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Article

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Do comment letters from the stock exchanges have governance effect on R&D manipulation?

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ABSTRACT

As an important reform of supervision, the comment letter mechanism adopted by the Shanghai Stock Exchange and the Shenzhen Stock Exchange has been paid much attention by regulators and academics. Taking Chinese A-share listed firms from 2015 to 2018 as our samples, this paper investigates the impact of comment letters on companies' R&D manipulation. Our empirical results show that R&D-related comment letters can effectively reduce companies' R&D manipulation. Further tests show that the more timely the comment letters and responses letters, or the stronger the intensity of comment letters, the higher the governance effect of comment letters on R&D manipulations. Specifically, when R&D-related comment letters involve the questions of R&D manipulation directly, the governance effect is pronounced. The governance effect of R&D-related comment letters is stronger for firms which are punished following the receipt of comment letters or firms which are paid more market attention. Finally, from the perspective of motivations of R&D manipulation, the governance effect of R&D-related comment letters is more pronounced in samples with strong tax-reducing incentives. After employing PSM-DID to control endogeneity, the main results are still held. To sum up, our findings enrich the growing body of research on the effectiveness of the comment letter mechanism and provide important implications for improving the resources allocation in R&D.

KEYWORDS

Front-line supervision; R&D-related comment letters; R&D manipulation; timeliness of comment letters; tax-reducing incentives

1. Introduction

Front-Line Supervision is one of the basic functions of the Chinese stock exchanges. In 2013, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) started to promote the Express Train System of information disclosure and transform front-line supervision from ex-ante review to process-review and post-review. The comment letter system is an important mechanism of post-review for the SSE and the SZSE. The most prominent feature of this mechanism is to disclose rules, process and results of information supervision. In October 2020, the State Council issued 'The Opinions on

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Further Improving the Quality of Listed Companies', it is emphasised that the front-line supervision of the stock exchanges should be strengthened and the effectiveness of the supervision on listed companies should be improved. As an important reform of information disclosure, the comment letter mechanism has attracted great attention from regulators and academics (Chen et al., 2019; Cunningham et al., 2020; Gunny & Hermis, 2020).

This paper investigates the governance effect of comment letters on the behaviour of R&D manipulation. We focus on R&D manipulation to investigate the effectiveness of first-line supervision from the stock exchanges for two reasons. The first is that the quality of economic development is determined by the efficiency of firms' R&D investments. R&D investments are the source of corporate innovation and the engine of economic growth (Lerner & Wulf, 2007; Stokey, 1995). To encourage the enthusiasm of innovation and R&D investment, the government reduces the marginal cost by tax incentives (Duchin et al., 2010; Lin et al., 2013). To obtain the benefits of tax reductions, firms tend to manipulate R&D expenditure (Wang, 2016a). From the macro perspective, the Chinese government is pushing forward the strategy of transformation of economic development and economic restructure. The efficiency of R&D investments is critical to this national strategy (Lu, 2011). The innovations encouraged by the government should be hard-core technologies. R&D manipulation not only wastes the national resources and deviate from the original objective of R&D incentive policies, but also obstructs the realisation of national strategy. The Chinese 14th Five Year Plan for national economy and social development also emphasises effective allocation of R&D resources. From the micro perspective, the motivation of voluntary disclosure of R&D information is influenced by high risk and strong monopoly in R&D activities (Cui et al., 2020). Some companies are engaged in R&D manipulation to get tax benefits (G. C. Yang et al., 2017; Wang et al., 2019). An effective supervision can enhance the role of the capital market to improve R&D investment. Given the importance of R&D investment, information disclosures of R&D are the most concerned issues in comment letters from the stock exchanges. In our samples from 2014 to 2017, the proportion of R&D-related comment letters is 25.9%.

When the firms' R&D information disclosure is inadequate or irregular, the stock exchanges will issue comment letters and require the firms to make amendments to reduce the information asymmetry on R&D activities. The regulatory pressure and market attention of comment letters increase the costs and decrease the benefits of R&D manipulation. Therefore, we expect that R&D-related comment letters can decrease the degree of R&D manipulation. In the cross-sectional tests, we expect that when comment letters are more timely or more intensive, the governance effect of comment letters on R&D manipulation is stronger.

Using Chinese A-share listed firms from 2015 to 2018 as our samples, this paper investigates the front-line supervision effect of comment letters on R&D manipulation. The empirical results show that R&D-related comment letters can effectively reduce R&D manipulation. When considering the characteristics of comment letters, we find that the more timely the comment letters and responses, or the stronger the intensity of the comment letters, the greater the governance effect of comment letters on R&D manipulation. Specifically, when R&D-related comment letters have the direct questions on R&D manipulation, the governance effect of the comment letter mechanism is more pronounced. We further test the paths of the governance effect of R&D-related comment letters and find that potential punishment cost and the pressure of market attention can

enhance the governance effect. Finally, the governance effect of R&D-related comment letters on R&D manipulation is more pronounced in samples with strong tax-reducing incentives. The results are robust when endogeneity is addressed.

Our study makes several theoretical and practical contributions. First, from the perspective of external governance of R&D manipulation, this paper tests the effectiveness of the front-line supervision of the stock exchanges, which enriches the research on the economic consequences of targeted supervision. Our results also have an important implication for the R&D information supervision of IPO on the STAR market, which adopts a registration-based IPO system. Prior studies examined the effects of comment letters on firms' information disclosure (Brown et al., 2018; Chen et al., 2018a; Li et al., 2019a), tax avoidance (Kubick et al., 2016), earnings management (Chen et al., 2019; Cunningham et al., 2020), analyst forecasts (Bozanic et al., 2017; Q. Wang, 2016b) and auditors' inputs and outputs (Chen et al., 2018b; Gietzmann & Pettinicchio, 2014), while this paper analyses the governance effect of R&D-related comment letters, especially when the firms are challenged with R&D manipulation directly. We also examine the paths of the governance effects of comment letters, which are rarely studied in the previous literature. We explore the joint effects of media or auditors and front-line supervision from the stock exchange, which shows how to strengthen the collaborative governance of the third-party intermediaries in the process of front-line supervision of the exchanges.

Second, we provide evidences of the regulatory effect of comment letters on R&D manipulation and contribute to the literature on the governance of R&D investment and accounting policy. Prior studies find that accrual-based earnings management of comment letter recipients is decreasing (Chen et al., 2019; Cunningham et al., 2020), while real-activities-based earnings management is increasing (Cunningham et al., 2020). Chen et al. (2019) find no relation between R&D comment letters and discretionary accruals. Most of the existing literature has provided the existence of R&D manipulation (G. C. Yang et al., 2017; G. C. Yang & Rui, 2020; Z. Chen et al., 2018; Wang & Jiang, 2018), but few studies over how to regulate or supervise R&D manipulation. Our study fills this gap and we find that comment letters have significant governance effect on R&D manipulation.

Third, our findings have a critical implication to industrial incentive policies. The existing research on the effectiveness of industrial policies has not reached a consensus (Hou & Yang, 2019; R. L. Yang & Hou, 2019), In particular, Chinese high-tech industrial policies have both an incentive effect and catering effect (G. C. Yang & Rui, 2020). To improve the efficiency of industrial policies, effective supervision is much-needed. Our findings demonstrate that the comment letter mechanism can increase the effective implementation of high-tech industrial policies and promote the ecological construction of technological innovation.

Finally, we find that timely supervision is important. Different from developed countries, issuance and disclosure comment letters from the SSE and the SZSE are much timely in China. We find that timeliness is vital on the governance role of comment letters and has an important implication to supervisors. That is, one way to improve the effectiveness of supervision is to issue comment letters in a timely fashion.

The remainder of this paper is organised as follows: [Section 2](#) briefly reviews related literature on comment letters and R&D manipulation, and [Section 3](#) provides the theory backgrounds and develops hypotheses. [Section 4](#) has research designs and [Section 5](#) presents the main empirical results. [Section 6](#) shows additional analyses and robustness tests, and [Section 7](#) concludes.

2. Literature review

2.1. Literature on comment letters

The comment letters system is also called the inquiry system. Comment letters are issued by the SEC in the United States, while in China they are issued by the Shanghai and the Shenzhen Stock Exchanges. The research on the economic consequences of comment letters focuses on the following aspects: (1) the influence of comment letters on the information environment of companies; (2) the impact of comment letters on the behaviours of top management or companies; (3) the impact of comment letters on the stakeholders' decisions.

First, comment letters can improve the information environment of companies. The disclosure of comments letters can bring negative market reaction and has information content (Chen et al., 2018a), and reduce the information asymmetry in M&A (Li et al., 2019a). Johnston and Petacchi (2017) find that bid-ask spread declines and earnings response coefficients (ERC) increase for comment letter recipients. Bozanic et al. (2017) find that disclosure of comment letters can decrease information asymmetry, and thus reduce firms' litigation risk. From the perspective of fair value, Bens et al. (2016) find that fair-value-related comment letters can reduce the information uncertainty of fair value estimations. In addition, Brown et al. (2018) document that comment letters from the SEC have spillover effects on the industry peers' disclosure of risks.

