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Ownership structure and real earnings management: Evidence from China

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ABSTRACT

Although ownership structure is fundamental to corporate accounting behaviors, the current literature provides scarce evidence about the governance effect of ownership structure on real earnings management (REM). We seek to address this issue by using a sample of Chinese listed firms which are likely to engage in earnings management during 2003–2014. We find that Chinese firms with more influential largest shareholders are more prone to REM; and that firms with state control and managerial ownership are less likely to engage in REM. We further find that there exists a joint and sequential relationship between REM and accrual-based earnings management in China. Our findings are robust to different variable measurements, samples and regression models. Our study contributes to the research on the relationship between ownership structure and earnings management and contributes to the understanding of REM in emerging economies. Our findings have significant implications for shareholders, analysts and regulators, and are important and relevant given that MSCI decides to include China mainland stocks in its indexes starting 2018.

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1. Introduction

According to CNBC (June 21, 2017), "After years of waiting, MSCI has agreed to include China mainland stocks in its indexes, beginning next year. It's a big move: MSCI controls the indexes behind some of the biggest exchange-traded funds (ETFs) in the world, including the MSCI Emerging Markets ETF." Due to the inclusion of China mainland stocks in the MSCI Indexes in 2018, global investors are likely to increase the investment in Chinese public companies. It is important to gain a deeper understanding of these companies' earnings management behaviors since earnings management is related to the financial performance and stock performance of these companies.

We focus on real earnings management (REM) in this paper since earnings management in China is frequently done through real activities (Chen, Lee, & Li, 2008). Chen et al. (2008) emphasize that "With rigid rule-based accounting standards, earnings management through accounting method choice and discretionary accruals is rare in China". Szczesny, Lenk, and Huang (2008) also find that REM activities are significantly higher for Chinese firms in danger of missing a regulation-imposed performance threshold. Kuo, Ning, and Song (2014) find that Chinese listed firms engage more in real earnings management after the share split reform in 2005–2007. After the adoption of International Financial Reporting Standards (IFRS) in 2006, China shifted to principle-based accounting standards from rule-based accounting standards. Ho, Liao, and Taylor

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(2015) find that Chinese listed firms shifted to less detectable and under-scrutinized real activities manipulation for upward earnings management after the adoption of IFRS in 2006.

Ownership structure is fundamental to corporate accounting behavior. Regarding earnings management, prior research mainly discusses the effects of ownership structure on accrual-based earnings management (AEM) (e.g. Warfield, Wild, & Wild, 1995; Haw, Hu, Hwang, & Wu, 2004; Mitra & Cready, 2005; Kim & Yi, 2006; Ding, Zhang, & Zhang, 2007). However, our understanding of the governance effect of ownership structure on real earnings management (REM) is limited.

We aim to provide evidence from China, the largest emerging economy, on the relationship between ownership structure and REM. We focus on three undiscussed dimensions of ownership structure related to Chinese listed firms: state control, largest shareholder's ownership and managerial ownership. Many Chinese listed firms are ultimately state-controlled and have large influential shareholders, which probably has a fundamental impact on REM. Because the percentage of managerial ownership continuously increases and represents a significant part of managerial wealth in China, we also examine the effect of managerial ownership on REM.

Using Chinese listed firms from 2003 to 2014, we construct four different samples of firms that are likely to engage in upward earnings management. After correcting for the potential sample selection bias with Heckman procedures, we find that the percentage ownership of the largest shareholders is positively related to REM. We also find that state control and managerial ownership are negatively associated with REM. Additional subsample regressions show that the negative effects of state control and managerial ownership on REM are more prominent for firms with higher ownership by the largest shareholders, and that the effect of the largest shareholder on REM mainly exists for non-state controlled Chinese firms. These findings are robust to regressions based on different variable measurements, sample sizes and research designs. Additional tests show that there exists a joint and sequential relationship between REM and AEM for Chinese suspect firms, which is documented by Zang (2012) for US firms.

Ding et al. (2007) examine the association between ownership structure and earnings management in the context of China and is of particular relevance of our study. Our paper differs from theirs in the following: (1) Ding et al. (2007) use a sample of 273 firms of year 2002, while we use a much larger sample of around 7000 observations of suspect firms which are likely to engage in earnings management over a much longer time period of 2003–2014.[1] (2) We investigate the role of managerial ownership, which is not examined in Ding et al. (2007).[2] (3) We examine the joint and sequential nature of real earnings management and accrual-based earnings management,[3] which has not been examined in Ding et al. (2007). We find that there exists a joint and sequential relationship between these two types of earnings management.

Our paper makes the following contributions to the literature. First, we extend prior research on the relationship between ownership structure and earnings management. Extant literature mainly provides evidence about the effects of different shareholders on AEM (e.g. Warfield et al., 1995; Haw et al., 2004; Mitra & Cready, 2005; Kim & Yi, 2006; Ding et al., 2007). Roychowdhury (2006) and Zang (2012) both document a monitoring effect of institutional ownership on REM. However, the effects of other shareholders on REM have not been examined. In this paper, we contribute to the literature by testing the effects of state control, largest shareholder and managerial ownership on the level of REM.

Second, we also complement the REM research by providing empirical evidence from China. Prior REM literature is mainly based on developed economies (e.g. Roychowdhury, 2006; Cohen & Zarowin, 2010; Zang, 2012). The Chinese economy is the second largest in the world and growing quickly, but also characterized by weak investor protection, severe information opaqueness, and poor corporate governance. Earnings management in China is often done through real activities (Chen et al., 2008; Kuo et al., 2014), which has been inadequately investigated. The findings of this study contribute to a better understanding of REM in developing economies.

Third, our study has implications for global investors, who are increasingly investing in emerging markets like China, especially given the inclusion of China stocks in the MSCI Indexes starting in 2018. Our results show that it is important to understand institutional factors when analyzing the financial reporting in the emerging market such as China (Bushman & Smith, 2001). To understand the economic behavior of earnings management in Chinese firms, one must first understand the role of institutional factors such as ownership structure and its influence on earnings management.

The rest of the paper is organized as follows. Section 2 introduces institutional background and develops the hypotheses. Section 3 discusses sample construction and estimation models. Section 4 presents empirical results about the effects of ownership structure on REM, including robustness tests. Section 5 concludes the paper.

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[1] The larger sample over multiple years allows us to provide a comprehensive panel study of the impact of ownership structure on real earnings management, which increases the external validity of this line of research. There are also a lot of changes since the sample period of Ding et al. (2007). For example, the Sarbanes-Oxley Act of 2002 of the US, similar reforms in many countries such as China, as well as the Financial Crisis of 2007–2008 have impact on firms' financial reporting worldwide. Given these profound changes, whether the results in Ding et al. (2007) still hold is an important research issue.

[2] Managerial ownership is an important component of ownership structure, and Warfield et al. (1995) find that managerial ownership is negatively related to accrual-based earnings management.

[3] Because of the progress of the literature, we can use a more sophisticated measure of real earnings management. Ding et al. (2007, p. 230) use a measure computed as "nonoperating income/sales" to reflect the "non-operating related party transactions", such as the disposal of fixed assets. Our measures of real earnings management focus on operating profits, which are designed to comprehensively measure real earnings management targeted at operating profits.

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2. Institutional background and hypotheses development

2.1. Ownership structure of Chinese listed companies

Chinese companies have experienced significant changes in ownership structure in the process of economic reforms. Before 2005, the ownership of listed firms was still split because most of the state-owned stocks were not tradable. Chinese regulators implemented a share split reform in 2005–2006 for full stock circulation, requiring the non-tradable shareholders to offer shares and/or cash compensations to the tradable shareholders (see detailed information about the share split reform in Firth, Lin, & Zou, 2010). By the end of 2007, 1254 Chinese listed firms, accounting for 97% of the A-share market capitalization, had completed the share split reform and begun to gradually release their non-tradable shares (Firth et al., 2010; Kuo et al., 2014). Although the percentage of state ownership declines to some degree, the state still exerts great influences on Chinese listed firms (Liu, Tian, & Wang, 2011).

Besides the state control, many Chinese companies also have a concentrated ownership structure, with the largest shareholders holding a significant percentage of these companies. The concentrated ownership structure has significant impact on the capital structure and governance of these firms, as it can affect fundamental agency incentives (Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001). The largest shareholders with controlling rights might discriminate against minority shareholders, especially when the legal protection is not strong enough.

To help alleviate agency problems and improve corporate performance, some of the ownership is offered to the management of Chinese listed companies. The managerial ownership mainly comes from the following sources: (1) the adoption of employee stock ownership plans by some companies in the 1990s, which was terminated by the Chinese regulators in the late 1990s due to concerns about inequality and illegality; (2) the executive stock incentive plans (stocks or stock options), which is more popular after the share split reform in 2005–2006; (3) the management buy-outs (MBOs) in 2003–2005, whose frequency is reduced due to the strengthened regulation on MBOs after 2005; (4) some original shareholders of the enterprises before being publicly listed, who are also managers of the firms. The equity percentage held by management increases continuously during the period of 2003–2014. On average, more than 67% of the firms have managerial ownership in 2003. At the end of 2014, more than 73% of our sample firms have managerial ownership. Therefore, the effects of managerial ownership on accounting in Chinese firms deserve more research attention.

