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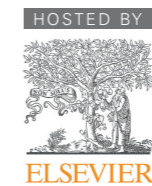
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A review of tax avoidance in China

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ABSTRACT

This paper synthesizes the major empirical findings of the burgeoning tax avoidance research in China from the accounting, finance, and economics literature over the last 13 years. It surveys the evidence in four main areas: (1) the mechanisms through which Chinese firms avoid income taxes; (2) the effects of government ownership and agency problem on tax avoidance; (3) tax avoidance and political connections; and (4) the roles of book-tax conformity, tax enforcement, and corporate governance. It also discusses the appropriateness of tax avoidance measures in the Chinese setting. Finally, it proposes important directions for future research.

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1. How do firms avoid taxes?

While current studies mainly focus on the determinants of tax avoidance, the ways in which firms avoid taxes is an overarching concern. Evidence in the literature shows that the main mechanisms of corporate tax avoidance in China include location migration, income shifting through transfer mispricing, intertemporal income shifting through accruals management, and consumption bribery.

Taking advantage of the tax rate differentials across regions, Wu et al. (2007) investigate how firms react to the termination of a local government's first levying and then rebating taxes (FLTRT) policy. The authors find that firms losing the benefits of FLTRT lower their tax burden by changing their registration locations to regions with preferential tax rates. However, firms controlled by local governments do not choose location migration as their tax avoidance strategy, due in part to the local government's incentives to stabilize local incomes and the local economy.

Lo et al. (2010) and Shevlin et al. (2012) examine income relocation activities from a high to a low tax jurisdiction via transfer pricing manipulation. Using the ratio of gross profit from related-party sales to gross profit

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from unrelated-party sales to proxy for transfer pricing strategies, Lo et al. (2010) examine the effects of tax, financial reporting, and tunneling incentives on transfer pricing manipulation. They hypothesize that when managers' bonus plan is determined by the firm's reported earnings or the listed firm enjoys a reduced corporate tax rate, the firm has incentives to shift profits into the listed firm through transfer mispricing. In addition, government-controlled firms are more likely than the privately owned firms to siphon profits out of a listed company through transfer pricing manipulation. Hence, the shifting of profits increases with the ownership percentage of the controlling shareholder. Consistent with these expectations, the authors find that the transfer mispricing proxy is positively associated with firms' marginal tax rate, management's bonus, and the percentage of shares owned by the government as the controlling shareholder.

While their investigation centers on related parties (also known as affiliated firms) that are not part of a consolidated group, Shevlin et al. (2012) explore income shifting within a book-consolidated group. Shifting income out of a consolidated group reduces the profit of one of the parties, thereby increasing nontax costs. In contrast, shifting income among consolidated parties can reduce the firm's tax payments without affecting the listed firm's aggregate reported pretax income. A contribution of this paper is that the authors construct a measure of tax rate differential adjustments (TRDA, TRD*) to directly estimate the tax savings from shifting income to lower-taxed subsidiaries within a consolidated group. Chinese income tax laws require each consolidated subsidiary to calculate its current taxes on an independent legal entity basis. In contrast, Chinese accounting standards require that all controlled subsidiaries consolidate their income for book purposes. Such a different reporting treatment, along with substantial tax rate differentials across subsidiaries, allow firms to avoid taxes via income shifting at a low financial cost. More importantly, the disclosure in B-share firms' tax footnote captures this practice. The authors demonstrate that intangible-intensive firms and firms with a rights issue exhibit more tax savings from income shifting. However, they find no evidence that state-owned enterprises (SOEs) shift more (less) income than other firms after (before) the 2002 tax-sharing reform, presumably because of the small sample size.

Using the 2007 New Enterprise Income Tax Law reform as a setting, Lin et al. (2012) and Lin et al. (2014) investigate how firms use inter-temporal income shifting to save taxes through accruals management (e.g., accelerating expenses or deferring revenues) in the anticipation year of a tax rate cut. Identifying firms whose marginal tax rates (MTR) were greater than 25% in the pre-reform period as tax-induced earnings management motivated firms, Lin et al. (2012) report that firms with expected lower tax rates after the reform reported negative discretionary current accruals in 2007. However, this practice is less evident for SOEs with a larger state-owned ownership percentage and firms with stronger corporate governance.

Lin et al. (2014) develop their hypotheses based on an analysis of the nontax cost considerations of different ownership structures. Compared with public firms, private firms may engage in more inter-temporal income shifting because their nontax costs associated with reporting lower earnings are low. In contrast, public firms have a high financial reporting cost as they face more pressure from capital markets, public disclosure, and external monitoring. By limiting the sample to public and private firms with a tax rate decrease after 2007, the authors find that private firms report more negative current accruals before the year of the tax rate reduction than in other periods and that private firms report more income-decreasing current accruals than public firms in 2007. This suggests that firms take book-tax trade-offs into consideration when making tax decisions.

The most recent paper by Tang (2020) corroborates a unique type of corporate political activity (CPA) that firms undertake to lower their tax burden. Specifically, the author investigates whether and to what extent firms bribe tax officials through gift-giving, banqueting, and entertaining activities and the payoffs that firms gain from these practices. Studies of tax-related CPA in the U.S. have shown that firms connect to politics through lobbying, political action committees, and campaign contributions to influence tax policies and enforcement (Correia, 2014). However, these types of CPA cannot be generalized to China because of China's one-party system. Instead, consumption bribery (i.e., getting things done by offering lavish gifts, entertainment, and travel opportunities) is widely used to establish connections with government officials and reap preferential treatment in China (Tang, 2020).