Second, the comment letter mechanism acts as a double-edged sword on management behaviours. On the one hand, L. M. Cunningham et al. (2020) and Chen et al. (2019) find that comment letters can reduce accrual-based earnings management. Kubick et al. (2016) prove that tax-related comment letters can decrease tax avoidance of firms. Li et al. (2019b) find that firms are more likely to make earnings forecasts and forecasts are more accurate after they receive comment letters from the SSE and the SZSE. Comment letters make the management less likely to hide bad news and mitigate stock price crash risk (Zhang et al., 2018a). On the other hand, comment letters can induce management opportunistic behaviours. For example, Dechow et al. (2016) document that insider trading is much higher prior to disclosure of the SEC revenue-recognition related comment letters. Cunningham et al. (2020) find that comment letters could make management shift from accrual-based earnings management to real-activities-based earnings management.

Finally, the comment letter mechanism plays an important role in the decisions of stakeholders. The number of analysts will increase (Bozanic et al., 2017) and the quality of analysts' forecasts is improved for comment letter recipients (Li et al., 2019a; Q. Wang, 2016b). In terms of auditors, Gietzmann and Pettinicchio (2014) find that auditors tend to increase audit fees of comment letter recipients and even issue more conservative audit

opinions (Chen et al., 2018b). From the aspect of inquiry efficiency, Ballestero and Schmidt (2019) show that firms tend to give their response letters more quickly when comment letters are copied to their auditors.

2.2. Literature on R&D manipulation

Literature on R&D manipulation can be summarised into three topics.

The first is research on motivation of R&D manipulation. R&D activities have a far-reaching impact on economic growth (Fang et al., 2017; Stokey, 1995). Therefore, governments have several incentive policies to encourage enterprises to make R&D investments. Chinese government issued Administrative Procedures on High-tech Enterprises Identification (Administrative Procedures, hereafter) which sets the benchmarks for high-tech enterprises. Usually, to be identified as a High-tech enterprise, the percentage of R&D-related employees and the ratio of R&D investment to revenues must reach the minimum requirements. Only when identified as a high-tech enterprise, can the company enjoy a lower corporate income tax rate of 15%. Some companies will manipulate R&D ratios to reach the benchmarks of a high-tech enterprise. Yang et al. (2017), Wang and Jiang (2018), and Z. Chen et al. (2018) find that the distribution of the ratio of R&D investment to revenues is discontinuous near the regulatory benchmark and it is clustered on the just right of benchmark, which confirms that companies manipulate R&D ratio to get tax benefits. These studies show that there exists asymmetric information in the identification process of high-tech enterprises, which may lead to rent-seeking and ineffectiveness of policies by R&D manipulation (Yang & Rui, 2020).

The second is the economic consequences of R&D manipulation. R&D manipulation is not conducive to the improvement of R&D efficiency, leads to the decline of company performance (Yang et al., 2017; Wang & Jiang, 2018; Wang et al., 2019), and is detrimental to high-quality economic development (Yang et al., 2020). Wan and Xu (2019) find that R&D manipulation decreases the efficiency of R&D incentive policies. Zhang et al. (2017) find that the capitalisation of R&D expenditure decreases the cash flow and thus damages firms' value. The effectiveness of an innovation incentive policy is weakened in samples that manipulate R&D investment (Yang & Rui, 2020).

The third topic is the governance of R&D manipulation, Li et al. (2020) discuss how to increase the supervision efficiency on R&D manipulation by a stochastic evolutionary game model. Wang et al. (2019) find that R&D manipulation decreases in a good legal environment.

To sum up, comment letters have a governance effect on companies' information disclosure and management behaviours. However, the existing literature mainly focuses on the direct effect of comment letters and rarely provides specific paths for these effects. As for R&D incentive policies, the existing literature provides evidence that companies conduct R&D manipulation in order to meet the requirements of high-tech enterprises, but little of the literature explores how to regulate the behaviour of R&D manipulation. Comment letters from the SSE and the SZSE pay much attention to R&D information, which provides us with a good research opportunity. Does the front-line supervision from stock exchanges have a governance effect on R&D manipulation? And if so, what is the specific paths? As far as we are aware, there is no literature to answer these important questions.

3. Theory analysis and hypothesis development

It is critical to improve the efficiency of R&D investment to build an innovation-oriented country. Owing to asymmetric information and rent-seeking, R&D manipulation may lead to misallocating R&D resources and reducing the efficiency of R&D investment. We expect that front-line supervision by the SSE and the SZSE will have a governance effect on R&D manipulation.

First, comment letters have a regulatory effect, which increases the cost of R&D manipulation. In China, the stock exchanges are not only the organisers and operators of the capital market, but also the front-line regulators of the capital market. The exchanges have advantages in information access and collection. In China, the two stock exchanges are vested the power of regulation by the Securities Law and the Rules of the Stock Exchanges. As the regulators of listed companies' information disclosure, the SSE and the SZSE perform regulatory functions under the leadership of the China Securities Regulatory Commission (CSRC) and their front-line supervision has authoritative power. According to the Listing Rules of Stocks, listed companies must take comment letters from the exchanges seriously and give responses to comment letters in a timely fashion. According to the Assessment and Evaluation Methods for Information Disclosure, the two stock exchanges will pay attention to whether the listed companies truthfully reply to the comment letters within the required period. If the listed companies fail to give a reasonable responses or do not reply, further investigations from the CSRC may be triggered. We expect that this kind of authoritative front-line regulatory inquiry will have a significant governance effect on corporate behaviours. For doubtful R&D investment and aggressive recognition and measurement of R&D, the firms will be required to give supplements and explanations in the comments. For example, on 12 May 2018, Kaile Technology Co. Ltd. received a comment letter on its annual report from the SSE.¹ Kaile is challenged the rationality of the increase of R&D investment and required to explain why the rapid increase of R&D investment is not matched with change of R&D personnel. The governance role of the comment letter mechanism is also achieved by attracting the attention of other administrative agencies. Kangmei Pharmaceutical Co. Ltd. is a typical case. In 2019, Kangmei was issued a comment letter on its RMB 30 billion financial fraud by the SSE,² which triggered a following intervention and inspection by the Ministry of Finance, and the whole pharmaceutical industry is involved in this thorough and penetrating investigation.³ The comment letter mechanism can attract the attention of administrative agencies, increase the regulatory risk and the cost of R&D manipulation, and thus mitigate the companies' R&D manipulation behaviours.

Second, comment letters can bring market attention, which reduces R&D manipulation of companies. On the one hand, comment letters have information content, are signals of lower quality of information and reveal the potential problems in R&D expenditures. Media, auditors, analysts and other market participants also pay attention to the contents of comment letters. Thus comment letter recipients will face stronger pressures which increase the cost of information manipulation. Comment letters not only increase the costs of solving the involved problems, but also push up companies' transaction costs. For

¹Please refer to: http://www.sse.com.cn/disclosure/listedinfo/announcement/c/2018-05-12/600260_20180512_2.pdf.

²Please refer to: <https://finance.sina.com.cn/stock/re/news/cn/2019-05-30/doc-ihvhiwv5579651.shtml>.

³Please refer to: http://jdjc.mof.gov.cn/gongzuodongtai/201906/t20190604_3271092.htm.

example, creditors would charge higher interest rates (Cunningham et al., 2017; Hu et al., 2020). On the other hand, comment letters can damage the reputation of companies and their top management. In an effective market, reputation is an important intangible asset and is regarded as a market governance mechanism which can restrict the improper behaviours of companies and top management. Zhang (2002) points out that the reputation mechanism is the basis of legal system and it is reputation other than legal system, to maintain the order of market transactions at a lower cost. For their career development and compensations, top managers often attach great importance to their own reputation. A comment letter usually casts doubts on a company's operation, investments and quality of financial information, which not only brings negative market reaction and public attention to the firm, but also has a negative effect on the management's market reputation and career development. Gietzmann et al. (2016) find that the change of top management increases for comment letter recipients. To reduce the reputation damage and market transaction cost caused by comment letters, the management can reduce opportunistic behaviours such as R&D manipulation. In particular, when R&D investments are explicitly challenged in comment letters (defined as R&D-related comment letters), the tax regulatory authorities and other market participants could be more vigilant with regard to the companies' R&D manipulation, and manipulation costs will increase and manipulation benefits will decrease, thus reducing R&D manipulation.

Third, comment letters can weaken the rent-seeking motivation of R&D manipulation and promote the effective implementation of R&D incentive policy. R&D incentive policy acts as an incomplete contract signed between the government and enterprise. The incompleteness of this contract is that no third party can ensure the effective implementation of the contract (Yang & Hou, 2019). In order to obtain tax reduction, firms have a strong incentive to manipulate R&D expenditures or R&D personnel, which has a negative impact on the effectiveness of a high-tech incentive policy. Comment letters can focus on companies' R&D investment, sustainability of high-tech enterprise identity and compliance of accounting recognition and measurement of R&D expenditures, thus improving the effectiveness of R&D resource integration.

In summary, the governance effect of comment letters comes from regulatory deterrence directly and market pressure indirectly, which compels the management to respond to the comment letters and increase the quality of R&D information. The increased cost and decreased benefits alleviate firms' motivation of R&D manipulation. This governance effect of comment letters on R&D manipulation will be larger for recipients of R&D-related comment letters. Thus, we propose Hypothesis 1 as follows.

H1: Other things being equal, the decrease of R&D manipulation for recipients of R&D-related comment letters will be larger than for recipients of non-R&D-related comment letters.