2.2. Earnings management in China

Various internal and external factors make earnings management more pervasive in China. Because accounting numbers are adopted as very influential performance measures for compensation contracts in China, firm managers have strong incentives to manipulate earnings (Wang, Chen, Lin, & Wu, 2008). The agency conflicts between majority and minority shareholders also explain a significant portion of earnings management for Chinese listed firms (Liu & Lu, 2007). Corporate earnings are highly influenced by the largest shareholder's tunneling and propping behaviors in China (Aharony, Wang, & Yuan, 2010; Liu & Lu, 2007).

Certain regulation requirements also make earnings management more prominent in China. The China Securities Regulatory Commission (CSRC) requires listed companies to meet certain thresholds, such as previous-year return on equity (ROE) and ROE levels of 0%, 6% and 10% before they can receive permission for IPO or additional share issuance.[4] If companies want to raise money from the capital markets, they have strong incentives to manage earnings. Consequently, many firms report ROEs slightly above the regulatory thresholds (Chen & Yuan, 2004). Even for the state-controlled firms, they may manage earnings to boost their probability of being selected for IPOs (Aharony, Lee, & Wong, 2000). The local governments as ultimate owners may also provide subsidies to inflate corporate earnings above certain regulatory thresholds for financing (Chen et al., 2008).

As for REM in China, Chen et al. (2008) document that earnings management in China is frequently done through real activities. They emphasize that "With rigid rule-based accounting standards, earnings management through accounting method choice and discretionary accruals is rare in China". Szczesny et al. (2008) also find REM activities are significantly higher for Chinese firms in danger of missing a regulation-imposed performance threshold. Kuo et al. (2014) find that Chinese listed firms engage more in real earnings management after the share split reform in 2005–2007. After the adoption of IFRS in 2006, China shifted to principle-based accounting standards. Ho et al. (2015) find that Chinese listed firms shifted to less detectable and under-scrutinized real activities manipulation for upward earnings management after 2006. Therefore, it is important to investigate REM in Chinese listed firms, especially when they are suspected for earnings manipulation.

2.3. Hypothesis for the effect of state control on REM

State control occurs if the ultimate owner of a listed company is the state or the government. Agency problem is a significant issue in state-owned companies since there is separation of ownership and controls in state-owned companies as

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[4] Please refer to Chen et al. (2008) for details concerning regulatory thresholds.

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in privately-owned public companies.[5] Different from privately-owned companies, state-owned companies have another type of agency problem in addition to the agency problem between management and outside shareholders. As stated in Ding et al. (2007), "... there is an extra agency relationship in state-owned companies compared to privately-owned companies, as the controlling owners are themselves agents of the true owners: the state."

After years of ownership reform of SOEs, the state still maintains its ownership control and exerts strong influences on Chinese listed firms (Liu et al., 2011). Aharony et al. (2000) document that SOEs also manage earnings to boost their chances of being selected for IPO. Chen et al. (2008) show that local governments as ultimate owners may provide subsidies to inflate corporate earnings above certain regulatory thresholds for financing. They describe this phenomenon as "government assisted earnings management in China". Recent studies show that even in SOEs, economic performance such as ROA and EVA has become important in the evaluation of SOE executives (Du, Erkens, Young, & Tang, 2017; Lin, 2018), which could induce earnings management by SOE managers.

On the other hand, for the non-SOEs, they have less serious agency problems than SOEs because managers of non-SOEs are better aligned with private owners, especially in family firms.[6] In terms of earnings quality, Wang (2006) and Ali, Chen, and Radhakrishnan (2007) find that family firms report higher earnings quality, including lower discretionary accruals, higher predictability of cash flows, and higher earnings response coefficients. In addition, managers in private firms have to be more market oriented rather than political or social responsibility oriented (Qian & Wu, 2003). They make decisions with better economic optimization and are subject to more stringent monitoring by banks, suppliers and other stakeholders than SOEs. Due to the higher costs of REM, private firms may prefer to undertake less REM than do SOEs. Therefore, being aware of the negative effects of REM on firm values in the long run, non-SOEs would have less REM. Based on the above discussion, it is reasonable to hypothesize that there is a higher level of REM in SOEs than in non-SOEs.

However, Chen, Li, Liang, and Wang (2011) emphasize that when compared with their non-state-owned counterparts in China, the motivation of state-owned companies to manage earnings is still significantly lower. Ding et al. (2007) find that privately-owned listed companies tend to maximize their accounting earnings more in China. One important explanation relates to the resource-based perspective. Because of their special relationship with respective governments, state-owned companies get prioritized allocation of resources, which may reduce pressures for earnings management. For example, banks in China are inclined to give preferential credit treatment to state-owned companies (Brandt & Li, 2003). As more direct evidence, Ding et al. (2007) and Lo, Wong, and Firth (2010) find that state-owned companies conduct lower levels of earnings management through discretionary accruals and related-party transactions.

Another explanation relates to the social responsibility perspective. Generating profit is not the only goal of state-owned enterprises. The existence of state control requires them to undertake many social responsibilities, such as maintaining social stability and providing employment (Li & Zhang, 2010). Thus, the incentive of earnings management is lower for state-owned firms. When minority shareholders' interests are threatened by REM, the existence of state control may help reduce the possibility of REM due to social responsibility considerations.

As the above literature and theoretical discussions provide no clear directional prediction between state control and earnings management, we propose our first hypothesis in the competing forms as follows:

Hypothesis 1a (H1a):. Ceteris paribus, the level of real earnings management is higher for companies with state control.

Hypothesis 1b (H1b):. Ceteris paribus, the level of real earnings management is lower for companies with state control.

2.4. Hypothesis for the effect of the largest shareholders on REM

As for the effect of the largest shareholders, we mainly discuss the situation that the largest shareholders are also the controlling shareholders[7] because concentrated ownership is prevalent in Chinese listed firms.

When there is concentrated ownership, agency costs between large and small shareholders become a significant issue since large shareholders maximize their own private benefit at the cost of small shareholders (Faccio & Lang, 2002). As argued by Shleifer and Vishny (1997, p. 758), "Large investors may represent their own interests, which need not coincide with the interests of other investors in the firm". Concentrated equity ownership gives the largest shareholders substantial discretionary power to use the firm's resources for personal gain at the expense of other shareholders (Bai, Liu, Lu, Song, & Zhang, 2004; Fan & Wong, 2002). Specifically, when they have a controlling ownership, the largest shareholders become entrenched through pursuing their own interests at the expense of the company and minority shareholders (Claessens, Djankov, Fan, & Lang, 2002; Shleifer & Vishny, 1997), benefit from earnings management by reducing the cost of external

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[5] For convenience, we refer to privately-owned public companies as privately-owned companies in the remainder of the paper.

[6] When having concentrated ownership, family owners are likely to have strong incentives to monitor managers (Cheng, 2014).

[7] The effect of the largest shareholders depends on their ownership proportion (see the subsample and interactive analyses in Panel B of Table 8). When dominant influence exists, the largest shareholders are also the controlling shareholders. However, it is difficult to quantitatively define the dominant or controlling influence. The ownership of more than 50% is commonly believed to be controlling. But this criterion is too strict because the largest shareholders with 30%, 20% or even less might also control a firm in substance if the remaining ownerships are very diverse. We use the ownership proportion of the largest shareholders in our hypothesis tests for two reasons. First, it avoids the difficulty in identifying the existence of the controlling shareholder. Second, it helps reflect the effect of the largest shareholders in an incremental way.

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financing and debt covenant violations (Dou, Hope, Thomas, & Zou, 2016; Jiang, 2008), and sell higher-priced stocks to second generation shareholders (Lopez & Rees, 2002).

In China, controlling shareholders may intervene and encourage earnings management for private interests (Jaggi & Tsui, 2007). Thus, corporate earnings are highly influenced by controlling shareholders' tunneling and propping behaviors in China (Aharony et al., 2010; Liu & Lu, 2007). Empirical evidence shows that the equity percentage owned by largest shareholders in China relates positively to the absolute value of discretionary accruals (Firth, Fung, & Rui, 2007). More importantly, the largest shareholders in Chinese firms also intentionally initiate some real transactions among related parties for earnings manipulation (Jian & Wong, 2010; Liu & Lu, 2007). The effects of those real transactions are probably reflected in REM components as abnormal levels of production costs, discretionary expenses or cash flows.

The controlling shareholder in Chinese companies could encourage REM due to several reasons. First, REM in China is more difficult to uncover and punish than AEM, since the overall legal and regulation systems in China are not as strong as those in the developed countries. Second, the greater power of the controlling shareholder would also make REM more feasible in more concentrated firms. Third, although REM means a purposeful deviation from optimal business transactions, the controlling shareholder may not be sensitive to the costs of REM when the expected private benefits from REM are irresistible and when the costs are shared by minority shareholders and other stakeholders.