Using one-year survey data, Cai et al. (2011) find that Chinese firms with a high industry tax burden incur more entertainment and travel costs (ETC), suggesting that ETC contain "greasy" money. Tang (2020) extend their study by using panel data extracted from publicly available financial statements and more refined research designs (e.g., the residual method, exogenous shocks, two-stage least squares estimations, and alter-

native tax burden measures). The author provides systematic evidence on the existence of tax corruption and bribery at the firm level. The results show that, on average, a one-standard-deviation increase in consumption bribery decreases a firm's total tax burden by 0.65%, translating into tax savings of RMB40 million (equivalent to US\$6.44 million). The decision of consumption bribery and its outcomes are determined by firm size, the strength of political connectedness, industry competitiveness, and the levels of local corruption, economic development, and marketization. This paper is the first to study listed firms' ability to reduce their tax burden through bribery and to verify the existence and magnitude of tax corruption in China using publicly disclosed financial statement data. It extends contemporary research on tax-related CPA.

Taken together, the mechanisms of tax avoidance in China documented by studies to date include location migration, income relocation from high to low tax-rate jurisdictions through transfer pricing manipulation, inter-temporal income shifting through accruals management, and consumption bribery.

2. Government ownership, the agency problem, and tax avoidance

A distinctive feature of Chinese capital markets, relative to their counterparts in developed countries, is the concentrated government ownership. Approximately 73% of listed firms are directly controlled by the government through the State Asset Management Bureau (SAMB) or government institutions or indirectly controlled through their prior SOEs (CSRC, 2005). On average, the largest shareholder owns more than 40% of a listed firm's shares (Chan et al., 2016).¹ The unique organizational structure formed by incompletely restructured SOEs, and the concentrated ownership and weak corporate governance mechanisms, create an environment conducive to insider abuse (Tang, 2016). Unlike most Western countries where diffuse ownership structures are typical and the principal-agent problem (i.e., the Type I agency problem) is prevalent, agency conflicts between controlling and minority shareholders (i.e., the Type II agency problem) in China are acute. Controlling shareholders' tunneling practices are pervasive and have been well documented (Chan et al., 2016; Tang, 2016; Lo et al., 2010).

Given this background, the managers of government-controlled firms have competing incentives for tax avoidance. They have incentives to make tax decisions favorable to the government rather than maximizing investors' interests because they are appointed and evaluated by the government. They are eager to protect government revenues by avoiding aggressive tax planning because such tax planning will raise the after-tax profits that benefit minority shareholders at the expense of the government (Bradshaw et al., 2019; Tang & Firth, 2011; Shevlin et al., 2012; Chan et al., 2016). However, these managers also have incentives to avoid taxes to maximize the corporate resources under their control and to facilitate the expropriation of such resources from minority shareholders (Tang, 2016; Tang & Firth, 2011; Chan et al., 2016; Tang et al., 2017; Lo et al., 2010).

The emerging agency perspective on tax avoidance suggests that tax avoidance activities create a shield for the diversion of rents, which facilitates the diversion of resources from shareholders to managers, or from minority shareholders to controlling shareholders Desai and Dharmapala (2006); Tang, (2019). Examples include telling outside shareholders that income-shifting out of the firm is for tax avoidance purposes or claiming that insider transactions are not reported to avoid detection by tax authorities (Chan et al., 2016). Therefore, whether SOEs avoid paying less or more tax than on-SOEs is an interesting empirical question.

Motivated by the agency theory of tax avoidance, Tang (2016) dissects the incentives behind SOEs' tax avoidance from the perspective of tunneling. By analyzing the incomplete privatization process, the author proposes that incompletely restructured SOEs have strong motivations and capabilities to expropriate wealth from minority shareholders. Evidence from a sample of B-share listed firms from 1999 to 2004 indicates that SOEs controlled by the central government (SOECG) and SOEs controlled by local governments (SOELG) engage in more tunneling activities than SAMB and non-SOEs do as the shareholding percentage increases. Further, the magnitude of their tunneling increases with the level of tax avoidance, suggesting that tunneling can be an incentive for tax avoidance.

¹ Although privatization reform substantially reduced the percentage of SOEs to 38% in Chinese stock markets, SOEs still made up 64.36% of the total market capitalization at the end of 2014 (Wong 2016).

Chan et al. (2016) provide direct evidence of tunneling-related tax avoidance. They find that corporate tax avoidance is positively associated with firms' tunneling magnitude after controlling for firm characteristics, corporate governance, and institutional factors that affect tunneling. Further investigation of the economic consequences of tunneling-related tax avoidance shows that the market discounts the value of firms that are strongly suspected of engaging in such practices. Specifically, for aggressive tunneling-related tax avoidance firms, a 1% increase in tax avoidance results in a decrease in firm valuation of between 0.17% and 0.21%, amounting to between RMB4.42 and RMB5.32 million. For aggressive tunneling-related tax avoidance firms with opaque disclosure, a 1% increase in tax avoidance leads to a 0.42% decrease in firm valuation, equaling approximately RMB9 million. These findings support the agency perspective on tax avoidance and reconcile the mixed evidence on the economic consequences of tax avoidance in U.S. studies (see Hanlon & Heitzman, 2010).

Li et al. (2017b) explore SOEs' tax avoidance activities in the context of China's split-share structure reform. Before the split-share structure reform in 2005, government-held shares were non-tradable. SOEs expropriated minority shareholders' wealth through cash distribution and tunneling. After the reform, government-held shares became freely tradable at market prices, better aligning the incentives/interests of the controlling shareholder with those of minority shareholders. Therefore, the mitigation of the agency conflict between controlling and minority shareholders motivates SOEs to create profits and enhance firm value through tax avoidance. Consistent with this prediction, Li et al. (2017b) present robust evidence that SOEs engage in more tax avoidance after the reform. This effect is more pronounced for local SOEs, firms located in regions with financial deficits, and firms with fewer layers, consistent with the view that government intervention plays a role in SOEs' tax avoidance strategies.