Both comment and response letters are disclosed in a timely fashion in China. The two stock exchanges require listed companies to respond in time (generally within seven working days from the date of comment letter issuance). The exchanges will rank the listed firms annually by the quality of information disclosure, of which the timely response to a comment letter is an important consideration. On the one hand, R&D manipulation detection, timely comment letters issuance and urging companies to improve the

information disclosure, reflect the efficiency of front-line supervision by the stock exchanges. On the other hand, timely responses to comment letters show that supervision from the exchanges has greater pressure on the recipients and are also signals that the recipients have the motivation and ability to solve problems rapidly. Thus, we expect that timely comment letters and responses have a stronger governance effect on R&D manipulation, and we propose Hypothesis 2a as follows.

H2a: The more timely the comment and response letters, the stronger the governance effect of the comment letter mechanism on R&D manipulation.

The intensity of comment letters may be different owing to the limited regulatory resources of the stock exchanges, the different styles of supervisors, as well as the different financial situations and the information disclosure quality of companies. More comment letters or more questions to a company reflects stronger front-line supervision from the exchanges. A higher intensity of comment letters may imply more problems or serious defects in the information disclosure of recipients and the exchanges have paid more attention to them, which brings stronger pressure and deterrence to the recipients and push them to improve information disclosure and decrease R&D manipulation. So we propose Hypothesis 2b as follows.

H2b: The intensity of comment letters is positively correlated with the governance effect of comment letters on R&D manipulation.

4. Research design

4.1. Sample selection

Comment letters have been publicly disclosed since 2015 in China. We take Chinese A-share listed firms from 2015 to 2018 as our initial samples, and obtain financial data from the China Stock Market and Accounting Research Database (CSMAR). The data of comment letters on annual reports are manually collected from the websites of the SSE, the SZSE and Baidu news (news.baidu.com). We obtained 2321 initial samples of comment letters on annual reports.

We excluded the following observations: (1) firm-years in the financial industry (18 observations); (2) firm-years with missing variables (29 observations); (3) firm-years with sales less than RMB 50 million (42 observations). There are 2232 observations in the final samples, of which 580 comment letters are R&D-related.

4.2. Variable definition

4.2.1. Measure of R&D manipulation

According to Administrative Procedures, the minimum requirements for high-tech enterprises are as follows: the ratio of R&D investment to sales is no less than 4% for a company with sales within RMB 50 million to RMB 200 million; the ratio of R&D investment to sales is no less than 3% for a company with sales over RMB 200 million.

Following Burgstahler and Dichev (1997), Bhojraj et al. (2009), Yang et al. (2017), and Yang and Rui (2020), an R&D manipulation company is defined as the company whose R&D investment is just higher than the minimum requirements. Specifically, we take 0.5% or 1% as the benchmarks respectively. The details of proxy for R&D manipulation are as follows.

(1) Taking 0.5% as the benchmark: When sales are less than RMB 200 million and the ratio of R&D investment to sales is in [4.0%, 4.5%), or when sales are more than or equal to RMB 200 million and the ratio of R&D investment to sales is in [3.0%, 3.5%), *MBB1* takes the value of 1, and 0 otherwise.

(2) Taking 1% as the benchmark: When sales are less than RMB 200 million and the ratio of R&D investment to sales is in [4.0%, 5.0%), or when sales are more than or equal to RMB 200 million and the ratio of R&D investment to sales is in [3.0%, 4.0%), *MBB2* takes the value of 1, and 0 otherwise.

4.2.2. R&D-related comment letters

We download and read comment letters one by one. A comment letter will be defined as R&D-related (*RDCL*) when it includes one or more of the following items: 'mismatch/reasonability between R&D expenditure (investment) and R&D personnel', 'financial or legal conditions for the qualification of high-tech enterprises', 'management expenses vs R&D expenses', 'R&D expense/investment manipulation', 'R&D activities', 'R&D policies', 'R&D projects', 'R&D investment', 'R&D expenses', 'capitalisation of R&D', 'area of R&D investment', 'R&D progress' and 'R&D plan'. If a comment letter contains at least one of these items, *RDCL* takes the value of 1, and 0 otherwise.

4.2.3. The timeliness of comment letters

Following Ballesteros and Schmidt (2019), and Gunny and Hermis (2020), and based on the Chinese setting of comment letters, we proxy the timeliness of comment letters as follows: (1) Timeliness of a comment letter (*CLFtimeless*) is calculated as the number of calendar days between the date of the comment letter from the stock exchange and the date of the annual report. (2) Timeliness of a response letter (*CLHtimeless*) is calculated as the number of calendar days between the date of a company's response to the comment letter and the date of the comment letter from the stock exchange. (3) Composite timeliness (*CLTtimeless*) is calculated as the average value of *CLFtimeless* and *CLHtimeless*.

4.2.4. The intensity of comment letters

We measure the intensity of comment letters using three dimensions: the number of questions in a comment letter (*CLQ*), the number of consecutive years receiving comment letters (*CNumCL*) and the frequency of comment letters within one year (*NumCL*).

When a company receives comment letters from the stock exchange for two/three/four consecutive years during the research period, *CNumCL* takes the value of 2/3/4. If only any one year is inquired inconsecutively, *CNumCL* takes the value of 1.

NumCL is the frequency of comment letters within one year. In our sample, the maximum and minimum of *NumCL* are 3 and 1, respectively.

In regressions, we take the natural logarithm of the above three variables and define them as $\ln CLQ$, $\ln CNumCL$ and $\ln NumCL$, respectively.

4.3. Model specification

To test Hypothesis 1, we design model (1) to examine the governance effect of R&D-related comment letters on R&D manipulation:

$$MBB1_{i,t}/MBB2_{i,t} = \beta_0 + \beta_1 RDCL_{i,t-1} + \beta_m Control_{i,t-1} + Industry + Year + \mu_{i,t} \quad (1)$$

In model (1), $MBB1_{i,t}/MBB2_{i,t}$ are the two dependent variables of R&D manipulation in year t ; $RDCL_{i,t-1}$ is an independent variable that equals 1 if a firm received an R&D-related comment letter in year $t-1$, and 0 otherwise. According to Hypothesis 1, R&D-related comment letters have a governance effect on a company's R&D manipulation and β_1 should be significantly negative.

To test Hypothesis 2a, we divide samples into a timely group and a non-timely group by three measures of timeliness of a comment letter ($CLFtimeless/CLHtimeless/CLTtimeless$), respectively and examine the difference of β_1 between the two groups based on model (1).

To test Hypothesis 2b, we construct the following model (2):

$$MBB1_{i,t}/MBB2_{i,t} = \beta_0 + \beta_1 \ln CLQ_{i,t-1} / \ln CNumCL_{i,t-1} / \ln NumCL_{i,t-1} + \beta_m Control_{i,t-1} + Industry + Year + \mu_{i,t} \quad (2)$$

In models (1) and (2), $Control_{i,t-1}$ is a set of control variables in year $t-1$. Following G. C. Yang et al. (2017) and Wang et al. (2019), we control firm size ($\ln Size_{i,t-1}$), return on total assets ($ROA_{i,t-1}$), financial leverage ($Lev_{i,t-1}$), growth rate of sales ($Growth_{i,t-1}$), state-owned enterprises ($SOE_{i,t-1}$), the high-tech qualification of firms in the prior two years ($Htprior_{i,t-1}$), board size ($DirSize_{i,t-1}$), proportion of independent directors ($IndepRatio_{i,t-1}$), management shareholding ($Mshare_{i,t-1}$), ownership concentration ($Fshare_{i,t-1}$), company age ($\ln Age_{i,t-1}$), cash flow from operations ($CFO_{i,t-1}$), losses ($Loss_{i,t-1}$), auditors ($Big4_{i,t-1}$), political connection ($PC_{i,t-1}$) and punishment by the stock exchanges or the CSRC ($Punishment_{i,t-1}$). In order to control the possible reversal effect of R&D manipulation (sustainability of R&D manipulation), we control the variables of R&D manipulation ($MBB1_{i,t-1}/MBB2_{i,t-1}$) in the year $t-1$. Finally, we include year and industry fixed effects. To mitigate the effect of outliers, all continuous variables are winsorised at 1% and 99% levels. The detailed definitions of all variables are shown in Table 1.

5. Empirical results

5.1. Descriptive statistics

Table 2 reports distributions of comment letters. Panel A presents the distribution of comment letters by year, which shows that comment letters from the two stock exchanges are gradually increasing from 2014 to 2017. The proportion of the R&D-related comment letters is about 25.9% (580/2232). Panel B shows the distribution of comment letters by industry, and about 67.25% (1501/2232) of comment letters are issued to firms in the manufacturing industry.

Table 3 provides the descriptive statistics for main variables. For the two R&D manipulation proxies, the mean of $MBB1_t$ and $MBB2_t$ are 0.088 and 0.165 respectively. These descriptive results are similar to those of Yang et al. (2017). The mean of $RDCL_{t-1}$ is 0.259, indicating that 25.9% of comment letters involve R&D issues. The mean of $CLFtimeless_{t-1}$ is 34.60 days, the

Table 1. Definition of variables.