Based on these discussions, we propose our second hypothesis as follows:

Hypothesis 2 (H2). Ceteris paribus, the level of real earnings management relates positively to the ownership percentage of the largest shareholders. The effect is likely driven by the largest shareholder also being the controlling shareholder.

2.5. Hypothesis for the effect of managerial ownership on REM

Prior evidence of the relationship between managerial ownership and earnings management is mixed. Classical agency theory predicts there is a conflict of interest between shareholders especially outside shareholders and managers who act as agents of shareholders (Berle & Means, 1932; Jensen & Meckling, 1976). Higher managerial ownership can align the interests of shareholders and management and reduce agency costs. Consistent with the alignment effect perspective, many studies argue that higher managerial ownership helps mitigate earnings management (e.g. Warfield et al., 1995; Klein, 2002; Ebrahim, 2007). However, some studies indicate that managerial ownership relates positively to earnings management (Cheng & Warfield, 2005; Guidry, Leone, & Rock, 1999), because managers also try to maximize the value of their stockholding (Yang, Lai, & Leing Tan, 2008). Extant literature also reports an insignificant relationship (Francis, Maydew, & Sparks, 1999; Gabrielsen, Gramlich, & Plenborg, 2002) and a U-shaped relationship between managerial ownership and AEM (Yeo, Tan, Ho, & Chen, 2002). However, it is noteworthy that the above results are only restricted to the effect of managerial ownership on AEM, without direct evidence relating to REM.

Among the different forms of earnings management, REM is costlier than AEM because it deviates from an otherwise optimal transaction and imposes a real cost on the firm (Zang, 2012). According to the agency theory, managerial ownership can encourage managers to improve firm value and align the interests between managers and shareholders. For example, managerial ownership could increase the contractual protection and job security of CEOs, which helps reduce managerial short-termism through earnings management (Chen, Cheng, Lo, & Wang, 2015; DeFond & Park, 1997). Consequently, higher managerial ownership may restrict managers' incentives to manipulate earnings for increasing short-term compensation. The higher the percentage of managerial ownership, the larger the negative effect of earnings management to them. Thus, managerial ownership makes REM less preferable than AEM. Although the percentage of managerial ownership is still not very high in Chinese firms, the total value of managerial ownership is much higher when compared with cash compensation. Based on these discussions, we propose the third hypothesis as follows:

Hypothesis 3 (H3). Ceteris paribus, the level of REM relates negatively to the percentage of managerial ownership.

3. Research design

3.1. Measuring real and accrual-based earnings management

According to Roychowdhury (2006), Cohen and Zarowin (2010), and Zang (2012), there are three metrics to study the level of REM: abnormal cash flows from operations, abnormal discretionary expenses, and abnormal production costs. Following Zang (2012), we focus on abnormal discretionary expenses and abnormal production costs in our main tests. Abnormal cash flows from operations are only considered as a robustness test, because Roychowdhury (2006) argues that cash flows from operations are affected by real activities manipulation in different directions, making the net effect ambiguous.

We use the following equations to estimate the normal level of discretionary expenses and production costs for each industry and year, which are the same as those in Zang (2012):

$$\frac{DISX_t}{A_{t-1}} = k_0 + k_1 \frac{1}{A_{t-1}} + k_2 \frac{SALES_t}{A_{t-1}} + \varepsilon_t \tag{1}$$

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$$\frac{PROD_t}{A_{t-1}} = k_0 + k_1 \frac{1}{A_{t-1}} + k_2 \frac{SALES_t}{A_{t-1}} + k_3 \frac{\Delta SALES_t}{A_{t-1}} + k_4 \frac{\Delta SALES_{t-1}}{A_{t-1}} + \varepsilon_t \tag{2}$$

$DISX_t$ represents the discretionary expenses in year t, defined as the sum of advertising expenses, R&D expenses and Selling, General and Administrative Expenses (SGA); $PROD_t$ represents the production costs in year t, defined as the sum of costs of goods sold (COGS) and the change in inventories; A_{t-1} is the lagged total assets; $SALE_t$, $\Delta SALE_t$ and $\Delta SALE_{t-1}$ mean the level, the change and the lagged change of gross sales from ordinary operations. The abnormal discretionary expenses *(ADISX)* and abnormal production costs *(APROD)* are computed as the industry-year residuals from the above regression equations. Given sales levels, earnings are managed upward through abnormally low discretionary expenses and/or abnormally high production costs. Following Roychowdhury (2006), Cohen and Zarowin (2010) and Zang (2012), we compute an aggregate measure of REM denoted as *AREM* which is *APROD* plus the negative value of *ADISX*.

We calculate discretionary accruals as the difference between the accounting accruals scaled by lagged assets and the sum of the first four components on the right hand of the Eq. (3):

$$\frac{ACCRUAL_t}{A_{t-1}} = k_0 + k_1 \frac{1}{A_{t-1}} + k_2 \frac{(\Delta SALES_t - \Delta REC_t)}{A_{t-1}} + k_3 \frac{PPE_t}{A_{t-1}} + \varepsilon_t \tag{3}$$

$ACCRUAL_t$ represents earnings before extraordinary items and discontinued operations minus operating cash flows reported in the statement of cash flows for a certain year; A_{t-1} is the lagged total assets; $\Delta SALES_t$ is the change of sales; ΔREC_t is the change in accounts receivables; and PPE_t is the gross property, plant, and equipment. We use the level of discretionary accruals (denoted as *DA*) derived from the above modified Jones model (Dechow, Sloan, & Sweeney, 1995) as a control in our regression analysis on the determinants of REM.

3.2. Suspect firms and the correction for potential sample selection bias

For the samples of real earnings management, Cohen and Zarowin (2010) focus on firms around seasoned equity offerings and identify suspect firms as those with the levels of either real earnings management or discretionary accruals higher than industry-year medians. Zang (2012) uses a sample of suspect firms which is based on observations just beating/meeting several important earnings benchmarks.

Following Cohen and Zarowin (2010) and Zang (2012), we construct four suspect firm samples which are more prone to earnings management based on earnings management measures and/or earnings benchmarks. We first identify suspect firms as those with total values of AEM and REM measures being positive in our main tests. This criterion allows our sample to include firms which manage earnings through AEM, REM or both strategies and reflect the total effects of different strategies. The second sample includes observations with total values of AEM and REM measures higher than corresponding industry-year medians, which results in a similar sample size as the first one. The third sample is created by identifying firm year observations just beating/meeting the earnings benchmarks identified according to the Chinese institutional background. The benchmarks include previous-year return on equity (ROE) and current-year ROE levels of 0%, 6% and 10% (Chen & Yuan, 2004).[8] Therefore, we identify suspect firms as those reporting ROE changes (ΔROE) less than 1% and those having ROEs in intervals of (0–1%), (6–7%) and (10–11%). Our last sample is based on the overlap between the first and third samples, requiring both positive total values of AEM and REM and just beating/meeting earnings thresholds at the same time.

To mitigate the potential sample selection bias of suspect firms, we adopt a two-stage Heckman procedure as in Zang (2012). In the first stage, we use a probit model to examine the determinants of a firm's decision to manage reported earnings based on all available observations. The inverse Mills ratios *(MILLS)* are generated by the probit model and included in the second stage regressions as controls for potential sample selection bias. The first stage probit model is defined as follows:

$$\begin{aligned}
\text{Prob}[Suspect = 1] = {} & Probit \, (\gamma_0 + \gamma_1 SIZE + \gamma_2 ISSUE + \gamma_3 LEVER + \gamma_4 MTB + \gamma_5 LNSHARE + \gamma_6 ROA \\
& + \gamma_7 ANALYST + \gamma_8 SUSP\_indlag + \gamma_9 TRUST + \sum \gamma_j DUM + \varepsilon)
\end{aligned} \tag{4}$$

The dependent variable is a dummy for whether an observation is included in the suspect firm samples (one if included, zero otherwise). We select the independent variables based on prior research that suggests managerial incentives for earnings management. *SIZE* is the natural logarithm of year-end total assets. *ISSUE* is equal to one if a company issues new stocks or bonds. *LEVER* is long term liabilities divided by total assets. *MTB* is the market value equity divided by book value of equity. *LNSHARE* is the logarithm of the number of shares outstanding. *ROA* is the income before extraordinary items divided by total assets. *ANALYST* is the natural logarithm of the number of analysts following the firm plus one at the beginning of the year. We include these variables to control for the effects of firm size, financing demand, capital structure, growth opportunities, capital market incentives, profitability, and analyst coverage on the probability of being a suspect firm (Chan, Chen, Chen, & Yu, 2015; Dechow, Ge, & Schrand, 2010; Zang, 2012). According to Lennox, Francis, and Wang (2012), it is important to include exogenous instrumental variables in the first stage of Heckman procedures. Therefore, we include two variables

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[8] The Return on Equity (ROE) levels of 6% and 10% are specific regulation thresholds for seasoned equity offering in China. Because the ROE threshold of 10% is removed by the China Securities Regulatory Commission in 2006, we include firms with ROEs between 10% and 11% within the suspect sample only for the year of 2003–2005. We ignore the benchmarks of analyst forecasts because the role of financial analysts in China is questioned and criticized frequently. For example, an article from the Bloomberg in May 2016 is entitled as "China stock analysts were among world's worst amid surprise rout".