While these studies focus on agency problems from a business perspective, Tang et al. (2017) provide new insights into this aspect through the lens of intergovernmental agency problems. Local governments play dual but conflicting roles in China. They serve as tax collectors on behalf of the central government, and they are controlling shareholders of the firms from which they collect taxes. Being a tax collector, local governments tend to maximize the taxes collected to increase local fiscal revenue. However, as dominant shareholders, they have incentives to avoid taxes to maximize their after-tax returns. Prior to 2002, the tax-sharing system required that the income taxes collected from local government-controlled firms (LG firms) be exclusively assigned to the local governments and that those collected from central government-controlled firms (CG firms) be assigned exclusively to the central government. As such, there was no intergovernmental agency conflict, as local governments retained 100% of the taxes they collected. The payoff of collecting taxes was higher than that of avoiding taxes for local governments. The new tax-sharing system implemented in 2002, however, requires that the income taxes of LG firms be equally shared with the central government. Therefore, local governments must make trade-offs between the cost of sharing taxes with the central government and the cost of sharing after-tax profits with minority shareholders.

Using the 2002 tax-sharing reform as a natural experiment and a propensity score matching difference-in-differences method, Tang et al. (2017) explore how local governments balance their tax collection and tax avoidance incentives and whether local governments direct the firms they control toward tax avoidance to expropriate the central government's tax revenue. They provide robust evidence that tax collectors can also be tax avoiders and that the propensity of local governments (tax collectors versus tax avoiders) is determined by the tax revenue sharing ratio and their ownership percentage in the controlled listed firms. When local governments' ownership percentage in their controlled firms is higher than the tax-sharing ratio, local governments direct their controlled firms to avoid taxes. The reason is doing so increases both outside shareholders' return on investment and local governments' extra-budgetary revenue. Evidence also reveals that the tax avoidance of LG firms is significantly associated with local fiscal conditions, in line with the view that local governments expropriate central tax revenue to meet their financial needs through tax avoidance. This paper contributes to the literature on tax and public finance by incorporating a principal-agent government model into firms' tax behavior and shedding light on the long-unsolved puzzle of why SOEs avoid taxes.

Based on a 1999–2012 sample, Bradshaw et al. (2019) report a contradictory result, showing that SOEs exhibit higher effective tax rates (ETRs) and cash ETRs (their proxy for tax avoidance) than non-SOEs, and that local SOEs pay more taxes than central SOEs. They interpret this as evidence that SOEs (local SOEs) engage in less tax avoidance than non-SOEs (central SOEs). The underlying assumption is that the probability

of SOE managers being promoted is associated with SOEs' income tax paid; therefore, managers have an incentive to pay more taxes. However, these results should be interpreted with caution. First, their ETR measure neither rules out the effect of tax rate differentials nor controls for the impact of the new Enterprise Income Tax Law, effective in 2008, on firms' tax burden.² Hence, it reflects an innate tax burden more than tax avoidance. Second, their cash ETR measure is strongly correlated with the ETR measure because, before 2007, most firms adopted a tax payable method under which income tax expense equaled current tax expense. Moreover, the authors do not separate firms using the tax payable method from those using the tax effect method, which limits the ability of the cash ETR to capture tax deferral strategies. Furthermore, the study ignores the effects of the 2005 split-share reform and the 2002 tax-sharing reform on SOEs' tax avoidance decisions (see Li et al., 2017b; Tang et al., 2017).

Using confidential tax audit data, Chan et al. (2010) also find that firms with a higher percentage of government ownership are less tax compliant, although that is not their focus.³ A concurrent working paper by Chow et al. (2019) investigates the relationship between SOEs and tax evasion. Using a novel dataset of detected tax evasion cases disclosed in annual reports, the authors demonstrate that SOEs are more likely to evade taxes (the most aggressive form of tax avoidance) than non-SOEs. To further clarify why their findings contradict those from Bradshaw et al. (2019), the authors perform a set of correlation analyses. They conclude that neither the ETR nor the cash ETR used in Bradshaw et al. (2019) captures aggressive tax avoidance (especially tax evasion). They also find that tax evading SOEs are less likely to be caught and subject to more lenient penalties than non-SOEs when caught. These results document SOEs' inherent privilege from their rooted political connections and offer an alternative explanation for why SOEs are more tax aggressive than non-SOEs are.

Overall, the distinct feature of concentrated government ownership derived from China's incomplete privatization process creates acute agency problems and extraordinary rent expropriation incentives for government-owned firms. This institutional setting provides a new perspective that enables researchers to resolve interesting issues that the U.S. setting cannot. For example, why do SOEs avoid taxes? Who is the ultimate tax decision-maker for a firm: the controlling shareholder or the CEO? Do tax avoidance incentives go beyond the traditional purpose of tax savings? To what extent do rent extraction and tax avoidance interact? How do investors distinguish between real tax avoidance and diversionary tax avoidance? Under what circumstances is tax avoidance value-enhancing? How do intergovernmental agency problems affect tax avoidance in a decentralized tax administrative system?

3. Tax avoidance and political connections

The tax benefits of establishing political connections have been documented in the literature (see the review in Barrick and Brown, 2019). Studies show that U.S. firms attempt to influence tax policies and enforcement (e.g., audit intensity, audit outcomes, preferential tax treatment) through lobbying, campaign contributions, and political action committees (Chen et al., 2018). In contrast, Chinese firms engage in tax-related political activities mainly through connected directors and CEOs (Wu et al., 2012; Shen et al., 2019) and consumption bribery (Tang, 2020). For example, Wu et al. (2012) conjecture that private firms are in a disadvantageous position compared to SOEs because they lack government connections. The authors predict and provide evidence that hiring current or former government or military personnel as the chairman or CEO helps non-SOEs to lower their effective tax rates. However, there is no significant difference in the ETRs of SOEs with connected managers and those without connected managers. These results suggest that political connections do provide tax benefits to private firms and that SOEs have the strongest political connections rooted in government ownership.

² Prior to the new Enterprise Income Tax Law, state-owned and private-owned firms were subject to a corporate income tax rate of 33%, whereas foreign-invested firms (a subset of non-SOEs) were taxed at only 15%. Since 2008, all firms (SOEs and non-SOEs) have been taxed at 25%.

³ Chan et al. (2013b) find a negative association between government-owned firms and tax avoidance. However, this association only exists for SOECG firms.