Variables	Definition
$MBB1_{it}$	Taking 0.5% as benchmark: When sales are less than RMB 200 million and the ratio of R&D investment to sales is in [4.0%, 4.5%), or when sales is more than or equal to RMB 200 million and the ratio of R&D investment to sales is in [3.0%, 3.5%), $MBB1$ takes the value of 1, and 0 otherwise.
$MBB2_{it}$	Taking 1% as benchmark: When sales are less than RMB 200 million and the ratio of R&D investment to sales is in [4.0%, 5.0%), or when sales is more than or equal to RMB 200 million and the ratio of R&D investment to sales is in [3.0%, 4.0%), $MBB2$ takes the value of 1, and 0 otherwise.
$RDCL_{it-1}$	R&D-related comment letter, a dummy variable that equals 1 if the firm received a R&D-related comment letter in year $t-1$, and 0 otherwise.
$CLTimeless_{it-1}$	Timeliness of the receipt of comment letter, calculated as the number of calendar days between the date of comment letter from the stock exchange and the date of annual report.
$CLHTimeless_{it-1}$	Timeliness of response letter, calculated as the calendar days between the date of company's response to a comment letter and the date of comment letter from the stock exchange.
$CLTimeless_{it-1}$	Composite measure of timeliness of comment letter and response letter, calculated as the average of $CLTimeless_{it-1}$ and $CLHTimeless_{it-1}$.
$\ln CLQ_{it-1}$	The natural logarithm of the number of questions in comment letters in year $t-1$.
$\ln \text{Num}C_{it-1}$	The natural logarithm of the number of consecutive years receiving comment letters by the end of year $t-1$.
$\ln \text{Num}C_{it-1}$	The natural logarithm of the frequency of comment letters within year $t-1$.
$Htprior_{it-1}$	A dummy variable that equals 1 if a firm is recognised as a high-tech enterprise in the prior two years, and 0 otherwise.
SOE_{it-1}	A dummy variable that equals 1 if a firm is a state owned enterprise in year $t-1$, and 0 otherwise.
$\ln \text{Size}_{it-1}$	Firm size, measured as the natural logarithm of total assets in year $t-1$.
ROA_{it-1}	Return on total assets, measured as net income divided by average total assets in year $t-1$.
Lev_{it-1}	Financial leverage, measured as total liabilities divided by total assets in year $t-1$.
$Growth_{it-1}$	Growth rate of sales, difference between sales in year $t-1$ and in year $t-2$, and then divided by sales in year $t-2$.
$MShare_{it-1}$	Proportion of shares owned by management team in year $t-1$.
$Fshare_{it-1}$	Proportion of shares owned by the largest shareholder in year $t-1$.
$\ln \text{Age}_{it-1}$	Natural logarithm of one plus firm's listed years by the end of year $t-1$.
IndepRatio_{it-1}	Proportion of independent directors on the board in year $t-1$.
DirSize_{it-1}	Natural logarithm of the number of directors on the board in year $t-1$.
CFO_{it-1}	Net cash flow from operation divided by total assets in year $t-1$.
Big4_{it-1}	A dummy variable that equals 1 if a firm is audited by international Big 4 auditors in year $t-1$, and 0 otherwise.
Loss_{it-1}	A dummy variable that equals 1 if a firm has a negative earnings in year $t-1$, and 0 otherwise.
PC_{it-1}	A dummy variable that equals 1 if a firm's chairman or CEO has served as officer of the government or the military, member of the Chinese People's Political Consultative Conference, or deputy to the People's Congress in year $t-1$, and 0 otherwise.
Punishment_{it-1}	A dummy variable that equals 1 if a firm is punished by the stock exchanges or the CSRC in year $t-1$, and 0 otherwise.
<i>Year</i>	Year effects
<i>Industry</i>	Industry effects

minimum and maximum are 3 days and 81 days respectively. The mean of $CLHTimeless_{t-1}$ is 13.16 days, the minimum is 3 days and the maximum is 70 days. The mean of high-tech qualification enterprises ($Htprior_{t-1}$) is 0.180, which is consistent with Wang et al. (2019).

5.2. Multivariate regression analysis

5.2.1. Comment letters and R&D manipulation (H1)

Table 4 reports the impact of comment letters on R&D manipulation. The dependent variable is $MBB1_t$ or $MBB2_t$ which measure R&D manipulation. In columns (1)–(2), the regression coefficients on $RDCL_{t-1}$ are significantly negative at the 1% level, indicating that the pressure from R&D-related comment letters can significantly decrease R&D manipulation. The results are consistent with expectation in Hypothesis 1.

Table 2. Distribution of comment letters.

Panel A: Distribution of comment letters by year			
Year of annual reports	Comment letters	R&D-related comment letters	Non-R&D-related comment letters
2014	325	58	267
2015	552	124	428
2016	580	161	419
2017	775	237	538
Total	2232	580	1652

Panel B: Distribution of comment letters by industry			
Industries	Comment letters	R&D-related comment letters	Non-R&D-related comment letters
A. Agriculture, forestry, livestock farming and fishery	69	15	54
B. Mining	57	4	53
C. Manufacturing	1501	426	1075
D. Electricity, heat, gas and water production and supply	40	1	39
E. Constructions	85	8	77
F. Wholesale and retail businesses	103	16	87
G. Transportation, warehousing and postal services	33	5	28
H. Hotels and catering services	5	1	4
I. Information transmission, software and information technology service	142	72	70
K. Real estate	74	8	66
L. Leasing and business services	36	8	28
M. Scientific research and technology service	14	4	10
N. Water conservancy, environment and public facilities management	24	1	23
O. Residential services, repair and other services	0	0	0
P. Education	1	0	1
Q. Health and social work	7	1	6
R. Culture, sports and entertainment	29	7	22
S. Comprehensive	12	3	9
Total	2232	580	1652

As for control variables, the regression coefficients on SOE_{t-1} and $Loss_{t-1}$ are all significantly negative, showing that the companies with a strong motivation for tax avoidance (non-state-owned companies and profit companies) are positively correlated with R&D manipulation behaviours. The coefficient on high-tech enterprises ($Htprior_{t-1}$) is significantly positive, indicating that R&D manipulation behaviours are more likely to occur in high-tech enterprises, which is basically consistent with G. C. Yang et al. (2017) and Wang et al. (2019).

5.2.2. The timeliness of comment letters and R&D manipulation behaviour (H2a)

Table 5 reports the impact of timeliness of comment letters on R&D manipulation. Panel A of Table 5 presents the result of timeliness of comment letters. Results for the timely group are reported in columns (1) and (3), the coefficients on $RDCL_{t-1}$ are both significantly negative at the 1% level. The results for the non-timely group are reported in columns (2) and (4), the coefficients on $RDCL_{t-1}$ are both significantly negative at the 10% level. The absolute value of the coefficient in columns (1)/(3) is significantly larger than that in columns (2)/(4). That is, the governance effect of timely comment letters is larger than non-timely comment letters. Panel B of Table 5 presents the results of timeliness of response letters. Panel C of Table 5 presents the results of composite variables of timeliness. The results in Panel B and Panel C are similar to those in Panel A.

Table 3. Descriptive statistics.

Variable	N	Mean	Std. Dev	Min	Median	Max
$MBB1_t$	2232	0.088	0.284	0	0	1
$MBB2_t$	2232	0.165	0.372	0	0	1
$RDCL_{t-1}$	2232	0.259	0.439	0	0	1
$CLFtimeless_{t-1}$	2232	34.60	21.57	3	31	81
$CLHtimeless_{t-1}$	2232	13.16	10.45	3	10	70
$CLTtimeless_{t-1}$	2232	23.84	11.27	4.502	22.50	49.50
$\ln CLQ_{t-1}$	2232	2.216	0.443	0.693	2.197	3.663
$\ln CNumCL_{t-1}$	2232	0.860	0.262	0.693	0.693	1.609
$\ln NumCL_{t-1}$	2232	0.718	0.099	0.693	0.693	1.386
$Htprior_{t-1}$	2232	0.180	0.384	0	0	1
$\ln Size_{t-1}$	2232	22.05	1.083	19.78	22.01	26.05
ROA_{t-1}	2232	0.018	0.062	-0.149	0.018	0.220
Lev_{t-1}	2232	0.460	0.221	0.057	0.457	0.916
$Growth_{t-1}$	2232	0.247	0.711	-0.550	0.088	5.653
SOE_{t-1}	2232	0.242	0.428	0	0	1
$DirSize_{t-1}$	2232	2.096	0.199	1.609	2.197	2.708
$MShare_{t-1}$	2232	0.067	0.130	0	0.002	0.615
$IndepRatio_{t-1}$	2232	0.379	0.055	0.333	0.364	0.571
$Fshare_{t-1}$	2232	0.316	0.141	0.085	0.292	0.750
$\ln Age_{t-1}$	2232	2.337	0.582	0.693	2.303	3.258
CFO_{t-1}	2232	0.023	0.071	-0.179	0.024	0.242
PC_{t-1}	2232	0.272	0.445	0	0	1
$Big4_{t-1}$	2232	0.026	0.158	0	0	1
$Loss_{t-1}$	2232	0.214	0.410	0	0	1
$Punishment_{t-1}$	2232	0.232	0.421	0	0	1

Following Cleary (1999) and Lian et al. (2010), the ‘Bootstrap’ method with 1000 times are taken to test the coefficients difference between timely and non-timely groups. The differences of coefficients between timely and non-timely groups are all significant.