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which are regarded as exogenous to individual firm characteristics: *SUSP_indlag* and *TRUST. SUSP_indlag* is computed as the lagged yearly ratio of suspect firms to the total number of listed firms within an industry, similar to Firth, Lin, Liu, and Xuan (2013). The higher the ratio of suspect firms in a firm's industry, the more likely a firm is a suspect firm. We expect that the lagged form would help enhance its exogeneity to firm characteristics. *TRUST* are survey-based provincial trustworthiness scores from the Chinese Enterprise Survey System in 2001 (Zhang & Ke, 2002), based on Questionnaires to more than 15,000 managers in 31 provinces (responses = 4,600).[9] [10] This trust variable has been used in recent literature on the relationship between social trust and firm behaviors (e.g. Wu, Firth, & Rui, 2014; Ang, Cheng, & Wu, 2015) or market reactions (e.g. Li, Wang, & Wang, 2017; Qiu, Yu, & Zhang, 2019).[11] We expect that the level of provincial trust is negatively associated with the occurrence of suspect firms.

3.3. Regression model and control variables

Our model for real earnings management takes the following form:

$$AREM = b_0 + b_1 STATE + b_2 LARGEST + b_3 MNGTOWN + b_4 DA + b_5 MILLS + \sum b_j CTRL_j + \sum b_k DUM_k + \varepsilon \qquad (5)$$

The dependent variable *AREM* represents the aggregate REM measure. The variables of *STATE, LARGEST* and *MNGTOWN* are the ownership variables for hypotheses tests. We include the level of discretionary accruals derived from the modified Jones model (*DA*) as a control variable, since Cohen and Zarowin (2010) and Zang (2012) find that discretionary accruals are negatively associated with the level of REM. *MILLS* is the inverse mills ratio estimated from the first stage of the Heckman procedure from Eq. (4).

CTRL represents a series of other control variables which are associated with REM. Zang (2012) finds that there exists a joint and sequential relationship between REM and AEM. She argues that managers shift to more REM when the cost of AEM is high. Therefore, it is necessary to consider and include factors broadly related to earnings management. Specifically, we include the percentage of institutional ownership as a control variable (*INST*), because institutional shareholders may have both the incentives and capabilities to monitor managerial opportunism. To control for the potential effects of board governance, we include a dummy variable for the duality of CEO and chairman (*DUAL*) and the percentage of independent directors on the board (*INDEP*). We control for the level of net operating assets (*NOA*) and the length of last year operating cycles (*CYCLELAG*), which may affect a firm's preference for REM. To improve the explanation power of our empirical model in China, the following firm characteristics are considered: firm size (*SIZE*), long-term leverage ratio (*LEVER*), return on assets (*ROA*), cash flow from operations (*CFO*), sales growth (*SALEGROW*), and market to book ratio (*MTB*). We also include the dummies for whether a firm experiences a new stock (or bond) issuance (*ISSUE*), mergers and acquisitions (*MA*), punishment for illegal practice (*PUNISH*), and recognition as specially or particularly treated by regulators (*STPT*)[12]. Because external auditors represent an important monitoring mechanism against earnings management, we also control for the effects of auditor size (*BIG4*), audit firm tenure (*TENURE*) and auditor rotation (*AUDROTAT*) in our tests. Finally, we control for the potential effects of CEO changes and chairman changes with two dummy variables, *CEOCHG* and *CHAIRCHG,* as the CEO and chairman are key leaders of a firm and its board. *DUM* represents the year/industry dummies to control for the year/industry fixed effects. All regressions are implemented with standard errors clustered by firm.

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[9] The survey assesses the level of provincial trustworthiness from managers' responses to the question: "According to your experience, could you list in order the top five provinces where enterprises are most trustworthy?" The No. 1 province on the list is assigned the highest score of five, the No. 2 province on the list is assigned a score of four, and so on. A province's social trust score is the average trust-worthiness rating given by the managers. It mainly captures the extent of trust of corporate managers for a particular province.

[10] Per the advice of an anonymous reviewer, we examine the potential direct association between our two IVs and earnings management levels. In our paper, the effectiveness of the IVs might be doubtful if *SUSP_indlag* (*TRUST*) also has a direct positive (negative) association with the earnings management variables, especially for the subsamples of suspect firms. For the IV of *SUSP_indlag,* we find that *SUSP_indlag* has a negative and insignificant association with both *AREM* and *DA* when we run the correlation and multivariate regression tests, providing no evidence of a direct positive association for the suspect firms. For the IV of *TRUST,* we find that *TRUST* has a significantly positive association with *AREM* (T=2.85) and a marginally significant positive association with *DA* (T=1.63) in multivariate regression tests, providing no evidence of a direct negative association with earnings management for the suspect firms. For suspect firms, the increases in earnings management levels are not likely due to a direct negative effect of *TRUST.* Therefore, the effectiveness of *SUSP_indlag* and *TRUST* as IVs is acceptable in our models.

[11] China provides an effective background to reflect the impact of local trustworthiness because China is a huge country and has large variations in its local trustworthiness. For example, trust scores range from 2.7 to 218.9. In addition, China has weak institutions and laws, so that local trustworthiness is important as an alternative mechanism to alleviate those problems. For example, Wu et al. (2014) show that social trust can help increase Chinese non state-owned firms' use of trade credit and provide evidence that social trust can mitigate the effect of weak legal institutions on the granting and receiving of trade credit. Ang et al. (2015) document that Chinese firms prefer to invest in regions where local partners and employees are considered more trustworthy; they are also more likely to establish joint ventures and to make greater research and development investments.

[12] According to Cheng, Xia, and Wang (2014), "In order to preserve the quality of firms for smaller investors whom hold positions in the traded shares, the CSRC and stock exchanges created several major requirements for firms to preserve their listing status. The primary instrument is the special treatment (ST) delisting procedure. Once designated as a "special treatment" firm by the stock exchange, a company needs to place a special designation on its ticker symbol as a warning to investors. The firm is on probationary status for 1 year after the designation, designated as "particular-transfer" or PT, and trading is suspended in the second year if the firm has not taken steps to rectify the conditions leading to the designation."

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3.4. Sample selection and descriptive statistics

We begin with 23,678 observations of Chinese listed firms from the Shanghai and Shenzhen Stock Exchanges in the CSMAR[13] between 2003 and 2014. We require that these observations have total assets available. We start from 2003 because it represents the first year of the post-Enron scandal and the year when most of our variables of interest are available. We end with 2014 because the China Securities Regulatory Commission (CSRC) issued significantly revised delisting regulations at the end of 2014. The revised delisting regulations strengthened accounting-based criteria and have the potential to change significantly firms' earnings management incentives and behavior to remain listed.

We exclude observations in the banking or insurance industry and the observations without enough data to calculate the earnings management measures. We also exclude observations which do not belong to the main boards[14] of Chinese A-shares and which have missing data for Eq. (4). After these exclusions, we obtain a sample of 15,062 observations, which can be used for the first stage probit regression of the Heckman procedure. In addition, we exclude 7744 observations which are not the suspect observations and 175 observations with any of the independent variables missing for Eq. (5). Following all these procedures, we obtain the main sample of suspect firms of 7143 observations. Please refer to Table 1 for further details concerning the sample selection.

Table 2 presents the descriptive statistics for the main sample. As for the earnings management measures, the average level of *AREM* is 0.0841, which is mainly due to overproduction (the average *APROD* is 0.0500). The average level of *AREM* is close to the mean of REM of 0.075 reported in Kuo et al. (2014). The magnitude of *DA* is 0.0391 on average, which is obviously smaller than the average value of *AREM*. The result is similar if the median and percentiles are compared, which indicates that REM in China deserves investigation. As we are using samples of suspect firms, the means of earnings management variables in this study are higher than those reported based on general samples by Ho et al. (2015).

As for the ownership variables, the mean of *STATE* is 0.6969, which shows that nearly 70% of the main suspect sample is state controlled firms (with the ultimate owner representing state ownership). The mean of *LARGEST* is about 0.37 and very close to that in Kuo et al. (2014), showing that the largest shareholder holds more than one third of equity ownership. As for the managerial ownership, we find that the average proportion of *MNGTOWN* is less than one percent. On the other hand, the existence of managerial ownership is very wide-spread (about 60–75 percent across different samples) and the economic value of managerial ownership is also significant for managers. Therefore, the effects of managerial ownership require further empirical examinations.

Table 2 also includes the description of all the continuous and dummy variables in Model 5. All the continuous variables are winsorized at the top and bottom 1 percent to mitigate the influence of extreme values. We find that the suspect firms on average have *NOA* of 2.4208, *CYCLELAG* of 76 days and institutional ownership (*INST*) of 13.5%. When compared with prior studies based on US samples such as Barton and Simko (2002) and Zang (2012), the level of *NOA* is similar and the mean values of *CYCLELAG* and *INST* are lower. For the sake of brevity, we do not discuss the statistics of other firm related variables. As for the auditor related variables, about 9.3% of suspect firms change their auditors on average; the average auditor tenure (*TENURE*) is 7.4 years. Only 5.7% of the suspect firms are audited by the international Big 4 auditors (*BIG4*). The low market share of the Big 4 auditors implies less scrutinized earnings management from the Big 4 in China.