Chen et al. (2019) examine the effect of provincial governors' regional favoritism on corporate tax avoidance activity. They propose that firms located in a municipality where the incumbent provincial governor has held a key office for more than one year receive political favoritism (e.g., preferential tax policies, lax enforcement, lenient levies), making these firms more tax aggressive. The results show that firms located in regions formerly administered by the incumbent provincial governors exhibit a higher level of tax avoidance than other firms. Additional analysis reveals that politically connected firms (i.e., firms whose chairmen or CEOs previously held positions in local government) in the favored region avoid more taxes than other firms in the same region. However, the channels through which governors convey such favoritism remain unknown.

Shen et al. (2019) investigate the effect on tax avoidance of political connections through hometown, workplace, and education ties. The results show that CEO and board member hometown ties (Laoxiang) with the local municipal Party committee secretary increase a firm's tax avoidance by 7.4%, whereas past employment ties only increase tax avoidance by 0.5%. There is no evidence that college ties affect tax avoidance. In addition, the effect of hometown ties on tax avoidance is only significant for non-SOEs, indicating that SOEs depend less on political connections to obtain resources from the government than non-SOEs do. Further analysis shows that hometown ties serve as a sturdy political shield and that politically connected firms are more likely to receive government subsidies.

Tang (2020) also shows that non-SOEs, small firms, SOEs with weak political connections, and firms in competitive industries spend more on entertainment and travel expenses to bribe tax officials to lower their tax burden than their counterparts do, implying that these firms have a stronger need to build political connections to clear bureaucratic obstacles and gain competitive advantages.

4. The effects of book-tax conformity, tax enforcement, and corporate governance on tax avoidance

4.1. Book-tax conformity

Book-tax conformity refers to reducing the extent to which managers can report accounting earnings that differ from taxable income based on accounting and tax rules, or vice versa (Tang, 2015). Since 1985, China has moved from basing financial accounting standards on tax codes towards an independent book-tax system. Before 1985, there were no book-tax differences (BTD) because the rules for measuring accounting income were the same as those for measuring taxable income. With the harmonization of China's Generally Accepted Accounting Principles with the International Financial Reporting Standards and the importation of some international tax laws, the gap between accounting and tax income has gradually increased (Chan et al., 2013a; Tang & Firth, 2011). The book-tax system divergence allows managers to aggressively report financial profits and taxable income simultaneously. Tang and Firth (2011) note that Chinese BTD fluctuate over time, but the variation cannot be solely attributed to regulatory changes during the observation period. Instead, they find that tax avoidance explains 27.8% of abnormal BTD.

Using confidential tax audit data for listed firms from 1996 to 2003, Chan et al. (2010) document that firms' tax noncompliance (measured as tax audit adjustments from Chinese tax authorities) increases as book-tax reporting conformity decreases. The informativeness of book-tax differences for tax noncompliance decreases as book-tax reporting conformity decreases. These results are consistent with Tang (2015) who demonstrates that a highly aligned book-tax system mitigates earnings management and increases tax compliance in an international setting.

4.2. Tax enforcement

Research on the role of tax enforcement in curbing tax avoidance is limited partly because of the difficulty in measuring tax enforcement. Lin et al. (2018) investigate a direct relation between tax enforcement and firms' tax burden and whether political connections (measured by board members' workplace ties) reduce the sensitivity of the ETR to tax enforcement. They first construct a province-level tax enforcement measure using aggregate data from the China Tax Audits Yearbook (2003–2013), including (i) permanent employees; (ii) tax inspectors; (iii) employees with a Bachelor's degree and/or professional qualification, and their age range; (iv) corporate taxpayers; (v) corporate tax returns audited; (vi) audit departments; (vii) suspicious cases; (viii)

cases prosecuted; (ix) cases closed; (x) regional tax revenue; (xi) tax deficiencies settled; (xii) overdue tax surcharges; and (xiii) tax penalties, interest, and fines. They classify this data into three factors (i.e., probability, expertise, and outcome) and construct an aggregate enforcement measure by ranking and calculating three factors' mean ranking for each region and year.

Next, Lin et al. (2018) demonstrate that tax enforcement strength is positively associated with ETR, suggesting that strong regional enforcement increases firms' tax burden in that region. However, this positive association is weakened for firms with a politically connected board. The authors interpret this as evidence that tax agencies subject the tax aggressiveness of connected firms to less scrutiny and lighter punishment, making their tax burden significantly lower than the statutory rate. However, two questions remain unanswered. Should connected firms have a lower tax burden than non-connected firms? If so, is the lower tax burden a result of connected firms receiving more preferential tax rates and subsidies (see Shen et al., 2019) or a reflection of connected firms benefiting from lenient tax enforcement and engaging in more tax avoidance? Does the association between ETR and political connections significantly differ between weak and strong enforcement regions?⁴

Using two tax enforcement intensity proxies (measured by the industries that are subject to stricter scrutiny by the tax authority in a year and the amount of tax revenue collected from tax audits scaled by the total tax revenues collected in a province respectively), Chow et al. (2019) find no evidence that past tax enforcement intensity curbs tax evasion. Instead, there is evidence showing that the strength of local law enforcement helps prevent tax evasion.

Xiao and Shao (2020) provide evidence that the enhanced tax enforcement driven by the implementation of the third stage of the China Tax Administration Information System pilot deters firms from hiding profits from tax authorities (e.g., underreporting accounts receivable or over-reporting accounts payable, inventory, or the number of employees).

Cen et al. (2017) examine the effect of regional tax enforcement intensity (their proxy for external governance) on the relation between tax avoidance and the cost of debt. Using China's New Regulation on bonds issuance in 2015 as a shock, the authors test for two competing effects of tax avoidance on the cost of debt: the tax-saving effect versus the risk exposure effect. The results reveal a negative (positive) relation between tax avoidance and the cost of debt before (after) the implementation of the New Regulation, suggesting that the risk exposure effect prevails over the tax-saving effect when the external governance of the bond market is weak. Evidence also shows that the relation between tax avoidance and the cost of debt varies with regional tax enforcement intensity.