Overall, the results in Table 5 show that the more timely the comment and response letters are, the stronger the governance effect of the comment letter mechanism on R&D manipulation. Hypothesis 2a is verified at all three dimensions of timeliness.

5.2.3. The intensity of comment letters and R&D manipulation (H2b)

Table 6 reports the impact of intensity of comment letters on R&D manipulation. Columns (1)–(2) are the results for the number of questions in comment letters, the coefficients on $\ln CLQ_{t-1}$ are both significantly negative at 1% level. The results for consecutive years of comment letters are shown in columns (3)–(4) of Table 6. The coefficients of $\ln CNumCL_{t-1}$ are also significantly negative at the 1% level. Lastly, the results for $\ln NumCL_{t-1}$ are reported in columns (5)–(6) of Table 6 and they are very similar to $\ln CLQ_{t-1}$ and $\ln CNumCL_{t-1}$.

Overall, the results in Table 6 imply that the greater the intensity of comment letters, the stronger the governance effect of comment letters on R&D manipulation, as expected by Hypothesis 2b.

6. Additional analysis and robustness tests

Results in the main tests show that R&D-related comment letters have a governance effect on R&D manipulation. In order to strengthen our conclusions, we further explore (1) the impact of R&D-manipulation-related comment letters on the governance effect of

Table 4. R&D-related comment letters and R&D manipulation behaviour (H1).

Variable	(1) <i>MBB1_t</i>	(2) <i>MBB2_t</i>
<i>RDCL_{t-1}</i>	-0.744*** (-3.46)	-0.542*** (-3.34)
<i>LnSize_{t-1}</i>	-0.135 (-1.37)	-0.089 (-1.10)
<i>ROA_{t-1}</i>	0.054 (0.03)	-0.393 (-0.29)
<i>Lev_{t-1}</i>	0.989** (2.06)	0.634 (1.59)
<i>Growth_{t-1}</i>	-0.230 (-1.37)	-0.164 (-1.30)
<i>SOE_{t-1}</i>	-0.654** (-2.57)	-0.418** (-2.08)
<i>Htprior_{t-1}</i>	0.393** (2.00)	0.522*** (3.19)
<i>DirSize_{t-1}</i>	0.804 (1.45)	0.209 (0.46)
<i>MShare_{t-1}</i>	-0.663 (-1.01)	-0.430 (-0.78)
<i>IndepRatio_{t-1}</i>	2.296 (1.21)	-0.198 (-0.12)
<i>Fshare_{t-1}</i>	0.769 (1.25)	-0.055 (-0.11)
<i>LnAge_{t-1}</i>	-0.080 (-0.48)	-0.214 (-1.53)
<i>CFO_{t-1}</i>	1.420 (1.09)	2.176** (2.00)
<i>PC_{t-1}</i>	-0.140 (-0.74)	-0.030 (-0.19)
<i>Big4_{t-1}</i>	-0.391 (-0.61)	-0.088 (-0.20)
<i>Loss_{t-1}</i>	-0.685*** (-2.78)	-0.439** (-2.42)
<i>Punishment_{t-1}</i>	-0.455** (-1.99)	-0.362** (-2.03)
<i>MBB1_{t-1}</i>	1.906*** (10.26)	
<i>MBB2_{t-1}</i>		2.319*** (16.21)
Year & Industry	Yes	Yes
Constant	-17.684 (-0.02)	-15.646 (-0.02)
Pseudo <i>R</i> ²	0.175	0.248
<i>χ</i> ²	233.031	496.968
<i>N</i>	2232	2232

Notes: z-statistics are presented in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

comment letters; (2) the impact of company's regulatory cost and market attention pressure on the governance effect of comment letters; (3) the tax avoidance motivation and the governance effect of comment letters on R&D manipulation.

Table 5. The timeliness of comment letters and R&D manipulation (H2a).

Panel A: Timeliness of comment letters				
	timely (1)	non-timely (2)	timely (3)	non-timely (4)
Variable	$MBB1_t$	$MBB1_t$	$MBB2_t$	$MBB2_t$
$RDCL_{t-1}$	-1.059*** (-2.90)	-0.523* (-1.95)	-0.987*** (-3.61)	-0.408* (-1.93)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-2.603 (-0.75)	-1.609 (-0.50)	1.951 (0.68)	-1.725 (-0.61)
Pseudo R^2	0.175	0.129	0.271	0.197
χ^2	103.350	84.439	208.538	173.565
N	1100	1132	1100	1132
Difference (p-value)	0.536* (p = 0.096)		0.579* (p = 0.090)	
Panel B: Timeliness of response letters				
	timely (1)	non-timely (2)	timely (3)	non-timely (4)
Variable	$MBB1_t$	$MBB1_t$	$MBB2_t$	$MBB2_t$
$RDCL_{t-1}$	-1.190*** (-3.52)	-0.580* (-1.93)	-1.163*** (-4.49)	-0.361* (-1.69)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-3.387 (-1.17)	-1.082 (-0.27)	-0.414 (-0.15)	0.721 (0.22)
Pseudo R^2	0.187	0.127	0.262	0.216
χ^2	127.979	86.623	208.789	198.761
N	1103	1129	1103	1129
Difference (p-value)	0.610* (p = 0.085)		0.802** (p = 0.011)	
Panel C: average timeliness of comment letters and response letters				
	timely (1)	non-timely (2)	timely (3)	non-timely (4)
Variable	$MBB1_t$	$MBB1_t$	$MBB2_t$	$MBB2_t$
$RDCL_{t-1}$	-1.206*** (-3.21)	-0.419 (-1.64)	-1.245*** (-4.49)	-0.235 (-1.16)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-0.319 (-0.10)	-4.153 (-1.14)	2.062 (0.74)	-1.365 (-0.44)
Pseudo R^2	0.176	0.135	0.270	0.202
χ^2	115.800	92.939	211.864	183.442
N	1123	1109	1123	1109
Difference (p-value)	0.787** (p = 0.029)		1.010*** (p = 0.001)	

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms. Following Cleary (1999) and Lian et al. (2010), the 'Bootstrap' method with 1000 times are taken to test the coefficients difference between timely and non-timely groups.

6.1. Comment letters and R&D manipulation: when recipients are challenged by R&D manipulation directly

The previous results show that R&D-related comment letters can effectively decrease R&D manipulation of companies. As for the contents of R&D-related comment letters, some focus on the capitalisation and expensing of R&D inputs, which can be classified as earnings management questions. Some involve R&D investment, classification and manipulation of R&D expenses, or the qualification of high-tech enterprises, which can be defined as

Table 6. The intensity of comment letters and R&D manipulation (H2b).

Variable	Numbers of questions of comment letters		Consecutive years receiving comment letters		Numbers of comment letters within one year	
	(1) <i>MBB1_t</i>	(2) <i>MBB2_t</i>	(3) <i>MBB1_t</i>	(4) <i>MBB2_t</i>	(5) <i>MBB1_t</i>	(6) <i>MBB2_t</i>
<i>LnCLQ_{t-1}</i>	-0.561*** (-2.58)	-0.473*** (-2.84)				
<i>LnCNumCL_{t-1}</i>			-1.008*** (-3.06)	-0.771*** (-2.62)		
<i>LnNumCL_{t-1}</i>					-3.034** (-1.97)	-1.772** (-1.99)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-1.453 (-0.59)	0.598 (0.29)	-0.972 (-0.40)	1.136 (0.55)	0.172 (0.06)	1.460 (0.67)
Pseudo <i>R</i> ²	0.138	0.216	0.139	0.217	0.138	0.215
<i>χ</i> ²	170.854	350.565	175.150	360.703	166.523	371.859
<i>N</i>	2232	2232	2232	2232	2232	2232

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

R&D-manipulation-related comment letters. If the theoretical logic of this study is held, within the samples of R&D-related comment letters, it should be expected that the governance effect of R&D-manipulation-related comment letters is greater than in non-R&D-manipulation-related comment letters.

When the R&D-related comment letters involve ‘the mismatch/reasonability between R&D expenditure (investment) and R&D personnel, the qualification of high-tech enterprises, the classification of administrative expenses versus R&D expenses, R&D manipulation, R&D expense/investment manipulation’, they are defined as R&D-manipulation-related comment letters (*RDCLQ_{t-1}* takes the value of 1, and 0 otherwise). The other comment letters are regarded as non-R&D-manipulation-related comment letters (*RDCLNQ_{t-1}* takes the value of 1, and 0 otherwise). In the sample of R&D-related comment letters, the proportion of R&D-manipulation-related comment letters is 15% (87/580).

Table 7 presents the regression results of the targeted comment letters from the exchanges. Columns (1) and (3) are the results for all comment letter samples, the coefficients on *RDCLQ_{t-1}* are significantly negative at the 5% and 1% levels, respectively, while the coefficients on *RDCLNQ_{t-1}* are all significantly negative at the 10% level. The absolute values of coefficients on *RDCLQ_{t-1}* are much larger than those on *RDCLNQ_{t-1}*. Columns (2) and (4) are the results of the sub-sample of R&D-related comment letters, we find that the coefficients on *RDCLQ_{t-1}* are significantly negative at the 10% or 5% level, respectively.

