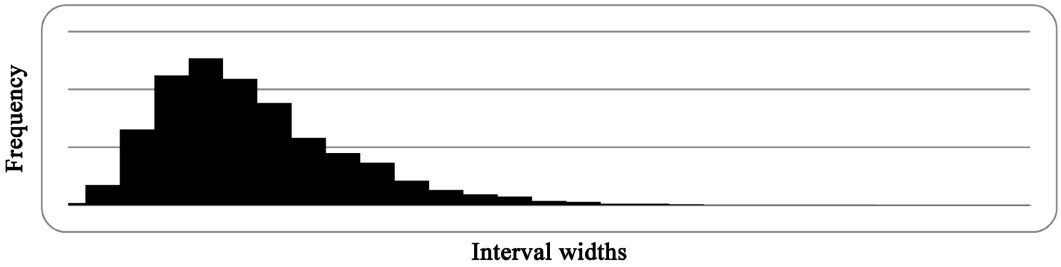
We construct empirical histograms as suggested in Degeorge et al. (1999). According to security law, a firm would like to be listed in china stock market should accumulate above 300 million sales prior 3 years in listed. We can't search out sales below 50 million in the current year of the listed firms in china high-tech enterprises, it is likely that these firms have been listed in stock market, therefore they have bigger size. Additionally, we search out sales from 50 million to 200 million in the current year for 281 samples, however, these firms' pre-managed R & D expenses to pre-managed sales above 4% in the prior 3 years. This is illustrated in **Figure 1**, which indicates a standardization difference between the negative value to the left of zero and the positive value to the right of zero, and this result is consistent with that of El-Sayed Ebaid (2012). Overall, H1, is not supported when sales from 50 million to 200 million in the current year. It is likely that these high-tech enterprises will not manipulate sales or R & D expenses to accordance with related requirements of the recognition "high-tech enterprise", to obtain tax benefits. They invested consistently in R & D, even when the standards for the certification of high-tech enterprises had not been established.

**Figures 2-4** focus on the scenarios when the sales are above 200 million yuan in the current year. This is illustrated in **Figure 2** to **Figure 4** which indicate a standardization difference between the negative value to the left of zero and the positive value to the right of zero, and this result is consistent with that of El-Sayed Ebaid (2012). **Figure 2** showed that pre-managed R & D expenses to pre-managed sales above 3% in the prior 3 years (i.e., pre-managed earnings to the right and are higher than earnings thresholds). Thus, H1 is also not supported. It is likely that these high-tech enterprises will still not manipulate sales or R & D expenses to accordance with related requirements of the recognition "high-tech enterprise", to obtain tax benefits (6423 samples). However, for a portion of the samples



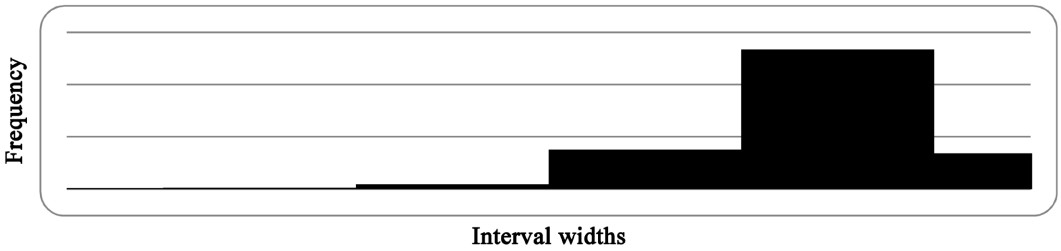

Source: My primary data source is the CSMAR databases where we calculate yearly observations.

**Figure 1.** Histogram of earnings thresholds according to managed earnings level (i.e., sales from 50 million to 200 million in the current year, pre-managed R & D expenses to pre-managed sales above 4% in the prior 3 years) (samples = 281).