4.3. Corporate governance

Few studies investigate the direct relation between corporate governance and tax avoidance. Chan et al. (2013a) use the percentage of independent directors on a board, board equity holdings, and CEO–chairman duality to measure corporate governance. The OLS results show that non-SOEs with CEO–chairman duality and more shares owned by directors are more tax aggressive. SOEs with higher board equity holdings also engage in more tax avoidance. However, there is no evidence that the percentage of independent directors on a board is associated with tax avoidance for either SOEs or non-SOEs. Another study by Lin et al. (2012) reports that firms with better corporate governance mechanisms (measured by a higher percentage of independent directors, the presence of an audit committee, and voluntary disclosure of internal control systems) engage in less inter-temporal tax-induced income shifting.

Zhang et al. (2016) study the relation between state pyramids and effective tax rates for local SOEs. They are not interested in tax avoidance. Instead, they regard a high ETR for SOEs as indicating a high level of

⁴ The benefits of establishing political connections include preferential tax treatment, low regulatory penalties, and less scrutiny and oversight (Wu et al., 2012). A low ETR can be driven by a low applicable tax rate and/or a high level of tax avoidance in China. If connected firms enjoy a low tax burden, it is unsurprising that the sensitivity of ETR to tax enforcement is mitigated for connected firms. Without teasing out the causes of a low ETR and the effect of political connections on ETR, it is difficult to conclude that firms with a lower ETR are more tax aggressive than their counterparts and that political connections weaken tax enforcement effectiveness in constraining tax avoidance.

government intervention. Claiming that a pyramidal structure can reduce government intervention, the authors hypothesize that local SOEs with more state pyramid layers have a lower ETR (their proxy for government intervention). They then attribute a negative relation to the role of pyramidal structures in reducing local SOEs' tax burdens. While it is unclear why a high ETR represents high political involvement, an alternative explanation of their results is that SOEs' multiple pyramidal structure facilitates income shifting, which lowers the corporate tax burden.

5. The appropriateness of tax avoidance measures

Prior literature has analyzed various tax avoidance measures commonly used in U.S. studies, such as ETR, BTD, Cash ETR, UTB (unrecognized tax benefits), tax sheltering (see Hanlon and Heitzman 2010 for a review). While each measure has its pros and cons, which measure is most appropriate depends on the specific research question. Careful thought should be given to the research question to be addressed, what will be measured and tested for, and what inferences can be drawn from the results given the measurement used. It is also crucial to ascertain whether and why U.S.-based tax avoidance measures can be readily applied to China's institutional and operating environments.

5.1. ETR

ETR is the most widely used metric in tax literature. A key limitation of the ETR measure, however, is its inability to distinguish between tax savings from innate tax preferences and tax savings from aggressive tax reporting. Unlike the U.S. setting where all corporations are subject to an identical statutory tax rate, Chinese firms are subject to heterogeneous income tax rates based on location, ownership type, firm age, and industry (Wu et al., 2007; Tang & Firth, 2011; Shevlin et al., 2012). As such, the ETR measure in China captures both innate tax rate differentials and intentional tax avoidance. Without controlling for the applicable tax rate, it is assertive to infer that firms with a lower ETR are more tax aggressive than those with a higher ETR. In my opinion, ETR is a good measure of tax burden whereas the modified ETR (e.g., $ATR - ETR$ or ETR/ATR) better captures tax avoidance.⁵

5.2. Cash ETR

The cash ETR measure is also a popular tax avoidance metric, which is the ratio of cash paid to pretax book income. One advantage of the cash ETR measure is that it captures tax deferral strategies but is not affected by changes in tax accounting accruals. The concern of mismatching over the cash ETR is not an issue in China, because China requires that all firms use the calendar year for both financial and tax reporting. However, caution should be taken that, before 2008, almost all Chinese listed firms adopted the tax payable method under which no deferred tax was recognized. Furthermore, income tax paid is not available in Chinese listed firms' cash flow statements. Researchers interested in this measure may have to estimate income tax paid and ensure that the firms in their sample adopt the tax effect method.

5.3. BTD, DDBTD, and DTAX

BTB is a function of accounting-tax misalignment, earnings management, and tax avoidance. Tang and Firth (2011, 2012) perform a comprehensive study of the theoretical framework, composition, and different information content of Chinese BTB. One of the significant contributions made by Tang and Firth (2011) is distinguishing the regulatory and opportunistic components of BTB. The authors document that different reporting rules between accounting standards and income tax laws explain approximately 77% of BTB in China. Furthermore, the variation in ABTD is caused by earnings management, tax avoidance, and their interaction. These results provide a caveat for researchers when using BTB as a proxy for tax avoidance

⁵ Please note that the ATR of a listed firm may be different than that of its subsidiaries or parent firm. Using the weighted average ATR of consolidated parties will help minimize potential noise in the modified ETR.

and when using ABTD to separately investigate EM or TM. While the income-effect BTM is widely used in the U.S., Tang and Firth (2011) demonstrate that the tax-effect BTM is superior conceptually and empirically in the Chinese setting.⁶

A few studies follow Desai and Dharmapala (2006) to estimate discretionary BTM by regressing total BTM on total accruals, in which total accruals are used to control for earnings management. Under China's institutional background, however, the residual from Desai and Dharmapala's estimation model captures most of the regulatory differences between accounting and tax reporting rules. In addition, the effectiveness of total accruals in capturing earnings management is arguable. A similar measure is the discretionary portion (DTAX) of permanent BTM constructed by Frank et al. (2009). Permanent BTM is measured as the difference between the effective and statutory tax rates multiplied by pretax accounting income. An assumption underpinning this measure is that tax avoidance generates permanent differences, whereas earnings management creates only temporary differences. As a result, DTAX fails to reflect tax avoidance activity that may give rise to temporary differences, such as shifting income from a high- to a low-tax year.