The results in Table 7 show that when recipients are challenged by R&D manipulation directly, the governance effect of comment letters is stronger, which is consistent with theoretical analysis in a hypothesis development section.

Table 7. The governance effect of R&D-manipulation-related comment letters.

Variable	Comment letter samples (1) $MBB1_t$	R&D-related comment letters (2) $MBB1_t$	Comment letter samples (3) $MBB2_t$	R&D-related comment letters (4) $MBB2_t$
$RDCLQ_{t-1}$	-1.562** (-2.10)	-1.800* (-1.70)	-1.232*** (-2.80)	-1.341** (-2.44)
$RDCLNQ_{t-1}$	-0.391* (-1.87)		-0.273* (-1.67)	
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-17.294 (-0.02)	-5.201 (-0.99)	-15.266 (-0.02)	-4.082 (-1.12)
Pseudo R^2	0.172	0.195	0.248	0.116
χ^2	229.933	49.266	497.436	53.560
N	2232	580	2232	580

Notes: z-statistics are given in brackets, ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

6.2. The paths of the governance effect of comment letters

In the theoretical analysis, we argue that the governance effect of comment letters comes from regulatory deterrence and market pressure, which compels the management to respond to the comment letters and increases the costs and decreases the benefits of R&D manipulation. That is, we document that regulatory deterrence and market pressure are the two important paths for the governance effect of comment letters.

In terms of regulatory deterrence, comment letters may arouse the attention of administrative agencies, increase the regulatory cost of recipients. The disclosure of comment letters can also bring market attention. For example, media, auditors, analysts and other market participants may cast doubts on a company's R&D information, which will damage the value of the company and the reputation of management. Therefore, we expect that the governance effect of comment letters on R&D manipulation is more significant in the sample with higher regulatory cost or stronger market attention pressure.

(1) *Proxy of regulatory cost*: We measure regulatory cost by whether the recipient is punished by the stock exchanges or CSRC in the following one or two years. The regulatory risk is higher if the recipient is punished by the regulatory authorities following the receipt of comment letter. Specifically, regulatory costs are defined as follows: (a) if a recipient of a comment letter is punished by the stock exchanges or the CSRC in the following year, $Pcost1$ is set to 1, and 0 otherwise; (b) if a recipient of a comment letter is punished by the stock exchanges or the CSRC in the following two years, $Pcost2$ is set to 1, and 0 otherwise. The means of $Pcost1/Pcost2$ are 0.234 and 0.351, respectively.

(2) *Proxy of market pressure*: We investigate the market attention pressure from three dimensions: media, auditor and analyst.

(a) *Media's attention*. Media act as an important information intermediary in the capital market and play the role of external corporate governance (Dyck et al., 2008). Following Luo and Du (2014), we search and count the news including recipient's name and the word 'comment letter' by Baidu news from the date of the comment letter to the end of year. We use $\ln(1 + \text{numbers of news})$ to proxy for media attention on a comment letter

(*Media*). The mean, minimum and maximum of *Media* are 1.513, 0.693 and 3.610, respectively. We divide the samples into high media attention group and low media attention group according to the median of *Media*.

(b) *Auditor's attention*. An external audit can reduce information asymmetry and perform a governance role (Fan & Wong, 2005). Auditors may be required to verify and issue their opinions on some issues in comment letters. In this situation, the regulatory risk of auditors increases and auditors will be more conservative to the recipients. When an auditor is required to issue their opinions on comment letters, *CKCL* takes the value of 1, and 0 otherwise. The mean of *CKCL* is 0.55 in our samples.

(c) *Analyst tracking*. Analysts perform important roles in a capital market (Yu, 2008), and comment letters can attract analysts' attention (Bozanic et al., 2017). We measure the analysts tracking as the increase of analysts tracking a recipient of a comment letter, namely $Analyst_Vary = \ln(1 + \text{numbers of analysts tracking the receipt of comment letters in year } t) - \ln(1 + \text{numbers of analysts tracking the recipient of comment letters in year } t-1)$.

We use the median of *Analyst_Vary* to divide the high analyst attention group (greater than the median) and the low analyst attention group (less than the median).

Table 8 reports the results of a path test for regulatory cost or risk. The samples are divided into two groups according to whether they are punished by the stock exchanges or CSRC following one or two years (*Pcost1/Pcost2*). The punished (non-punished) companies have higher (lower) regulatory cost. The results for *Pcost1* are shown in Panel A. Columns (1)/(3) present the results for samples with higher regulatory cost, the coefficient on $RDCL_{t-1}$ is significantly negative at the 1% level, the governance effect of comment letters is higher than that in columns (2)/(4) for samples with lower regulatory cost. The results for *Pcost2* are reported in Panel B of Table 8 and very similar to those in Panel A.

Table 9 reports the results of the path of market pressure. (a) Panel A demonstrates the influence of media attention: Column (1) and (3) are the samples with high media attention, the coefficients of $RDCL_{t-1}$ are significantly negative at the 1% level; Columns (2) and (4) are the results for samples with low media attention, the coefficients on $RDCL_{t-1}$ are not significant. It shows that the media attention is a path through which the comment letter mechanism has a governance effect on R&D manipulation behaviour. (b) Panel B presents the impact of the pressure of auditors' attention on the governance effect of comment letters. In columns (1) and (3), the coefficients of $RDCL_{t-1}$ are significantly negative at the 1% level for samples with higher auditors' attention while they are insignificant in columns (2) and (4) for samples with low auditors' attention. Results in Panel B suggest that when auditors are required to issue their opinions on comment letters, the governance effect of comment letters on R&D manipulation is stronger. (c) In Panel C, we test the impact of analyst attention. Coefficients of $RDCL_{t-1}$ are significantly negative at the 1% level in groups of high analyst tracking, and significant at the 5% level in the groups of low analyst tracking, but the difference between the two groups fails to pass the significance test.

Taken as a whole, the comment letter mechanism has a stronger governance effect on R&D manipulation when media attention or auditors' attention is higher, which is consistent with the analysis in hypothesis development.

Table 8. Regulator cost and the governance effect of comment letters.

Panel A: punishment in the following one years				
	High regulatory cost	Low regulatory cost	High regulatory cost	Low regulatory cost
Variable	(1) $MBB1_t$	(2) $MBB1_t$	(3) $MBB2_t$	(4) $MBB2_t$
$RDCL_{t-1}$	-1.583*** (-2.70)	-0.443** (-2.10)	-1.336*** (-2.76)	-0.341* (-1.95)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	1.824 (0.31)	-3.825 (-1.54)	-0.327 (-0.07)	-0.275 (-0.12)
Pseudo R^2	0.245	0.131	0.223	0.228
χ^2	53.189	132.423	62.496	383.105
N	524	1708	524	1708
Difference (p -value)	1.140** ($p = 0.031$)		0.995** ($p = 0.019$)	
Panel B: punishment in the following two years				
	(1)	(2)	(3)	(4)
Variable	$MBB1_t$	$MBB1_t$	$MBB2_t$	$MBB2_t$
$RDCL_{t-2}$	-1.647** (-2.51)	-0.326 (-0.91)	-1.362** (-2.25)	-0.210 (-0.08)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-0.645 (-0.17)	-6.993** (-2.18)	-0.889 (-0.22)	-8.126*** (-2.67)
Pseudo R^2	0.426	0.101	0.474	0.282
χ^2	64.221	113.185	148.138	188.039
N	487	899	487	899
Difference (p -value)	1.321** ($p = 0.027$)		1.152** ($p = 0.032$)	

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms. Following Cleary (1999) and Lian et al. (2010), Bootstrap method with 1000 times is used to analyse the difference of coefficients between two groups.

6.3. The motivation of tax avoidance and the governance effect of comment letters

The most important motivation of R&D manipulation is tax benefits. The stronger the motivation to get tax benefits, the more likely the company is to manipulate R&D investment or expenditure, thus the greater the governance effect of comment letters.

To investigate the impact of the motivation of tax avoidance on the governance effect of comment letters, we proxy the motivation of tax avoidance by the identity of high-tech enterprises, the abnormal accounting-tax difference ($NBTD$)⁴ and the property of ownership (SOE) (G. C. Yang et al., 2017; Wang et al., 2019).

Panel A of Table 10 reports the regression results when the identity of a high-tech enterprise is taken as a proxy of motivation of tax avoidance. Columns (1) and (3) are the results for high-tech enterprises, the coefficients of $RDCL_{t-1}$ are all significantly negative at the 1% level. Columns (2) and (4) report the results for non-high-tech enterprises, the coefficients of $RDCL_{t-1}$ are significantly negative at the 5% and 10% level respectively. The difference of coefficients between high-tech and non-high-tech is significant at the 10%

⁴Following Desai and Dharmapala (2006) and Zhang et al. (2018b), we take the accounting-tax difference excluding accrual profits ($NBTD$) to measure the motivation of tax avoidance. The higher the $NBTD$, the stronger the motivation of tax avoidance.

Table 9. Market attentions and the governance effect of comment letters.