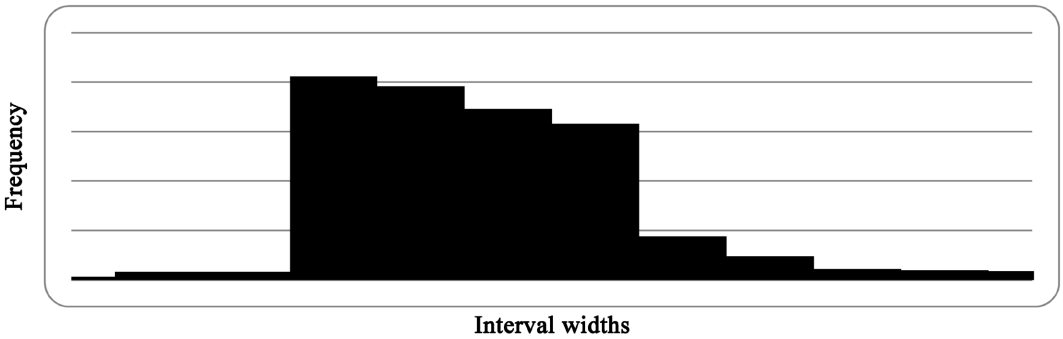

Source: My primary data source is the CSMAR databases where we calculate yearly observations.

**Figure 2.** Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales above 3% in the prior 3 years or not) (samples = 7266).




Source: My primary data source is the CSMAR databases where we calculate yearly observations.

**Figure 3.** Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years and whether caused pre-managed R & D expenses to managed sales above 3% in the prior 3 years or not) (samples = 843).




Source: My primary data source is the CSMAR databases where we calculate yearly observations.

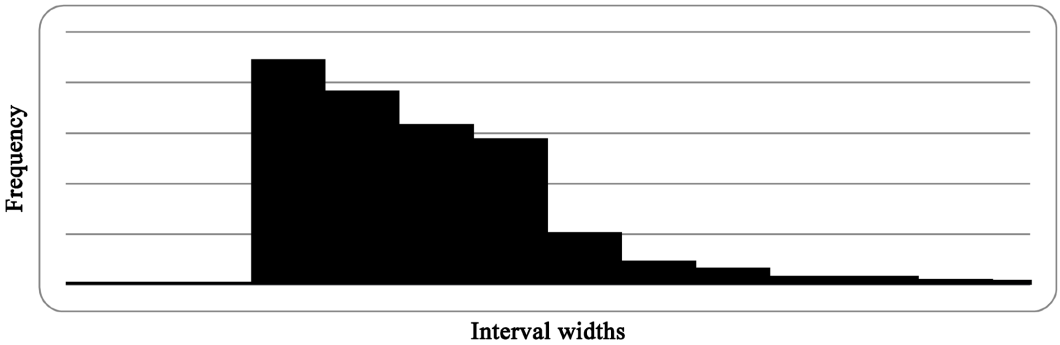
**Figure 4.** Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years and whether caused managed R & D expenses to pre-managed sales above 3% in the prior 3 years or not (samples = 843).

(843 samples), pre-managed R & D expenses totaled < 3% of pre-managed sales in the prior 3 years (i.e., pre-managed earnings to the left are lower than earnings thresholds), as shown in **Figure 2**. Furthermore, **Figure 3** shows that pre-managed R & D expenses totaled > 3% of managed sales (through manipulation of sales data) in the prior 3 years (managed earnings to the right are higher than earnings thresholds). **Figure 4** shows that managed R & D expenses totaled > 3% of pre-managed sales in the prior 3 years (through manipulation of R & D expense

data; managed earnings to the right are higher than earnings thresholds). Figure 5 shows that the proportion of managed R & D expenses was >3% in the prior 3 years (through manipulation of both R & D and sales data; managed earnings to the right are higher than earnings thresholds). Therefore, most of these high-tech enterprises (843 samples) still focus on tax incentives and tend to manipulate earnings through R & D expenses or sales data to meet the related requirements to be recognized as high-tech enterprises (i.e., pre-managed R & D expenses to managed sales, managed R & D expenses to pre-managed sales, or managed R & D expenses to managed sales above 3%). Finally, for a few of the samples, all of these ratios remained below 3%; thus, the degree of manipulation was limited, as can be seen in Figures 3-5. The ratios are lower than 3% because these high-tech enterprises may not focus on tax benefits and not expect to reflect innovation ability and performance through manipulated sales and R & D data.