Table 3 presents the Pearson correlations among related variables. All the earnings management variables show significant correlations to each other. The correlation between *AREM* and *DA* is −0.179, indicating a significant tradeoff between the two earnings management strategies by suspect firms. The correlation between *STATE* and *AREM* (*DA*) is significantly negative, supporting the mitigating effects of state control over REM (AEM). The correlation between *LARGEST* and *DA* is significantly positive, showing positive effects of largest shareholder ownership on the level of AEM. The correlation between *MNGTOWN* and *AREM* (*DA*) is significantly negative (positive), reflecting different effects of managerial ownership on REM and AEM. We omit the discussion of the remaining correlations for the sake of brevity.

4. Empirical results

In this section, we first examine and compare the effects of ownership structure on aggregate measures of REM and AEM based on the main sample of suspect firms. Then we consider the robustness of hypothesis testing to four additional samples of suspect firms. Moreover, we also test the robustness to alternative REM measures, alternative ownership variables, and different time periods. In all our regressions, we control for the year and industry fixed effects and adjust for firm-level clustering effects. We also control for the inverse Mills ratio we got from the first stage probit regression model.

Table 4 compares the means of the independent variables included in Model 4 and provides the probit regression results. It shows that suspect firms have lower profitability, lower shares outstanding, and lower analyst following on average. Suspect firms also have significantly higher long-term leverage than non-suspect firms. According to Lennox et al. (2012) and

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[13] The China Stock Market and Accounting Research (CSMAR) Database is developed by the Shenzhen GTA Information Technology Company and the University of Hong Kong. As indicated by previous studies, the CSMAR is one of the most important databases on the Chinese capital market (e.g. Firth, Fung and Rui, 2006, 2007).

[14] The firms from the Main boards of A-shares are of larger size, lower risk, better governance and better data continuity. According to Investopedia, "China A-shares are the stock shares of mainland China-based companies that trade on the two Chinese stock exchanges, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE)."

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Table 1
Sample Selection.

The starting sample:	23,678
Listed firm year observations from the Shanghai and Shenzhen Stock Exchanges during 2003–2014 in CSMAR with total assets available	
(1) Excluding observations in the banking and insurance industry	−426
(2) Excluding observations without enough data to calculate earnings management measures	−1475
(3) Excluding observations in the timber and furniture industry and other manufacturing industry with less than 15 industry-year observations to calculate earnings management	−193
The sample for earnings management estimation:	21,584
(4) Excluding observations which are not A-Shares from the Shanghai and Shenzhen Stock Exchanges	−5541
(5) Excluding observations with missing data for Eq. (4)	−981
The sample for the first regression of the Heckman procedure as in Eq. (4):	15,062
(6) Excluding the non-suspect firm-year observations with the total value of aggregate real earning management and accrual earnings management being zero or negative	−7744
(7) Excluding observations with missing data for Eq. (5)	−175
The main suspect sample:	7143

Table 2
Descriptive Statistics (n = 7143).

Variable	Mean	Std	25th	Median	75th
AREM	0.0841	0.1235	0.0152	0.0585	0.1209
ADISX	−0.03	0.058	−0.053	−0.025	−0.002
APROD	0.05	0.1064	−0.007	0.0303	0.0829
DA	0.0391	0.0931	−0.012	0.0266	0.076
STATE	0.6969	0.4596	0	1	1
LARGEST	37.422	15.926	24.95	35.262	49.833
MNGTOWN	0.8523	5.3263	0	0.002	0.0199
MILLS	0.7725	0.2008	0.6345	0.7577	0.8908
INST	13.484	18.454	0.3371	4.5889	19.834
DUAL	0.1144	0.3183	0	0	0
INDEP	0.3591	0.0532	0.3333	0.3333	0.375
NOA	2.4208	3.4096	0.9568	1.5455	2.6019
CYCLELAG	75.742	17.972	64.281	72.572	83.024
SIZE	21.789	1.2791	20.913	21.669	22.511
LEVER	0.1028	0.1191	0.0115	0.0581	0.1555
ROA	0.0209	0.0667	0.0041	0.0231	0.05
CFO	0.0069	0.0715	−0.025	0.0165	0.0504
SALEGROW	0.1822	0.5544	−0.058	0.108	0.2887
MTB	3.3148	3.6176	1.5034	2.2636	3.8152
ISSUE	0.1637	0.37	0	0	0
MA	0.3464	0.4758	0	0	1
PUNISH	0.1407	0.3477	0	0	0
STPT	0.0606	0.2386	0	0	0
BIG4	0.057	0.2318	0	0	0
TENURE	7.4004	4.9282	3	7	11
AUDROTAT	0.0934	0.291	0	0	0
CEOCHG	0.2139	0.4101	0	0	0
CHAIRCHG	0.1820	0.3859	0	0	0

Please refer to Appendix A for variable definitions. All continuous variables are winsorized at the top and bottom 1 percent.

Firth et al. (2013), we include two exogenous variables, i.e. *SUSP_indlag* and *TRUST*. The results of the probit regression, which is the first stage of the Heckman procedures producing the invers Mills ratios, are tabulated in the last two columns of Table 4. We find that the probability of being identified as a suspect firm is significantly positively associated with *ISSUE*, *LEVER*, and *SUSP_indlag*, and significantly negatively associated with *ROA*, *ANALYST* and *TRUST*.

4.1. Main results for the effects of ownership structure

Table 5 reports the results for the effects of ownership structure on aggregate real and accruals-based earnings management. The overall explanation powers are about 22% and 60% for the REM and AEM regressions. The average VIF is 2.58 and 2.52 for the two regressions, with the largest VIF of the ownership variables and main control variables less than 3 (untabulated).

We first discuss the coefficients of ownership variables in Table 5. The coefficients of *STATE* are significantly negative for the levels of both REM and AEM. The results show that state control helps mitigate earnings management in Chinese listed

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Table 3
Pearson correlations (n = 7143).

	AREM	ADISX	APROD	DA	STATE	LARGEST	MNGTOWN
AREM	1						
ADISX	−0.358***	1					
APROD	0.824***	0.156***	1				
DA	−0.175***	0.140***	−0.128***	1			
STATE	−0.073***	0.069***	−0.030***	−0.060***	1		
LARGEST	−0.013	0.027**	−0.005	0.046***	0.271***	1	
MNGTOWN	−0.046***	0.051***	−0.026**	0.050***	−0.216***	−0.096***	1
MILLS	−0.042***	−0.017	−0.066***	0.107***	0.056***	0.166***	0.067***
INST	−0.030**	0.026**	−0.019	−0.002	0.175***	0.121***	−0.015
DUAL	0.056***	−0.035***	0.040***	−0.018	−0.138***	−0.117***	0.064***
INDEP	0.042***	−0.026**	0.029**	−0.020*	−0.077***	−0.031***	0.041***
NOA	0.086***	0.029**	0.096***	0.025**	−0.107***	−0.088***	−0.046***
CYCLELAG	−0.033***	−0.113***	−0.104***	−0.082***	0.113***	0.064***	−0.036***
SIZE	−0.007	0.092***	0.054***	−0.022*	0.209***	0.253***	−0.004
LEVER	0.017	0.078***	0.060***	−0.025**	0.070***	0.057***	−0.048***
ROA	−0.252***	−0.029**	−0.301***	0.393***	0.013	0.166***	0.061***
CFO	−0.152***	−0.081***	−0.217***	−0.536***	0.083***	0.091***	0.001
SALEGROW	0.030**	0.184***	0.098***	0.137***	0.003	0.086***	0.020*
MTB	0.099***	−0.047***	0.072***	0.029**	−0.106***	−0.104***	0.007
ISSUE	0.002	0.064***	0.026**	0.063***	0.043***	0.035***	0.028**
MA	0.056***	0.046***	0.080***	0.047***	−0.018	0.020*	−0.004
PUNISH	0.050***	−0.019	0.045***	−0.020*	−0.102***	−0.132***	0.008
STPT	0.075***	−0.018	0.059***	−0.048***	−0.080***	−0.085***	−0.017
BIG4	−0.014	0.044***	0.007	−0.022*	0.106***	0.121***	−0.022*
TENURE	0.001	−0.050***	−0.015	−0.035***	−0.024**	−0.140***	−0.062***
AUDROTAT	0.034***	0.016	0.031***	0.002	0.034***	0.022*	−0.003
CEOCHG	0.062***	0.005	0.059***	−0.004	−0.02*	0.006	−0.002
CHAIRCHG	0.048***	0.002	0.044***	−0.038***	0.034***	−0.001	−0.024**

*, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. All variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent. The correlations among control variables are not reported for brevity (available upon request).

Table 4
The first stage of the Heckman procedure to correct for potential sample bias.