Panel A: the pressure from media attention				
Variable	High media attention	Low media attention	High media attention	Low media attention
	(1) <i>MBB1_t</i>	(2) <i>MBB1_t</i>	(3) <i>MBB2_t</i>	(4) <i>MBB2_t</i>
<i>RDCL_{t-1}</i>	-0.965*** (-3.06)	-0.158 (-0.60)	-0.559*** (-2.72)	-0.099 (-0.48)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-2.780 (-0.91)	-2.550 (-0.82)	-1.785 (-0.69)	-0.205 (-0.07)
Pseudo <i>R</i> ²	0.178	0.129	0.266	0.206
χ^2	108.046	96.568	217.970	199.631
<i>N</i>	1108	1124	1108	1124
Difference (<i>p</i> -value)		0.807** (<i>p</i> = 0.035)		0.460* (<i>p</i> = 0.078)

Panel B: the pressure from auditors' attention				
Variable	Auditor-involved	Non-auditor-involved	Auditor-involved	Non-auditor-involved
	(1) <i>MBB1_t</i>	(2) <i>MBB1_t</i>	(3) <i>MBB2_t</i>	(4) <i>MBB2_t</i>
<i>RDCL_{t-1}</i>	-0.741*** (-2.60)	-0.179 (-0.64)	-0.823*** (-3.69)	-0.180 (-0.62)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-3.938 (-1.07)	-2.196 (-0.75)	-2.797 (-0.96)	-2.408 (-0.79)
Pseudo <i>R</i> ²	0.155	0.143	0.239	0.154
χ^2	95.261	99.277	179.358	176.94
<i>N</i>	1235	997	1235	997
Difference (<i>p</i> -value)		0.562* (<i>p</i> = 0.082)		0.643** (<i>p</i> = 0.042)

Panel C: the pressure from analyst attention				
Variable	High analyst tracking	Low analyst tracking	High analyst tracking	Low analyst tracking
	(1) <i>MBB1_t</i>	(2) <i>MBB1_t</i>	(3) <i>MBB2_t</i>	(4) <i>MBB2_t</i>
<i>RDCL_{t-1}</i>	-0.806*** (-2.80)	-0.631** (-2.15)	-0.607*** (-2.72)	-0.461** (-2.08)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-2.316 (-0.66)	-1.950 (-0.52)	-1.214 (-0.38)	1.242 (0.45)
Pseudo <i>R</i> ²	0.139	0.176	0.276	0.186
χ^2	89.096	100.828	203.824	151.770
<i>N</i>	1137	1095	1137	1095
Difference (<i>p</i> -value)		0.175 (<i>p</i> = 0.332)		0.146 (<i>p</i> = 0.344)

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms. Following Cleary (1999) and Lian et al. (2010), Bootstrap method with 1000 times is used to analyse the difference of coefficients between two groups.

level. That is, the governance effect of the comment letter mechanism on R&D manipulation is more pronounced in high-tech enterprises, which tend to have a strong motivation of tax avoidance.

Abnormal accounting-tax difference (*NBTD*) is another measure of motivation of tax avoidance. The bigger the *NBTD*, the higher the motivation of tax avoidance. We divide the samples into high *NBTD* and low *NBTD* groups according the median of *NBTD* and the regression results are reported in Panel B of Table 10. The results are similar to those in Panel A.

The last variable taken as the proxy for motivation of tax avoidance is the property of ownership. SOEs have lower motivation to reduce taxes than non-SOEs. The tests between SOEs and non-SOEs are also similar to Panel A and B.

The results in Table 10 support our expectation that the governance effect of comment letters is greater for companies with higher motivation of tax avoidance than those with lower motivation of tax avoidance.

Table 10. The motivation of tax avoidance and the governance effect of comment letters.

Panel A: Motivation of tax avoidance: high-tech vs non-high-tech enterprises				
Variable	High-tech enterprises (1) $MBB1_t$	Non-high-tech enterprises (2) $MBB1_t$	High-tech enterprises (3) $MBB2_t$	Non-high-tech enterprises (4) $MBB2_t$
$RDCL_{t-1}$	-1.268*** (-2.64)	-0.566** (-2.43)	-0.953*** (-3.02)	-0.301* (-1.70)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-4.168 (-0.77)	-1.018 (-0.36)	-2.203 (-0.50)	1.612 (0.71)
Pseudo R^2	0.240	0.126	0.190	0.150
χ^2	81.663	117.292	80.359	200.537
N	402	1830	402	1830
Difference (p -value)		0.702* ($p = 0.080$)		0.652* ($p = 0.076$)
Panel B: Motivation of tax avoidance: abnormal accounting-tax difference (NBTD)				
	High NBTD $MBB1_t$	Low NBTD $MBB1_t$	High NBTD $MBB2_t$	Low NBTD $MBB2_t$
$RDCL_{t-1}$	-0.959*** (-3.51)	-0.165 (-0.69)	-0.852*** (-4.08)	-0.170 (-0.70)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-4.667 (-1.42)	2.020 (0.59)	-1.756 (-0.67)	2.240 (0.65)
Pseudo R^2	0.190	0.220	0.239	0.222
χ^2	162.703	172.738	225.867	171.742
N	1113	1119	1113	1119
Difference (p -value)		0.794** ($p = 0.020$)		0.682** ($p = 0.025$)
Panel C: Motivation of tax avoidance: SOE vs non-SOE				
	Non-SOEs $MBB1_t$	SOEs $MBB1_t$	Non-SOEs $MBB2_t$	SOEs $MBB2_t$
$RDCL_{t-1}$	-0.890*** (-3.64)	-0.246 (-0.56)	-0.602*** (-3.43)	0.010 (0.02)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	-5.016* (-1.81)	0.893 (0.18)	0.751 (0.34)	-2.122 (-0.52)
Pseudo R^2	0.190	0.162	0.229	0.295
χ^2	178.601	72.269	273.053	96.326
N	1690	542	1690	542
Difference (p -value)		0.644* ($p = 0.077$)		0.612* ($p = 0.051$)

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms. Following Cleary (1999) and Lian et al. (2010), the Bootstrap method is used to analyse the difference coefficient of independent variables between these groups, a total of 1000 repeated times are taken.

6.4. Robustness tests

6.4.1. Endogeneity issues

(1) *Difference-in-differences analysis.* To mitigate the endogeneity arising from the causal relationship between comment letters and the R&D manipulation, we follow previous studies (Chen et al., 2019; Cunningham et al., 2020) to perform difference-in-differences (DID) regression to address the potential endogeneity. Specifically, we expand the sample period from 2012 to 2018, which enables us to compare the changes from pre- and post-comment letters between comment letter recipients and non-comment letter recipients.

First, we take the propensity score matching (PSM) method⁵ based on one-to-one, the nearest neighbour matching principle to construct the treatment group and control group in the same year.

Second, we include up to two years before the receipt of a comment letter and two years after the receipt of a comment letter for both the treatment firms and the control firms. Then we define the key explanatory variables in the DID model: *Treat* equals 1 for the treatment firms (i.e. firms that receive R&D-related comment letters) and 0 for control firms (the propensity-score-matched firms). For both treatment firms and control firms, we define *After* which equals to 1 in the years after the receipt of comment letters, and 0 otherwise. Finally, we construct the following DID model:

$$MBB1_{i,t}/MBB2_{i,t} = \beta_0 + \beta_1 Treat_{i,t} \times After_{i,t} + \beta_2 After_{i,t} + \beta_3 Treat_{i,t} + \beta_m Control_{i,t-1} + Industry + Year + \mu_{i,t} \quad (3)$$

Control variables (*Control_{it}*) in model (3) are same as those in model (1). What we are concerned with is the coefficient of *Treat*×*After*, which shows the difference in governance effect on R&D manipulation (*MBB1/MBB2*) between the treatment firms and the control firms. We expect that β_1 is significantly negative.

The results for model (3) are reported in Panel A of Table 11. Columns (1)–(2) and columns (3)–(4) show the regressions with three-year windows (*t*–1 through *t*+1) and five-year windows (*t*–2 through *t*+2), respectively. The coefficients on *Treat*×*After* are all significantly positive at the 1% level in those columns. These results suggest that R&D-related comment letters have a governance effect to the recipients in the following one or two years, which is consistent with the main findings in Section 5.

(2) *Heckman two-step model.* Comment letter recipients may be selected, which could lead to sample selection bias. The Heckman two-step model is used to alleviate the endogeneity caused by the self-selection problem (Heckman, 1979). We employ the Heckman two-step model. In the first stage, we use the probit model to regress on *RDCL_{it}* (*RDCL_{it}* equals 1 if the firm receives an R&D-related comment letter in year *t*, and 0 otherwise) then we calculate the Inverse Mill's Ratio (*IMR*). In the first stage of Heckman, the independent include the ratio of R&D investment to sales (*RDSpendRatio_{it}*),

⁵In the first stage of PSM, the dependent variable is *RDLetter_t* (i.e. *RDLetter_t* equals 1 if the firm receives a R&D-related comment letter in year *t*, and 0 otherwise). Following Cassell et al. (2013) and Heese et al. (2017), we control firm size (*LnSize_t*), return on total assets (*ROA_{it}*), financial leverage (*Lev_{it}*), growth rate of sales (*Growth_{it}*), losses (*Loss_{it}*), state owned enterprises (*SOE_{it}*), board size (*DirSize_{it}*), management shareholding (*Mshare_{it}*), ownership concentration (*Fshare_{it}*), the proportion of independent directors (*IndepRatio_{it}*), *Dual_{it}* (a dummy variable that equals 1 if the CEO is also the chairman, and 0 otherwise), cash flow from operations (*CFO_{it}*), company age (*LnAge_{it}*), big4 auditors (*Big4_{it}*), internal control audit opinion (*InMAO_{it}*), publishing by the stock exchanges or CSRC (*Punishment_{it}*), auditors change (*InSwitch_{it}*), CEO or CFO change (*Mchange_{it}*), litigation risk (*Litigation_{it}*), merger and acquisitions (*MA_{it}*), the announcement of a restatement (*Restatement_{it}*), bankruptcy risk (*Zscore_{it}*), year and industry fixed effects.