Overall, all of the listed high-tech enterprises in china are 1932 firms and included with 7547 samples, pre-managed R & D expenses to pre-managed sales above 4%, 3% in the prior 3 years among different sales in the current year are 6704 samples. It is showed that 88.83% of the listed high-tech enterprise in china have been focused on R & D activities whether the qualification of "high-tech enterprises" are established by the China government or not, may because that China government has been support firm invest R & D activities and innovations since 2006.

Although 843 samples are pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years when sales above 200 million in the current year, but most of them still accordance with related requirements of the recognition "high-tech enterprise" through manipulate R & D expenses or both sales and R & D expenses, these empirical results showed that this rule (i.e., related requirements of the recognition with high-tech enterprises) have play an important role in encouraging enterprise investment R & D or innovation activities. Kahneman and Tversky (1979) presented prospect theory and reported that managers



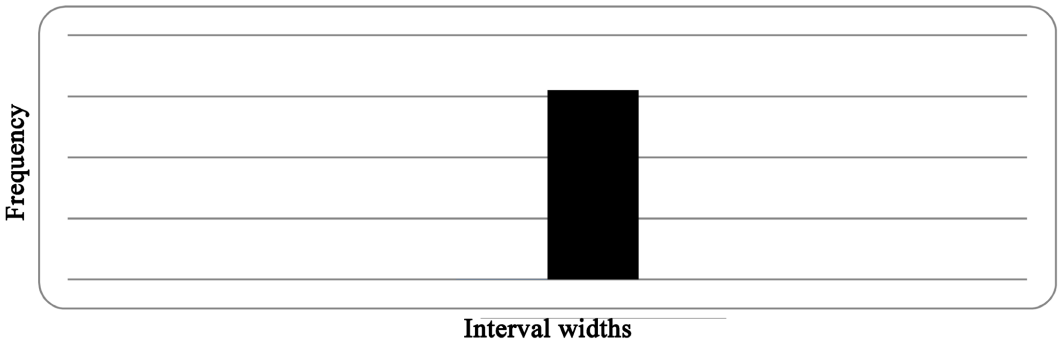

Source: My primary data source is the CSMAR databases where we calculate yearly observations.

Figure 5. Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years and whether caused managed R & D expenses to managed sales above 3% in the prior 3 years or not (samples = 843).

making decisions focus on the value with a certain reference point. The proportion of R & D expenses to sales may be a desired level through earnings management in order to obtain the qualification of high-tech enterprises and obtain tax benefits. We still showed that prospect theory are be supported because pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years when sales above 200 million in the current year, managers of the listed high-tech enterprises manipulate earnings through sales or R & D expenses, caused and R & D expenses to sales above 3% in the prior 3 years. On the other hands, managers of theses high-tech enterprises choice the maximum economic benefits by their-selves (i.e., accordance with high-tech enterprises to obtain tax benefits) and making decisions focus on a certain reference point such as proportion of R & D expenses to sales above 3% in the prior 3 years when sales above 200 million in the current year.