6. Summary and thoughts for future research

China's unique institutional characteristics and its position as the world's second-largest economy provide excellent opportunities to research tax avoidance activities. These distinctive features include but are not limited to the acute Type II agency problem caused by the concentrated ownership structure, substantial tax rate differentials across firms, industries, regions, and years, double stock markets, rigid capital issuance requirements, the dual role of government as the tax claimant and the controlling shareholder of SOEs, the transition from a tax-based accounting system to a divergent accounting-tax system, and frequent accounting and tax reforms.

Given that China's tax regimes, enforcement, market practices, and institutional factors are quite different from those of the U.S., studies of these factors in the Chinese setting will supplement and enrich the tax literature. There are many potentially exciting avenues for future research. For example, do the magnitude and mechanisms of tax avoidance differ among ownership structures (e.g., SOELG vs. SOECG, SOEs vs. non-SOEs, public vs. private firms)? If so, why, and how? Do Chinese firms leverage mergers and acquisitions to avoid taxes? Apart from documenting the causes and consequences of tax avoidance, more in-depth studies of new devices for tax avoidance are needed. Such empirical work has the potential to contribute to our understanding of tax practices and corporate and individual behaviors in organizations. With the increasing role of multinational SOEs in the global marketplace, international transfer pricing and overseas tax haven investments are worthy of further exploration. While current studies dominantly focus on corporate income tax avoidance,⁷ research on whether and how taxpayers avoid other taxes (e.g., value-added tax, individual tax, capital gains tax) will be theoretically and practically crucial.

China's tax research has progressed rapidly in the last decade, but it is still at an early stage compared with U.S. studies. Its growth is impeded by concerns regarding methodological rigor and theoretical grounding. While some research results and measures built on U.S. studies cannot be readily transferred to the Chinese context, I encourage researchers to expand these boundaries by delving into both traditional tax theories and competing views. Integrating the unique features of China's capital markets and tax environments into the growing tax literature and developing a Chinese-specific theory will offer novel insights into the tax world and the implications of tax avoidance in emerging markets.

⁶ Tang and Firth (2012) find that regulatory and opportunistic sources of BTM have different implications for the accounting-based and market-based attributes of earnings quality. Abnormal BTM and normal BTM are incrementally informative about earnings persistence and go beyond the information in discretionary accruals and total accruals, suggesting that investigating BTM adds value to investors in assessing firms' underlying performance.

⁷ One exception is Li et al. (2017a), who investigate how individual investors' dividend taxes affect a firm's dividend payout policy. Although their focus is not on tax avoidance, they find that investors reduce trading activities in the month before a cum-dividend day to lower their dividend tax rates in response to the 2012 dividend tax reform.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. A comparison of studies on tax avoidance in China

Study	Tax avoidance measure	Findings
Wu et al. (2007)	$ETR = (\text{tax expense} - \text{deferred tax expense}) / \text{profit before interest and tax}$	Firms with FLTRT lower their tax burden by moving business registration location to low tax rate regions.
Chan et al. (2010)	$ADJ = \text{total tax audit adjustments} / \text{sales revenue}$	Tax noncompliance increases as book-tax conformity decreases.
Tang and Firth (2011)	$\text{Tax-effect BT}D = (\text{prima facie income tax expense} - \text{current tax expense}) / \text{total assets}$ $ABTD = \text{the component of BT}D \text{ unexplained by regulatory differences} / \text{total assets}$	Firms with strong incentives for earnings and tax management exhibit high ABTD.
Tang and Firth (2012)	$ABTD = \text{the component of BT}D \text{ unexplained by regulatory differences} / \text{average total assets}$ $NBTD = (\text{BT}D - \text{ABTD}) / \text{average total assets}$	Firms with greater tax avoidance and earnings management exhibit less persistent earnings. Large NBTD increases the earnings–returns relation but large ABTD do not.
Wu et al. (2012)	$ETR = \text{income tax expense} / (\text{profit before tax} + \text{asset depreciation reserves excluding provisions for bad debts} - \text{investment returns} + \text{cash dividends received} + \text{cash bond interest received})$	Politically connected non-SOEs enjoy more tax benefits than their counterparts. There is no significant difference between the ETRs of connected and non-connected SOEs.
Shevlin et al. (2012)	$TRDA = \text{tax rate differential adjustments in tax footnote}$ $TRDA^* = PTBI^*(t_h - t_p) + TRDA$	Intangible-intensive firms and firms concerned with meeting minimum earnings thresholds to issue equity avoid taxes by shifting income from high-rate to low-rate subsidiaries within a consolidated group.
Chan et al. (2013b)	$ETR = \text{the current portion of tax expense} / \text{adjusted taxable income} (\text{profit before tax} + \text{asset impairment} - \text{investment returns}) (\text{excluding cash dividends and bond interests})$ $RETR = ETR / ATR$	There is a negative association between government-owned firms and tax avoidance, but only for firms owned by the central government. Firms with higher board equity holdings are more tax aggressive.
Tang (2016)	$ABTD = \text{abnormal BT}D \text{ with DACC control}$ $METR = ETR / ATR$ $MCETR = CETR / ATR$	SOELG and SOECG engage in more tunneling than SAMB and non-SOEs do. The tunneling magnitude of SOECG increases with their tax avoidance level.
Chan et al. (2016)	$DETR = ETR - ATR$	Tunneling is positively associated with tax avoidance. This association is more pronounced when firms are short of cash resources and the investor protection environment is weak. The market discounts this tunneling-related tax avoidance.