Table 11. Comment letters and R&D manipulation: endogeneity.

Panel A: PSM-DID				
Variable	Pre- and post-comment letters three-year windows		Pre- and post-comment letters five-year windows	
	(1) <i>MBB1</i>	(2) <i>MBB2</i>	(3) <i>MBB1</i>	(4) <i>MBB2</i>
<i>Treat</i> × <i>After</i>	−1.192*** (−2.62)	−1.005*** (−3.18)	−0.986*** (−2.87)	−0.989*** (−3.63)
<i>After</i>	−0.183 (−0.52)	−0.087 (−0.29)	−0.386 (−1.27)	−0.190 (−0.82)
<i>Treat</i>	0.051 (0.31)	0.214 (1.54)	0.051 (0.35)	0.215* (1.87)
Controls	Yes	Yes	Yes	Yes
Year & Industry	Yes	Yes	Yes	Yes
Constant	−1.231 (−0.45)	−1.407 (−0.66)	−0.556 (−0.25)	−1.664 (−0.94)
Pseudo <i>R</i> ²	0.129	0.219	0.146	0.210
χ^2	179.161	365.731	258.234	483.815
<i>N</i>	2216	2216	3305	3305

Panel B: Heckman two-step		
	(1) <i>MBB1_t</i>	(2) <i>MBB2_t</i>
<i>RDCL_{t-1}</i>	−0.737*** (−3.48)	−0.453*** (−2.88)
<i>IMR_{t-1}</i>	0.153 (0.97)	0.030 (0.23)
Controls	Yes	Yes
Year & Industry	Yes	Yes
Constant	−16.634*** (−6.79)	−15.621*** (−7.68)
Pseudo <i>R</i> ²	0.176	0.186
χ^2	233.94	373.44
<i>N</i>	2232	2232

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

the proportion of R&D personnel (*RDPersonRatio_{it}*), the ratio of capitalised R&D expenditure to R&D investment (*RDCapitalRatio_{it}*), non-efficient R&D investment (*RDInvest_{it}*), firm size (*LnSize_{it}*), return on total assets (*ROA_{it}*), financial leverage (*Lev_{it}*), growth rate of sales (*Growth_{it}*), losses (*Loss_{it}*), state-owned enterprises (*SOE_{it}*), the high-tech qualification of firms (*Htprior_{it}*), management shareholding (*Mshare_{it}*), cash flow from operations (*CFO_{it}*), company age (*LnAge_{it}*), punishment by the exchanges or the CSRC (*Punishment_{it}*), year and industry fixed effects.

In the second stage of the Heckman model, we add *IMR* to the regression in model (1) and the results are shown in Panel B of Table 11. The coefficient on *RDCL_{t-1}* is significantly positive at the 1% level. That is, our main conclusions still remain in the Heckman model.

6.4.2. Alternative measure for R&D manipulation

Following Ye and Zang (2016), we estimate the abnormal management expenses by the prediction model of management expenses as follows:

$$Mfee_{i,t} = \beta_0 + \beta_m X_{i,t} + Industry + Year + \varepsilon_{i,t} \quad (4)$$

In model (4), $Mfee_{it}$ is management expenses, X_{it} is a set of control variables which include firm size ($\ln Size_t$), return on total assets (ROA_{it}), financial leverage (Lev_{it}), growth rate of sales ($Growth_{it}$), state-owned enterprises (SOE_{it}), the high-tech qualification of firms ($Htprior_{it}$), board size ($DirSize_{it}$), the proportion of independent directors ($IndepRatio_{it}$), management shareholding ($Mshare_{it}$), ownership concentration ($Fshare_{it}$), CEO duality ($Dual_{it}$), company age ($\ln Age_{it}$), cash flow from operations (CFO_{it}), the proportion of fixed assets ($Tangible_{it}$), big4 auditors ($Big4_{it}$), executive compensation ($Compensation_{it}$), year and industry fixed effects. We use model (4) to estimate the firms' expected management expenses, and the residual term (ε_{it}) equals to the actual management expenses minus the expected management expenses. We define the residual as abnormal management expenses ($Abnormal_Mfee_{it}$). The mean, minimum and maximum of $Abnormal_Mfee_{it}$ are 0.0068, -0.121 , and 0.316 respectively.

When $Abnormal_Mfee_{it}$ is negative and R&D investment just meets the threshold of high-tech enterprise recognition (0.5% or 1% higher than the minimum required), it is likely that the firm transfers the non-R&D management expenses to R&D expenses to get recognition of high-tech enterprises. Specifically:

(1) Taking 0.5% as benchmark: When sales are less than RMB 200 million, the ratio of R&D investment to sales is in [4.0%, 4.5%) and $Abnormal_Mfee_{it}$ is negative, $MBBC1$ takes the value of 1; or when sales are more than or equal to RMB 200 million, the ratio of R&D investment to sales is in [3.0%, 3.5%), and $Abnormal_Mfee_{it}$ is negative, $MBBC1$ takes the value of 1; $MBBC1$ takes the value of 0 except for the above two sets of conditions.

(2) Taking 1% as benchmark: When sales are less than RMB 200 million, the ratio of R&D investment to sales is in [4.0%, 5.0%) and $Abnormal_Mfee_{it}$ is negative, $MBBC2$ takes the value of 1; or when sales are more than or equal to RMB 200 million, the ratio of R&D investment to sales is in [3.0%, 4.0%), and $Abnormal_Mfee_{it}$ is negative, $MBBC2$ takes the value of 1; $MBBC2$ takes the value of 0 except for the above two sets of conditions.

The means of $MBBC1$ and $MBBC2$ are 0.065 and 0.112 respectively.

Table 12 reports the governance effect of comment letters when R&D manipulation is measured by $MBBC1$ and $MBBC2$. The coefficients on $RDCL_{t-1}$ are significantly negative at the 5% level in both columns. Our main conclusions are robust.

Table 12. The governance effect of comment letters: alternative measure for R&D manipulation.

Variable	(1) $MBBC1_t$	(2) $MBBC2_t$
$RDCL_{t-1}$	-0.487** (-1.97)	-0.408** (-2.13)
Controls	Yes	Yes
Year & Industry	Yes	Yes
Constant	-17.725 (-0.01)	-13.805 (-0.03)
Pseudo R^2	0.229	0.263
χ^2	246.403	410.718
N	2232	2232

Notes: z-statistics are given in brackets; ***, **, * indicate significance at 1%, 5%, and 10% levels respectively. Standard errors are clustered by firms.

7. Conclusions

The frontline supervision of information disclosure of listed companies by the SSE and the SZSE is critical to improving the quality of the information environment in the Chinese capital market. Since the reform of the Express Train system in 2013, the comment letter mechanism has become the most important regulatory method of the two exchanges. Taking Chinese A-share listed firms from 2015 to 2018 as our samples, this paper explores the governance effect of comment letters on R&D manipulation. The empirical results show that (i) R&D-related comment letters can significantly decrease firms' R&D manipulation. (ii) The more timely the comment and response letters, or the stronger the intensity of comment letters, the greater the governance effect of the comment letters on R&D manipulation. Specifically, the governance effect of comment letters is more pronounced for R&D-manipulation-related comment letters, which shows that a targeted or accurate inquiry is more effective. (iii) In the tests of the paths of the governance effect of R&D-related comment letters, we find the regulatory risk and the pressure of market attention from media and auditors have significant impacts on the governance effect of R&D-related comment letters. (iv) The governance effect of R&D-related comment letters on R&D manipulation is more pronounced in the samples with strong tax-reducing incentives.

Our findings have several important implications. First, the comment letter system plays a vital role in the registration system reform of IPO. The mission of the STAR market is to promote the high-quality development of the capital market and cultivate high-tech enterprises with international competitiveness. Our findings have implications on how to identify the suspected R&D manipulation companies and how to put forward questions on R&D investment or expenditures. Second, different from the existing literature on the governance of earnings management, this study examines the governance effect of R&D-related comment letters on R&D manipulation and the paths through which the governance effect works. These findings have important implications for improving the allocation efficiency of R&D. The government or its agencies should improve supervision on qualification of high-tech enterprises and tax incentives. Third, we find regulation risk and market attention pressure are critical to the governance effect of comment letters. There is some enlightenment from these results. One is that supervision efficiency can be improved by increasing regulatory risk. The other is to make full use of pressure from market participants, such as media, auditors and analysts. Fourth, the importance of the timeliness of comment letters tells us that both timely inquiry and timely response are critical in the frontline supervision.

Overall, this paper explores the governance effect of comment letters from the stock exchanges on R&D manipulation. The findings have implications not only for the regular comment letter system but also for registration system reform of IPO in the Chinese capital market.

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