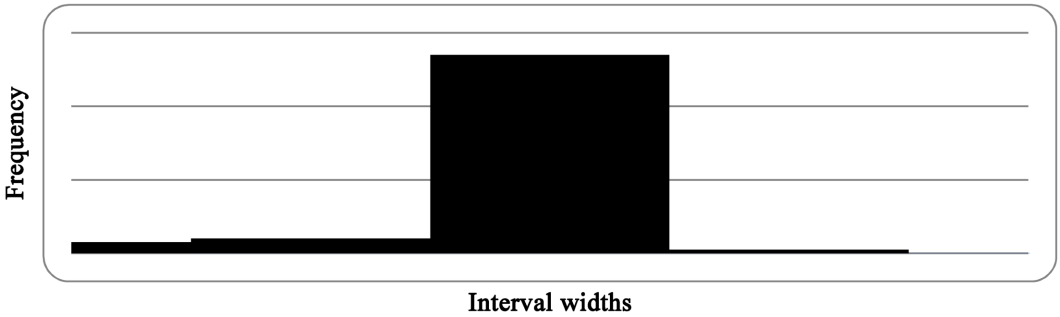
### 4.3. Robustness Test

We repeat the same analyses out of sample to tackle a possible sample specific issue and get general robust results. According to the robustness test, we used these enterprises' data from before 2008, and these sample enterprises only achieved sales above 200 million in the current year. For all of these samples, pre-managed R & D expenses totaled <3% of pre-managed sales in the prior 3 years. **Figures 6-8** indicate a standardization difference between the negative values to the left of zero and the positive values to the right of zero, and this result is consistent with that of El-Sayed Ebaid (2012). **Figure 6** shows that pre-managed R & D expenses totaled < 3% of managed sales in the prior 3 years (i.e., pre-managed earnings to the left are lower than earnings thresholds). **Figure 7** shows that managed R & D expenses totaled > 3% of pre-managed sales in the prior 3 years (i.e., pre-managed earnings to the left are lower than earnings thresholds). **Figure 8** shows that managed R & D expenses totaled > 3% of managed sales in the prior 3 years (i.e., pre-managed earnings to the left are lower than earnings



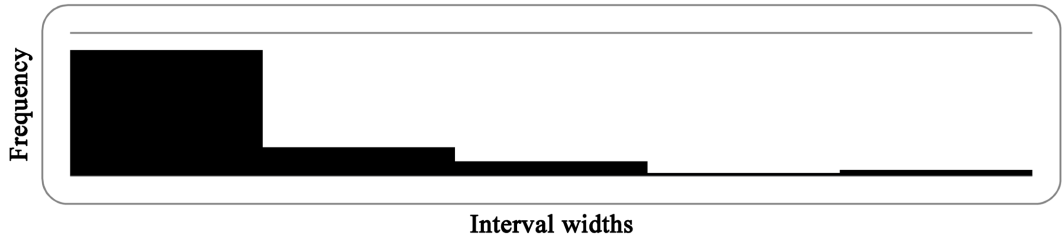

Source: My primary data source is the CSMAR databases where we calculate yearly observations.

**Figure 6.** Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years and whether caused pre-managed R & D expenses to managed sales above 3% in the prior 3 years or not) (samples = 62).




Source: My primary data source is the CSMAR databases where we calculate yearly observations.

**Figure 7.** Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years and whether caused managed R & D expenses to pre-managed sales above 3% in the prior 3 years or not) (samples = 62).




Source: My primary data source is the CSMAR databases where we calculate yearly observations.

**Figure 8.** Histogram of earnings thresholds according to managed earnings level (i.e., sales above 200 million in the current year, pre-managed R & D expenses to pre-managed sales below 3% in the prior 3 years and whether caused managed R & D expenses to managed sales above 3% in the prior 3 years or not) (samples = 62).

thresholds). Even manipulating R & D expenses or R & D expenses and sales reports, most of these enterprises still fail to meet the requirements for being recognized as high-tech enterprises. In accordance with the earnings thresholds determined before 2008, these enterprises probably will not manipulate sales or R & D expense reports. Overall, comparing these enterprises before and after 2008 revealed that this policy (i.e., requirements for being recognized as a high-tech enterprise to obtain tax benefits) caused differences in earnings management behavior, which has played an important role in encouraging enterprises to invest in R & D or innovation activities, especially since 2008.

## 5. Conclusion

Tax deductions associated with high-tech enterprise certification can encourage investment in R & D or innovation. This rule includes the proportion of R & D expenses to sales above a certain percentage in the prior 3 years among different sales in the current year. This ratio is likely a desired reference point for manipulating sales or R & D expenses to qualify as a high-tech enterprise and obtain tax incentives.

This study collected data from 2008 to 2018 from the CSMAR database. All 1932 listed high-tech enterprises were included, for a total of 7547 samples. The

results indicate that firms have sales of 50 - 200 million yuan in the current year and have accordance with 4% in the prior 3 years before manipulating sales or R & D expenses (281 samples); most of the firms with sales above 200 million yuan in the current year had accordance with 3% in the prior 3 years before manipulating sales or R & D expenses (6423 samples). The results also suggested that 88.83% of the listed high-tech enterprises in China were focused on R & D activities or innovations regardless of whether they qualified as a "high-tech enterprise" according to the China government, suggesting that these enterprises prioritize other financial incentives instead of tax incentives.