Variable	Comparison of means across subsamples			The first stage probit model	
	(1) Mean of suspect sample	(2) Mean of non-suspect sample	(3)=(1)-(2) Difference in means	Coeff.	Z-value
ISSUE	0.1627	0.1612	0.0016	0.0996***	3.27
LEVER	0.1032	0.0991	0.0041**	0.1706*	1.86
MTB	3.3668	3.3984	−0.032	−0.002	−0.79
LNSHARE	19.904	19.973	−0.069***	0.0149	1.14
ROA	0.0206	0.0311	−0.01***	−0.248*	−1.75
ANALYST	1.2921	1.4848	−0.193***	−0.145***	−11.16
SUSP_indlag	0.4876	0.4825	0.0051***	0.4513***	3.66
TRUST	76.762	80.420	−3.658***	−0.0004***	−2.71
				Constant and Year included	
Pseudo R²				0.013	
N	7318	7744		15,062	

In the first stage probit model, the dependent variable is *SUSPECT*, which is one for suspect firms and zero for non-suspect firms. The suspect firms are identified as those with the total value of real and accrual earnings management measure being positive. All other variables are defined in Appendix A. The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. All continuous variables are winsorized at the top and bottom 1 percent.

firms, which strengthens and extends the findings in Ding et al. (2007) and Lo et al. (2010). It is consistent with the lower motivation to manage earnings due to the prioritized resources and more social responsibilities for state-controlled firms.

The coefficients of *LARGEST* are positive and significant for the levels of both REM and AEM. Empirical evidence shows that the equity percentage owned by the largest shareholders in China relates positively to AEM (Firth et al., 2007).[15] Our results provide new evidence relating to REM, which means that the largest shareholders with higher ownership proportion are related to more REM inflating earnings numbers.

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[15] We find the square of *LARGEST* is not significantly associated with *AREM* or *DA* in untabulated tests. The result on *DA* is different from Ding et al. (2007), as we have more control variables, larger samples, and longer and different time periods than their study.

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Table 5
Effect of ownership structure on aggregated measures of REM and AEM.

	Dependent Var. is *AREM*		Dependent Var. is *DA*	
	Coeff.	T-value	Coeff.	T-value
CONSTANT	0.0108	0.26	0.0605*	1.77
STATE	−0.0145***	−3.66	−0.0078***	−3.96
LARGEST	0.0004***	3.75	0.0002***	3.16
MNGTOWN	−0.0007**	−2.35	0.0004**	2.52
DA	−0.4582***	−10.48		
AREM			−0.1355***	−7.24
MILLS	−0.0512**	−2.28	0.1278***	4.95
INST	−0.0002*	−1.65	5E-05	1.04
DUAL	0.0095*	1.94	0.0003	0.11
INDEP	−0.0303	−1.14	−0.0045	−0.3
NOA	0.0003	0.29	−0.0006	−1.24
CYCLELAG	0.0004***	3.47	0.0004***	7.05
SIZE	0.0029	1.46	−0.0068***	−5.22
LEVER	0.0011	0.07	0.0135	1.21
ROA	−0.0473	−1.44	0.3576***	3.96
CFO	−0.4696***	−9.39	−0.9374***	−37.33
SALEGROW	0.0193***	3.7	0.0164***	5.23
MTB	0.0024***	4.34	−0.0001	−0.24
ISSUE	0.0017	0.4	0.0208***	7.15
MA	0.0079***	2.75	0.0021	1.37
PUNISH	−0.0010	−0.24	−0.0033	−1.38
STPT	−0.0009	−0.12	−0.0043	−0.85
BIG4	−0.0015	−0.26	−0.0012	−0.34
TENURE	−0.0001	−0.16	0.0002	1.01
AUDROTAT	0.0081	1.43	0.0031	1.06
CEOCHG	0.0096***	2.7	0.0011	0.59
CHAIRCHG	0.0058	1.5	−0.0013	−0.68
	Year and Industry Dummies included			
R^2	0.2159		0.5922	
N	7143		7143	

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. All variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

As for the coefficient of *MNGTOWN,* it is significantly negatively related to the level of REM, consistent with the prediction of Hypothesis 3. We provide new evidence relating to REM, which supports the alignment effect of managerial ownership on mitigating earnings management from an agency perspective. In contrast, we find that managerial ownership relates positively to AEM, which is similar to the findings of Cheng and Warfield (2005). Therefore, our results show that managers are more sensitive to the costs of REM and have different attitudes towards REM and AEM. In summary, Table 5 shows that Chinese firms with more influential largest shareholders are more prone to REM. Chinese firms with state control and higher managerial ownership are less likely to engage in REM.

Then we discuss the coefficients of control variables in Table 5. To save space, we mainly discuss controls with significant coefficients in the REM regression. We correct for a statistically significant sample selection bias by including the inverse *MILLS* ratio estimated from the first stage Heckman procedure in Table 4. The negative and significant coefficient of *DA* shows the tradeoff between REM and AEM strategies by Chinese firms. We find that the REM level is significantly higher for firms with CEO duality (*DUAL*), longer last year operating cycles (*CYCLELAG*), higher sales growth (*SALEGROW*), and higher long-term leverage ratio (*LEVER*), larger market to book ratio (*MTB*), mergers and acquisitions (*MA*), auditor rotation (*AUDROTAT*) and CEO changes (*CEOCHG*). We also find that the REM level is significantly lower for firms with higher institutional ownership (*INST*) and more operating cash flows (*CFO*). Although not significant in the REM regression, variables such as *SIZE*, *ROA*, *ISSUE* and *PUNISH* are significantly associated with the level of AEM.

4.2. Robustness tests

In this section, we focus on the robustness of main results relating to REM in Table 5. We also have robustness tests also for AEM and find substantially the same results (not reported for brevity). The robustness is examined using different sample constructions, alternative REM measures, and different subsamples.

In Table 6, we consider the robustness to different samples of suspect firms through three additional approaches of suspect firm identification. Specifically, we identify suspect firms as those with total values of *DA* + *AREM* higher than industry-year medians, those just beating/meeting the earnings benchmarks, and those requiring both positive total values of

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Table 6
Robustness to different samples of suspect firms.

Dependent Var. is AREM	Suspect sample with the value of DA + AREM higher than its industry-year medians	Suspect sample with firms beating/meeting earnings thresholds	Suspect sample with both DA + AREM greater than 0 and beating/meeting earnings thresholds
STATE	−0.0171***	−0.0108*	−0.0153***
	(−4.14)	(−1.85)	(−2.84)
LARGEST	0.0004***	0.0003*	0.0005***
	(3.30)	(1.80)	(3.11)
MNGTOWN	−0.0006**	−0.0009**	−0.0006**
	(2.14)	(−2.28)	(−2.54)
	Control variables included		
R^2	0.1912	0.2180	0.2225
N	7353	4505	2294

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. t-values are presented in parenthesis. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. The earnings thresholds used for the last two samples are based on ROE intervals of (0, 0.01) and (0.06, 0.07) and $\triangle$ROE (ROE changes) intervals of (0, 0.01). All variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

DA + AREM and just beating/meeting earnings thresholds at the same time. We find that the coefficients of the three ownership variables are consistent with the results in Table 5 and support the corresponding hypotheses.

In Table 7, we examine the robustness of the results to alternative REM measures. Similar to Cohen and Zarowin (2010) and Zang (2012), we replace the dependent variable AREM with ADISX, APROD, ACFO and a second aggregate real earnings management variable (-ADISX-ACFO). The variables of ADISX and APROD are the abnormal levels of discretionary expenses and production costs, which are defined based on Model 1 and Model 2. The variable of ACFO means abnormal cash flows from operations, which are the residuals based on a model with industry-year regressions of operating cash flows on $1/A_{t−1}$, $SALES_t/A_{t−1}$ and $\triangle SALES_t/A_{t−1}$. The variable computation of -ACFO-ADISX represents a second aggregate measure of earnings management following Cohen and Zarowin (2010). As in Table 5, the results in Table 7 shows that firms with more influential largest shareholders engage in more REM, while firms with state control and higher managerial ownership are less likely to engage in REM. We find that the results from the ACFO regression are relatively weaker.

In Table 8, we report the robustness of our results to alternative ownership variables and different ownership-based subsamples. We generate alternative ownership variables including CSOE, LSOE, DLARGEST2, DLARGEST1, DMNGTOWN2 and DMNGTOWN1. Specifically, CSOE (LSOE) is a dummy variable coded as one if the firms are state-owned enterprises ultimately controlled by the Central (Local) government, and zero otherwise. DLARGEST2 (DLARGEST1) is the dummy for LARGEST coded as one if the ownership percentage of the largest shareholder is equal or greater than 50% (20%), and zero otherwise. DMNGTOWN2 (DMNGTOWN1) is the dummy for MNGTOWN coded as one if the ownership percentage of top managers is greater than 1% (0%), and zero otherwise.