(continued on next page)

Appendix A (continued)

Study	Tax avoidance measure	Findings
Li et al. (2017b)	ETR with ATR control	SOEs increase their tax avoidance after the split-share structure reform.
Cen et al. (2017)	ETR = (income tax expense – deferred income tax expense) / (EBIT – interest expense) SME = STR – ETR	The relation between tax avoidance and the cost of debt varies with the strength of external corporate governance regulations.
Tang et al. (2017)	METR1 = (income tax expense/pretax book income)/ATR METR2 = (income tax expense/net operating cash flows)/ATR	The intergovernmental agency conflicts resulting from the 2002 tax-sharing reform have led to more tax avoidance by SOELG, particularly when SOELG's ownership percentage is higher than the tax-sharing ratio.
Lin et al. (2018)	ETR = income tax expense/pretax income before special items	The positive relation between tax enforcement and ETR is weakened by political connections.
Bradshaw et al. (2019)	ETR = current income tax expense/pretax income CETR = (current income tax expense + beginning-of-year income taxes payable – end-of-year income taxes payable)/pretax income	SOEs avoid fewer taxes than non-SOEs. SOEs' ETR/CETR is positively associated with the probability of manager promotion.
Chen et al. (2019)	TA_BTD = (pretax income – taxable income)/total assets TA_ETR = STR – ETR	Firms located in favored regions that were formerly administered by the incumbent provincial governor show a higher level of tax avoidance than other firms.
Shen et al. (2019)	Income-effect BTD = (pretax financial income – taxable income)/total assets DDBTD = the component of BTD unexplained by total accruals	CEO hometown ties to local government officials positively affect tax avoidance.

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China-US trade dispute investigations and corporate earnings management strategy



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ABSTRACT

This paper studies Chinese firms' earnings management strategy in response to the trade dispute investigations initiated by the U.S. from 2001 to 2018. This topic is important given the increasingly severe international trade environment and the significant influence of macro economy on financial reporting. We find that firms affected by the U.S.-initiated trade dispute investigations engage in more upward earnings management. Additionally, the result is more pronounced in firms with a more negative market reaction around the announcement of the investigations. Cross-sectional tests provide evidence that the positive relation is stronger among firms whose U.S. operating revenue and management ownership is high, firms in provinces with weak investor protection, and firms that performed well one year after initiation of the investigations. Moreover, investors react positively to the earnings management by the affected firms. Our results are robust to a variety of sensitivity checks. Overall, our findings suggest that companies will manage their earnings upward to mitigate the negative impacts of the U.S.-initiated trade dispute investigations.

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1. Introduction

Since China's accession to the WTO in 2001, the bilateral trade volume between China and the United States increased 6.87 times from \$80.485 billion in 2001 to \$633.519 billion in 2018¹. Currently, the United States is China's largest trading country except the European Union. With the increasing trading volume between China and the United States, trade disputes are also escalating. In fact, the United States initiated

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¹ Data source: National Bureau of Statistics of the People's Republic of China (<http://data.stats.gov.cn/ks.htm?cn=C01>).

the most trade investigations and sanctions against China between 2001 and 2018². These trade dispute investigations lead to huge negative impacts on Chinese enterprises. For example, Fig. 1 plots the cumulative abnormal return (CAR) around the dates when firms are involved in the U.S.-initiated trade dispute investigations, which suggests that the CAR of the affected firms plummet significantly. Firms may take various actions in response to the investigations. In this paper we focus on earnings management and directly test whether and how firms manipulate earnings to mitigate the negative impacts of the investigations.

Lots of studies have been conducted on the firm's earnings management motivations which mainly include capital market motivations, political cost motivations, and contractual motivations. Specifically, capital market motivations include stock issues (Aharony et al., 1993; Teoh et al., 1998a; Healy and Wahlen, 1999; Lu and Wei, 2006; Wang and Liu, 2012), corporate mergers and acquisitions (Deangelo, 1988; Erickson and Wang, 1999), and catering to analysts' earnings forecasts (Burgstahler and Dichev, 1997; Dhaliwal et al., 2004). Political cost motivations include tax avoidance (Boynton et al., 1992), antidumping investigations (Magnan et al., 1999), and evasion of government capture (Chen et al., 2018). Contractual motivations include management compensation contracts (Watts and Zimmerman, 1978; Healy, 1985; Li et al., 2007; Wang and Wang, 2007) and debt contracts (DeFond and Jiambalvo, 1994; Sweeney, 1994). Besides the above three motivations, studies also find that firms manipulate earnings to take advantage of exogenous negative shocks. For example, in response to salient negative exogenous shocks such as natural disasters, firms tend to take a "big bath" to manage downward earnings to enhance profits in future periods in order to "refill the cookie jar" (Kirschenheiter and Melumad, 2002; Cheng et al., 2018).

Since the U.S.-initiated trade dispute investigation is one type of exogenous negative shocks to firms, it is possible that the affected firms may also take the opportunity to take a "big bath" in the current period in order to report higher future earnings. Cheng et al., (2018) points that natural disaster represents a significant negative shock for which the economic magnitude is hard for investors to quantify, providing a great opportunity for managing cookie jar reserve. However, trade dispute investigations may not be an appropriate opportunity to managing cookie jar reverse since investors can easily quantify the worst situation through the final duties. Though trade dispute investigations place significant burdens such as spending enormous amounts of time and money to defend themselves on the affected firms, they can make operational adjustments such as selling products to domestic markets to reduce loss. Therefore, these investigations may not be a sufficiently bad news like natural disasters and affected firms may prefer to smooth earnings, rather than take a "big bath" (Kirschenheiter and Melumad, 2002). Additionally, implicit in firms' use of "big bath" as a form of earnings management is managers' belief that the benefit of reporting higher future earnings is greater than the cost of reporting lower current earnings. Due to the high costs of reporting current loss in China, we argue that firms are also unlikely to take a "big bath" when they are faced with the trade dispute investigations. In China's special institutional context, reporting significant losses can lead to severe consequences for firms, such as reduced reputation, special treatment or even delisting, and higher financing costs (Lu, 1999; Wang et al., 2005; Wu et al., 2007). In addition, firms are also subject to lower regulatory risk when managing their earnings upward in China's premature capital market. We thus hypothesize that by trading off the benefits and costs of upward earnings management in China, firms affected by the U.S.-initiated trade dispute investigations are more likely to engage in upward earnings management rather than "big bath".