However, some samples' (843 samples) proportion of R & D expenses to sales was below 3% in the prior 3 years when sales were above 200 million yuan in the current year before manipulating sales or R & D expenses, and half of them exhibited a proportion of R & D expenses to sales above 3% after manipulating sales or R & D expenses. This indicated that tax deductions associated with high-tech enterprise certification incentivized high-tech firms to invest in R & D or innovation. Furthermore, prospect theory is be supported, because these managers of listed high-tech enterprises seek to maximize economic benefits (i.e., obtain tax benefits) and make decisions by focusing on a certain reference point such as maintaining the proportion of R & D expenses to sales above 3% in the prior 3 years when sales are above 200 million yuan in the current year.

The results provide critical implications for regulators and researchers. Some listed high-tech enterprises adjusted their R & D expenses and sales revenue to become certified high-tech businesses and thus be legible for tax deductions. Because of this, the taxation authorities adjusted the proportion of R & D expenses to sales necessary to obtain high-tech enterprise certification, revised the definitions of the R & D expenses-to-sales ratio (whereas a flat ratio is generally adopted in Western countries) to lower the lower limits of each class required to obtain high-tech enterprise certification, tracked the R & D activity of high-tech enterprises, inspected budget reports for source documents and expenses related to R & D activity, verified R & D activity based on intellectual property rights certificates, restricted the manipulation of R & D expense-to-sales ratio, and established a comprehensive taxation management system for R & D expenditure in which R & D spending represents the true level of investment in R & D or innovation. Future studies can compare the financing behavior and capital costs of high-tech firms before and after the firms are certified, or explore the effects of business environments, business strategies, management styles, governance systems, shareholding structures, and risk preferences on the manipulation of sales or R & D expenses by the management team for the purpose of obtaining tax deductions. This study has two limitations. First, because of limited data availability, the findings cannot be generalized to non-listed high-tech firms. Second, the applicability of the proposed R & D expenditure and sales models, which were used to measure earnings manipulation, necessitates further research. Overall, our results of this article are general and can be easily generalised to other places

such as R & D earnings management and listed high-tech firms.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

## References

An, H., Lee, Y. W., & Zhang, T. (2014). Do Corporations Manage Earnings to Meet Exceed Analyst Forecasts? Evidence from Pension Plan Assumption Changes. *Review Accounting Studies, 19,* 698-735. https://doi.org/10.1007/s11142-013-9261-8

Burgstahler, D., & Dichev, I. (1997). Earnings Management to Avoid Earnings Decreases and Losses. *Journal of Accounting and Economics, 24,* 99-126. https://doi.org/10.1016/S0165-4101(97)00017-7

Burgstahler, D., & Eames, M. (2006). Management of Earnings and Analysts' Forecasts to Achieve Zero and Small Positive Earnings Surprises. *Journal of Business Finance & Accounting, 33,* 633-652. https://doi.org/10.1111/j.1468-5957.2006.00630.x

Chen, S. K., Lin, B. X., Wang, Y., & Wu, L. S. (2010). The Frequency and Magnitude of Earnings Management: Time-Series and Multi-Threshold Comparisons. *International Review of Economics and Finance, 19,* 671-685. https://doi.org/10.1016/j.iref.2010.02.005

Cohen, D. A., & Zarowin, P. (2010). Accrual-Based and Real Earnings Management Activities around Seasoned Equity Offerings. *Journal of Accounting and Economics, 50,* 2-19. https://doi.org/10.1016/j.jacceco.2010.01.002

Cohen, D., Mashruwala, R., & Zach, T. (2010). The Use of Advertising Activities to Meet Earnings Benchmarks: Evidence from Monthly Data. *Review Accounting Studies, 15,* 808-832. https://doi.org/10.1007/s11142-009-9105-8

Dechow, P. M., Kothari, S. P., & Watts, R. L. (1998). The Relation between Earnings and Cash Flows. *Journal of Accounting and Economics, 25,* 133-168. https://doi.org/10.1016/S0165-4101(98)00020-2

Dechow, P., Sloan, R., & Sweeney, A. (1995). Detecting Earning Management. *The Accounting Review, 70,* 193-225.