The results in Panel A of Table 8 show that the mitigating effect of state control on REM is mainly driven by local SOEs. The untabulated F test shows that the difference between the coefficients of CSOE and LSOE is significant with a p-value of 0.0156. One possible reason is that the suspected central SOEs are less sensitive to the related costs of REM when compared with local SOEs. We also find that the largest shareholders' positive effects on REM exist particularly for firms with the largest shareholders' ownership equal or more than 50%. The result indicates that the dominant power of the largest shareholders makes REM less challenged by other shareholders or stakeholders. Finally, we find that management ownership helps reduce REM levels, especially when the ownership proportion is more than 1 percent. The insignificant coefficient of DMNGTOWN1 also shows that management ownership less than 1 percent only represents an immaterial proportion in Chinese listed firms. When testing the above ownership dummies within one regression (the last column of Panel A), the corresponding coefficients remain substantially the same.

In Panel B of Table 8, we further report regression results estimated from several ownership-based subsamples. We find that the hypothesized effect of the largest shareholders exists mainly for non-SOEs; and that the hypothesized effects of state control and management ownership exist mainly when ownership concentration is higher (with the value of LARGEST higher than 20 percent). It is also noteworthy that the coefficient of LARGEST changes to be significantly negative when the value of LARGEST is less than 20 percent, indicating alignment effects of the largest shareholders. Specifically, when the largest shareholder has less than 20 percent ownership, it is possible that the largest shareholder is an institutional shareholder. Consequently, institutional investors will monitor the opportunistic behavior of managers and help constrain REM. However, when the largest shareholders are more likely to be the controlling shareholders with more than 20% or 50% of ownership, the level of real earnings management relates positively to the ownership percentage of the largest shareholders. The results show that the effect is likely driven by the largest shareholder also being the controlling shareholder, consistent with Hypothesis 2. In the last column of Panel B of Table 8, we show the results of an interaction analysis. The significantly negative coefficients of the interaction terms (STATE × LARGEST, MNGTOWN × LARGEST) also show that the positive effect of largest shareholder on REM is mitigated by state control and management ownership. The results in Panel B of Table 8 reflect the interactions of the ownership variables and provide deeper insights into the effects of ownership structure.

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Table 7
Robustness to alternative REM measures.

	Dependent Var. is ADISX	Dependent Var. is APROD	Dependent Var. is ACFO	Dependent Var. is - ADISX- ACFO
STATE	0.0065***	−0.0047	−0.0005	−0.0077**
	(2.78)	(-1.48)	(-0.50)	(-2.16)
LARGEST	−0.0001*	0.0003***	−4E-05	0.0002*
	(-1.88)	(2.67)	(-0.88)	(2.08)
MNGTOWN	0.0006***	−0.0001	0.0003**	−0.001***
	(3.13)	(-0.20)	(1.93)	(-3.83)
	Control variables included			
R^2	0.1749	0.2332	0.7132	0.4007
N	7143	7143	5956	5956

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. t values are presented in parenthesis. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. *ACFO* means abnormal cash flows from operations, which are the residuals based on a model with industry-year regressions of operating cash flows on $1/A_{t-1}$, $SALES_t/A_{t-1}$ and $\triangle SALES_t/A_{t-1}$. Following Cohen and Zarowin (2010), the calculation of -ACFO-ADISX reflects the level of another aggregate measure of real earnings management. All variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

Table 8
Robustness to alternative ownership variables and different ownership-based subsamples.

Panel A: Robustness to alternative ownership variables				
Dependent Var. AREM	State ownership	Largest shareholding	Management ownership	All ownership variables
CSOE	−0.0013			−0.0055
	(−0.26)			(−1.05)
LSOE	−0.0126***			−0.0161***
	(−3.27)			(−3.95)
DLARGEST2		0.0151***		0.0169***
		(2.90)		(3.11)
DLARGEST1		0.0052		0.0058
		(1.21)		(1.31)
DMNGTOWN2			−0.0138*	−0.0161**
			(−1.83)	(−2.02)
DMNGTOWN1			0.0004	0.0020
			(0.12)	(0.61)
	Control variables included			
R^2	0.2134	0.2126	0.2111	0.2160
N	7143	7143	7143	7143

Panel B: Robustness to different ownership subsamples						
Dependent Var. AREM	SOEs	Non SOEs	LARGEST> = 50	LARGEST> = 20	LARGEST < 20	Interaction analysis
STATE			−0.0288***	−0.0154***	−0.0038	0.0034
			(−2.66)	(−3.58)	(−0.44)	(0.34)
LARGEST	0.0002	0.0010***	0.0010*	0.0005***	−0.0027**	0.0008***
	(1.63)	(3.91)	(1.93)	(3.45)	(−2.25)	(3.42)
STATE× LARGEST						−0.0005*
						(−1.95)
MNGTOWN	−0.0012	−0.0005	−0.0010**	−0.0008**	−0.0007	0.0001
	(−1.41)	(−1.49)	(−2.15)	(−2.09)	(−1.48)	(0.15)
MNGTOWN× LARGEST						−2E−05*
						(−1.65)
	Control variables included					
R^2	0.2170	0.2430	0.2481	0.2135	0.3250	0.2167
N	4978	2165	1768	6185	958	7143

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. T values are presented in parenthesis. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. *CSOE* (*LSOE*) is the dummy coded as one if the firms are state-owned enterprises ultimately controlled by Chinese central (local) government, and zero otherwise. *DLARGEST2* (*DLARGEST1*) is the dummy for *LARGEST* coded as one if the ownership percentage of the largest shareholder is equal or greater than 50% (20%), and zero otherwise. *DMNGTOWN2* (*DMNGTOWN1*) is the dummy for *MNGTOWN* coded as one if the ownership percentage of top managers is greater than 1% (0%), and zero otherwise. The subsample regressions in Panel B are based on the dummies of *DLARGEST1*, *DLARGEST2*, and whether a firm belong to SOEs or non-SOEs. All other variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

Finally, we discuss the robustness of our main results using different time periods and the Fama-MacBeth regression. In Table 9, we first divide our sample periods of 12 years (2003–2014) into the first 5 years (the pre IFRS adoption and pre share split reforms years) and the second 7 years (the post IFRS adoption and post share split reforms years). The results from the

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Table 9
Robustness to different time periods.

Dependent Var. *AREM*	The period of 2003–2007	The period of 2008–2014	Fama-MacBeth Regression
STATE	−0.0156***	−0.0152***	−0.0145***
	(-3.02)	(-2.66)	(-5.03)
LARGEST	0.0004**	0.0005***	0.0004***
	(3.03)	(3.17)	(4.31)
MNGTOWN	−0.0002	−0.0012**	−0.0005*
	(-0.68)	(-2.55)	(-1.93)
	Control variables included		
R^2	0.2152	0.2308	0.3360
N	2984	4159	7143

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. t values are presented in parenthesis. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. All variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

Table 10
Additional tests on executive managerial ownership.

	AREM	*DA*
STATE	−0.0132***	−0.0088***
	(−3.39)	(−4.37)
LARGEST	0.0004***	0.0002***
	(3.65)	(3.14)
EXECOWN	−0.1127*	0.0811***
	(−1.84)	(3.01)
	Control variables included	
R^2	0.2159	0.5863
N	7143	7143

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. T values are presented in parenthesis. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. *EXECOWN* is the ownership percentage of executive top manager. All other variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

corresponding regressions show that our first two hypotheses are consistently supported in both periods. The coefficient of *MNGTOWN* is not significant in 2003–2007, which is likely due to management ownership is much lower in this time period[16]. In the last column of Table 9, we report the results from a Fama-MacBeth regression model with Newey-West standard errors. Overall, the results are consistent with those in Table 5 and Table 7, indicating that our results are not affected by time periods such as the years of share split reform.

4.3. Additional tests[17]

4.3.1. Executive managerial ownership

In our main tests, management ownership is measured as the total percentage of shares held by top management team members including the board members, supervisory board members and top managers. Different from the decisional role of executive managers, nonexecutive managers (i.e. independent directors and supervisory board members) have more advisory and monitoring roles. It is also of interest to further examine the effects of executive managerial ownership on earnings management. Therefore, we generate a new management ownership variable named *EXECOWN*, which is the ownership percentage of executive top managers.

The results are presented in Table 10, with the first regression on REM and the second regression on AEM. We find that the REM level is significantly lower for firms with higher executive ownership; we also find that the AEM level is significantly higher for firms with higher executive ownership. The results show that our findings are robust to different measures of management ownership.

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[16] The mean of *MNGTOWN* (0.729) in 2003–2007 is significantly smaller than the mean value (0.941) in 2008–2014 (p < 0.05). The mitigating effect on real earnings management is limited when management ownership is trivial.

[17] We are grateful to an anonymous reviewer for these two important additional tests.

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Table 11
Additional tests on the joint and sequential nature of REM and AEM.