Degeorge, F., Patel, J., & Zeckhauser, R. (1999). Earnings Management to Exceed Thresholds. *Journal of Business, 72,* 1-33. https://doi.org/10.1086/209601

Desai, M. A., & Dharmapala, D. (2006). Corporate Tax Avoidance and High-Powered Incentives. *Journal of Financial Economics, 79,* 145-179. https://doi.org/10.1016/j.jfineco.2005.02.002

El-Sayed Ebaid, I. (2012). Earnings Management to Meet or Beat Earnings Thresholds Evidence from the Emerging Capital Market of Egypt. *African Journal of Economic and Management Studies, 3,* 240-257. https://doi.org/10.1108/20400701211265027

Ge, W. X., & Kim, J. B. (2014). Real Earnings Management and the Cost of New Corporate Bonds. *Journal of Business Research, 67,* 641-647. https://doi.org/10.1016/j.jbusres.2013.01.021

Goncharov, I., & Zimmermann, J. (2006). Earnings Management When Incentives Compete: The Role of Tax Accounting in Russia. *Journal of International Accounting Research, 5,* 41-65. https://doi.org/10.2308/jiar.2006.5.1.41

Graham, J. R., Harvey, C. R., & Rajgopal, S. (2005). The Economic Implications of Corporate Financial Reporting. *Journal of Accounting and Economics, 40,* 3-73.

https://doi.org/10.1016/j.jacceco.2005.01.002

Guidara, R., & Boujelbene, Y. (2014a). Earnings Management around Research and Development Manipulation. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 4,* 26-37.

Guidara, R., & Boujelbene, Y. (2014b). R & D-Based Earnings Management and Accounting Performance Motivation. *International Journal of Academic Research in Accounting, Finance and Management Sciences, 4,* 81-93.

Gunny, K. (2010). The Relation between Earnings Management Using Real Activities Manipulation and Future Performance: Evidence from Meeting Earnings Benchmarks. *Contemporary Accounting Research, 27,* 855-888. https://doi.org/10.1111/j.1911-3846.2010.01029.x

Guo, Y. Y., & Wang, B. (2013). Study on the Economic Growth of Patent Output in the High-Tech Industry. *Journal of Management and Sustainability, 3,* 103-107. https://doi.org/10.5539/jms.v3n1p103

Hansen, J. C. (2010). The Effect of Alternative Goals on Earnings Management Studies: An Earnings Benchmark Examination. *Journal of Accounting Public Policy, 29,* 459-480. https://doi.org/10.1016/j.jaccpubpol.2010.06.002

Hu, N. W., Cao, Q., & Zheng, L. (2015). Listed Companies' Income Tax Planning and Earnings Management: Based on China's Capital Market. *Journal of Industrial Engineering and Management, 8,* 417-434. https://doi.org/10.3926/jiem.1310

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica, 47,* 263-291. https://doi.org/10.2307/1914185

Kapoutsou, E., Tzovas, C., & Chalevas, C. (2015). Earnings Management and Income Tax Evidence from Greece. *Corporate Ownership & Control, 12,* 511-529. https://doi.org/10.22495/cocv12i2c5p1

Kim, J. B., & Sohn, B. C. (2013). Real Earnings Management and Cost of Capital. *Journal of Accounting and Public Policy, 32,* 518-543. https://doi.org/10.1016/j.jaccpubpol.2013.08.002

Liu, C. H., Yuen, C. Y., Yao, L. J., & Chan, S. H. (2014). Differences in Earnings Management between Firms Using US GAAP and IAS/IFRS. *Review of Accounting and Finance, 13,* 134-155. https://doi.org/10.1108/RAF-10-2012-0098

Louis, H. (2004). Earnings Management and the Market Performance of Acquiring Firms. *Journal of Financial Economics, 74,* 121-148. https://doi.org/10.1016/j.jfineco.2003.08.004

Marques, M., Rodrigues, L. L., & Craig, R. (2011). Earnings Management Induced by Tax Planning: The Case of Portuguese Private Firms. *Journal of International Accounting, Auditing and Taxation, 20,* 83-96. https://doi.org/10.1016/j.intaccaudtax.2011.06.003

Matsumoto, D. A. (2002). Management's Incentives to Avoid Negative Earnings Surprises. *Accounting Review, 77,* 483-514. https://doi.org/10.2308/accr.2002.77.3.483

Maydew, E. L. (1997). Tax-Induced Earnings Management by Firms with Net Operating Losses. *Journal of Accounting Research, 35,* 83-96. https://doi.org/10.2307/2491468

Mitra, S., Hossain, A., & Jain, P. (2013). Product Market Power and Management's Action to Avoid Earnings Disappointment. *Review of Quantitative Finance and Accounting, 41,* 585-610. https://doi.org/10.1007/s11156-012-0324-x

Mulyadi, M. S., & Anwar, Y. (2015). Corporate Governance, Earnings Management and Tax Management. *Procedia Social and Behavioral Sciences, 177,* 363-366. https://doi.org/10.1016/j.sbspro.2015.02.361

Mulyadi, M. S., Anwar, Y., & Yanny, L. (2013). Analysis of Corporate Income Tax Rate

Changes and Earnings Management. *Beykent University Journal of Social Sciences, 6,* 138-143.

Roychowdhury, S. (2006). Earnings Management through Real Activities Manipulation. *Journal of Accounting and Economics, 42,* 335-370. https://doi.org/10.1016/j.jacceco.2006.01.002

Seybert, N. (2010). R & D Capitalization and Reputation-Driven Real Earnings Management. *The Accounting Review, 85,* 671-693. https://doi.org/10.2308/accr.2010.85.2.671

Stubben, S. R. (2010). Discretionary Revenues as a Measure of Earnings Management. *The Accounting Review, 85,* 695-717. https://doi.org/10.2308/accr.2010.85.2.695

Sun, L., & Rath, S. (2012). Pre Managed Earnings Benchmarks and Earnings Management of Australian Firms. *Australasian Accounting Business and Finance Journal, 6,* 29-56.

Tabassum, N., Kaleem, A., & Nazir, M. S. (2015). Real Earnings Management and Future Performance. *Global Business Review, 16,* 21-34. https://doi.org/10.1177/0972150914553505

Zang, A. Y. (2012). Evidence on the Trade-Off between Real Activities Manipulation and Accrual-Based Earnings Management. *The Accounting Review, 87,* 675-703. https://doi.org/10.2308/accr-10196

## Appendix 1. Regressions of Dechow et al. (1998) Model

| | Dependent variable: $\frac{CFO_{i,t}}{TA_{i,t-1}}$ | |
|---|---|---|
| | 2007 | 2008-2018 |
| intercept | 0.011 | 0.019*** |
| $\frac{SALES_{i,t}}{TA_{i,t-1}}$ | 0.075*** | 0.041*** |
| $\frac{\Delta SALES_{i,t}}{TA_{i,t-1}}$ | −0.094 | −0.055*** |
| $R^2$ | 0.105 | 0.123 |
| $F$ value | 4.784** | 653.430*** |
| $N$ | 62 | 7547 |

Where $CFO_{i,t}$ is the cash flow from operations for year $t$; $TA_{i,t-1}$ is the assets for year $t-1$; $SALES_{i,t}$ is the sales for year $t$; $\Delta SALES_{i,t}$ is the change in sales for year $t$; $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

## Appendix 2. Regressions of Liu et al. (2014) Model

| | Dependent variable: $RD_{it}/TA_{it-1}$ | |
|---|---|---|
| | 2007 | 2008-2018 |
| intercept | 0.003 | 0.022 |
| $1/TA_{it-1}$ | 681,724.645 | 9,904,131.294 |
| $S_{it-1}/TA_{it-1}$ | 0.006** | 0.006 |
| $R^2$ | 0.056 | 0.037 |
| $F$ value | 12.182*** | 144.763*** |
| $N$ | 62 | 7547 |

Where $RD_{it}$ is the R & D expenditure of year $t$; $TA_{it-1}$ are the assets for year $t-1$; $S_{it-1}$ is the sales for year $t-1$; $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.