	Dependent Var. is *AREM*		Dependent Var. is *DA*	
	Coeff.	T-value	Coeff.	T-value
CONSTANT	−0.0181	−0.39	0.0651*	1.84
STATE	−0.0116***	−2.85	−0.0060***	−3
LARGEST	0.0004***	3.09	0.0001**	2.33
MNGTOWN	−0.0009***	−2.83	0.0005***	3.22
Unexpected AREM			−0.0715***	−5.99
Predicted AREM			0.0081**	1.99
MILLS	−0.1171***	−4.19	0.1350***	4.78
INST	−0.0002**	−1.97	0.0001*	1.81
DUAL	0.0100*	1.93	−0.0006	−0.19
INDEP	−0.0301	−1.08	−0.0040	−0.26
NOA	0.0006	0.63	−0.0007	−1.34
CYCLELAG	0.0002*	1.87	0.0004***	6.85
SIZE	0.0064***	3.13	−0.0075***	−5.7
LEVER	−0.0055	−0.33	0.0099	0.84
ROA	−0.2252***	−3.39	0.3853***	4.13
CFO	−0.0428	−1.08	−0.9241***	−34.1
SALEGROW	0.0126**	2.24	0.0150***	4.67
MTB	0.0027***	4.21	−0.0004	−0.85
ISSUE	−0.0084*	−1.86	0.0222***	7.2
MA	0.0074**	2.54	0.0007	0.44
PUNISH	0.0005	0.12	−0.0036	−1.48
STPT	0.0011	0.13	−0.0051	−0.95
BIG4	−0.0010	−0.16	−0.0012	−0.33
TENURE	−0.0002	−0.46	0.0002	1.02
AUDROTAT	0.0072	1.22	0.0021	0.72
CEOCHG	0.0097***	2.67	0.0005	0.29
CHAIRCHG	0.0068*	1.73	−0.0018	−0.89
	Year and Industry Dummies included			
R^2	0.1640		0.5768	
N	7143		7143	

The coefficients with *, ** and *** represent significance at 10%, 5% and 1% (two tailed) respectively. Corresponding statistics are adjusted for heteroskedasticity and firm-level clustering. *Unexpected (Predicted) AREM* is the estimated residuals (predicted values) from the first regression in Table 10. All other variables are defined in Appendix A. All continuous variables are winsorized at the top and bottom 1 percent.

4.3.2. The relationship between REM and AEM

Zang (2012) documents a joint and sequential relationship between REM and AEM for US listed companies. It is unclear in the literature whether the joint and sequential choice of REM and AEM also exists in China. More importantly, we are unclear whether our results on the relationship between ownership structure and REM would be affected when taking into account the joint and sequential relationship between REM and AEM. Following the recursive equation system in Zang (2012, p. 685), we run two regressions of REM and AEM sequentially. Different from the regressions in Table 5, we exclude *DA* from the first regression and substitute two new variables (*Unexpected AREM* and *Predicted AREM*) for *AREM* in the second regression. *Unexpected (Predicted) AREM* is defined as the estimated residuals (predicted values) from the first regression in Table 11. We find that for the second regression, the coefficient on *Unexpected AREM* is negative and significant at the 0.01 level. The result suggests that managers adjust the level of AEM after the fiscal year-end based on the realized level of REM (Zang, 2012). Like Zang (2012), the coefficient on *Predicted AREM* is positive and significant, consistent with the positive correlation between REM and AEM due to the cross-sectional variation in the total desired amount of earnings management. Therefore, we find that there also exists a joint and sequential relationship between REM and AEM for Chinese suspect firms.

5. Conclusion

Many Chinese listed firms are ultimately state controlled and have influential large shareholders, which can have significant impacts on earnings management. Although the percentage of managerial ownership is not high, the ownership continuously increases and represents a significant part of managerial wealth in China. In this paper, we examine the effect of ownership structure on the level of REM in China. Following prior studies, we measure real activities manipulation through overproduction and cutting discretionary expenditures (Cohen & Zarowin, 2010; Cohen, Dey, & Lys, 2008; Roychowdhury, 2006; Zang, 2012). We develop our hypotheses based on three dimensions of ownership structure: the state control, the largest shareholder's ownership and the managerial ownership.

Using Chinese listed firms from 2003 to 2014, we construct four different samples of Chinese firms suspected for upward earnings management. We test the hypotheses after correcting for sample selection bias through Heckman procedures. We find that the level of REM relates negatively to the existence of state control and positively to the ownership percentage of

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the largest shareholders, which are similar to their relations with AEM. Additionally, we find that managerial ownership has a negative effect on REM, in contrast to its positive effect on AEM. The results indicate that Chinese firms with more influential largest shareholders are more prone to REM; and that firms with state control and higher managerial ownership are less likely to engage in REM. We also run some subsample regressions and find that the negative effects of state control and managerial ownership on REM are more prominent for firms with higher largest shareholder's ownership; and that the effects of largest shareholder ownership and managerial ownership on REM mainly exist for non-state controlled Chinese firms. We further find a joint and sequential relationship between REM and AEM for Chinese suspect firms, which is documented by Zang (2012) for US firms. Our results are robust to regressions based on different variable measurements, sample sizes and model designs. While our results are robust to several sensitivity tests that address the potential endogeneity issues, it is still possible that the results are driven by some unidentified firm-specific attributes correlated with both ownership structure and earnings management. Thus, the results should be interpreted with caution regarding a strict causal relationship.

Prior studies focus on the relationship between ownership structure and AEM. In this paper, we contribute by testing the effects of ownership structure on REM. Prior REM literature is mainly based on developed economies (e.g. Roychowdhury, 2006; Cohen & Zarowin, 2010; Zang, 2012). We contribute to a better understanding of REM in developing economies by providing empirical evidence from China.

Our study contributes to the research on the relationship between ownership structure and earnings management, and contributes to the understanding of REM in emerging economies and has significant implications for shareholders, analysts and regulators. Our findings are also important and relevant given that MSCI decides to include China mainland stocks in its indexes starting in 2018. Real earnings management is closely related to firms' financial performance, so potential investors in MSCI indexes involving Chinese firms need to pay attention to the real earnings management of these firms.

Appendix A. Variable definitions

A	total assets
ACCRUAL	earnings before extraordinary items and discontinued operations minus operating cash flows
ADISX	the abnormal discretionary expenses are computed as the residuals from Eq. (1)
ANALYST	the natural logarithm of the number of analysts following the firm plus one at the beginning of the year
APROD	the abnormal production costs are computed as the residuals from Eq. (2)
AREM	the aggregate real earning management measure, calculated as the sum of abnormal discretionary expenses multiplied by negative one and abnormal production cost
AUDROTAT	one if a client firm rotates its audit firm, zero otherwise
BIG4	one if the auditor is an international Big 4 auditors, zero otherwise
CEOCHG	a dummy for CEO changes, coded one if a firm has a new CEO in a year.
CFO	the net cash flows from operating activities divided by beginning total assets
CHAIRCHG	a dummy for the board's chairman changes, coded one if a firm has a new chairman in a year.
CYCLELAG	the lagged days receivable plus days inventory less days payable
DA	the discretionary accruals are computed as the residuals from Eq. (3)
DISX	discretionary expenses, defined as the sum of advertising expenses, R&D expenses and Selling, General and Administrative Expenses (SGA)
INST	the percentage of shares held by institutional shareholders
ISSUE	one if a company issues new stocks or bonds
LARGEST	the percentage of shares held by the largest shareholder
LEVER	long term liabilities divided by total assets
LNSHARE	the logarithm of the number of shares outstanding
MA	one if a company conducts mergers and acquisitions, zero otherwise
MILLS	the inverse mills ratio estimated from the first stage probit regression
MNGTOWN	the total percentage of shares held by top management team members including the board members, supervisory board members and top managers

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Appendix A. (*continued*)

A	total assets
MTB	the market value divided by book value of equity
NOA	the net operating assets, measured as shareholders' equity less cash and marketable securities plus total debt, at the beginning of the year divided by lagged sales
PPE	gross property, plant and equipment
PROD	the production costs defined as the sum of costs of goods sold (COGS) and the change in inventories
PUNISH	one if a company and/or its executive managers are punished by the Chinese security market regulators, zero otherwise. The regulators include the China Securities Regulatory Commission (CSRC), the Ministry of Finance, the Shanghai and Shenzhen Stock Exchanges
REC	accounts receivable
ROA	the income before extraordinary items divided by total assets
SALEGROW	the one-year percentage growth in sales
SALES	the level of gross sales from ordinary operation
$\triangle SALES$	the change in gross sales from ordinary operation
SIZE	the natural logarithm of year-end total assets
STATE	one if the ultimate owner represents state ownership, and zero otherwise
STPT	a dummy for financial distress, coded one if identified by CSRC as "ST" or "PT" firms (specially or particularly treated firms) because of two-year consecutive losses or a current-year huge loss, and zero otherwise
SUSPECT	one for suspect firms and zero for non-suspect firms. The suspect firms are identified as those with positive total value of real and accrual earnings management
SUSP_indlag	the lagged yearly ratio of suspect firms to the total number of listed firms within an industry
TENURE	audit firm tenure in number of years
TRUST	the provincial trustworthiness scores from a survey by the Chinese Enterprise Survey System in 2001 (Zhang & Ke, 2002), based on Questionnaires went to more than 15,000 managers in companies in 31 provinces (response = 4600).

Appendix B. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jaccpubpol.2020.106733.

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