To examine the relation between trade dispute investigations and affected firms' earnings management strategy, we use a large sample of 33,088 firm-year observations over the period of 2001 to 2018. The affected sample comprises firm-years from industries that have been affected by the U.S.-initiated trade dispute investigations, and the remained firm-years constitute the unaffected sample. We first examine the impact of investigations on the earnings management of affected Chinese firms. Consistent with our hypothesis, we find firms in the industries involved in the U.S.-initiated trade dispute investigations conduct more upward earnings management in the initiated year of investigations than the unaffected firms.

We then perform the following cross-sectional analysis. First, we conjecture that firms which suffer more from the investigations should have more incentives to manipulate earnings. We use the market reactions

² According to the data of China Trade Remedies Information Platform (<http://cacs.mofcom.gov.cn/cacscms/view/notice/ckys#>), US initiated 266 trade investigations including anti-dumping, countervailing and safeguards against China between 2001 and 2018, and it ranked top 1 among all the countries that initiated trade investigations to China.

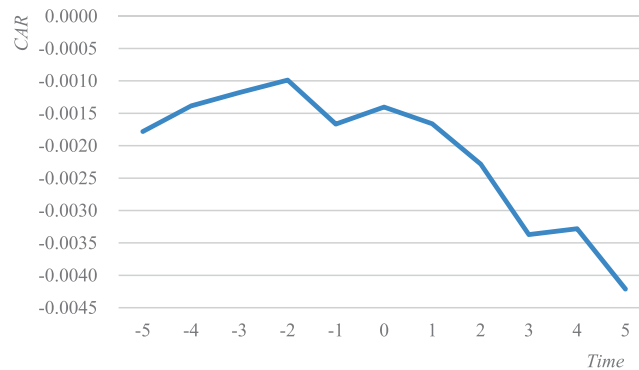


Fig. 1. Cumulative abnormal return around U.S.-initiated trade dispute investigations. Notes: This figure shows the cumulative abnormal return of Chinese firms which are involved in U.S.-initiated trade dispute investigations. The Y-axis is the cumulative abnormal return, and the X-axis is the relative day around the dates of the investigations.

around the announcement of the investigations as a proxy for the extent to which firms are negatively affected by the investigations. We indeed find that the main effect is stronger in affected firms with a more negative market reaction. Second, firms that have closer business connections with U.S. should be affected more by the investigations. We compute the percentage of U.S. revenue for each firm and find that affected firms engage in more earnings management if they have high percentages of U.S. revenues. Third, firms with higher management ownership may care more about the stock prices and thus should have more incentive to manage earnings upward. Fourth, we argue that the regulatory risk of earnings management is lower for firms in provinces with weak investor protection. Therefore, firms in those provinces may have lower regulatory costs of manipulating earnings, which leads to stronger incentive to manage earnings upward in the presence of trade dispute investigations. Fifth, we propose that the extent of upward earnings management depends on firms' expectation of eventual investigation results. For firms that can better counter the potential trade effect, they are more likely to manage earnings upward. We use the return on assets (ROA) one year after investigations to measure firms' expectation, and indeed find that the relation is more pronounced in affected firms that performed well one year after the initiation. Again, the results are consistent with our conjecture.

We further examine the real economic consequence of earnings management following trade dispute investigations for the affected firms. We find that the short-term market reactions of annual reports of firms with more upward earnings management are more positive, which suggests that the negative impact of trade dispute investigations is indeed alleviated by firms' upward earnings management.

Finally, we perform several supplemental tests to support our primary results. To rule out the alternative explanation that affected firms' earnings management behaviors may be caused by foreign buyers increasing their order to avoid the potential increase of tariff, we include the level of accounts receivable as a control variable into the main regression model. And in order to exclude the influence of other time-dimensional significant events and firm-level characteristics on the findings of the study, we use a series of methods such as placebo test for robustness test. Our findings are robust to all the above tests.

This study provides a number of important contributions to the literature. Firstly, we enrich the research on corporate earnings management strategy. The previous studies analyzed the motivations of corporate earnings management mainly around capital market pressures, political costs and contractual arrangements. In particular, it has been found in the literature that in the face of negative exogenous shocks such as natural disasters, firms strategically manage earnings downward (Cheng et al., 2018), i.e. by taking a "big bath" to cleanse the firm's current profits (Kirschenheiter and Melumad, 2002). Unlike developed markets, in China's special institutional context, firms' losses can have a serious negative impact on their operating environment, and in order to avoid such a shock, firms usually engage in upward earnings management (Lu, 1999; Wu et al., 2007). In addition, China's capital market regulatory system is still at the stage of continuous improvement, and firms' upward earnings management costs are even lower. Based on this, we investigate the impact of negative exogenous shocks on the upward earnings management of Chinese firms to provide evidence for the study of earnings management motivations and strategies based on emerging markets.

Secondly, we contribute to the study of the economic consequence of trade disputes. There have been more studies on the economic consequence of trade disputes to analyze their impact on macroeconomic development (David et al., 2013), and the firm level is also mainly concerned with the impact of trade disputes on firms' production operations and financial behavior (Liu and Ma, 2016; Crowley et al., 2018) and less concerned with the impact on firms' information disclosure strategy (Klevak et al., 2019). Considering that earnings information is crucial for investors to interpret firms' business status and development prospects, this paper takes the perspective of firms' earnings management and comprehensively analyzes the impact of trade dispute investigations on affected firms' earnings management strategies, providing evidence for the economic consequence of trade disputes from the perspective of information disclosure manipulation.

The last but not the least, the findings in this paper have some practical implications. By studying the impact of trade dispute investigations on firms' earnings management strategies, we suggest that regulators should strengthen the regulation of firms' information disclosure under the environment that trade dispute investigations become more and more frequently, and also suggest that market investors should cautiously interpret the operating performance of firms affected by trade dispute investigations.

The rest of this paper is organized as follows. Section 2 provides the background and develops our hypotheses. Section 3 describes the sample selection and research design. The empirical results and analysis are presented in Section 4. Section 5 performs additional analyses. Section 6 concludes.

2. Background and hypothesis development

2.1. Background

With the increasing trading volume between China and the United States since China's accession to the WTO, trade disputes are also escalating, especially during the past few years. Take anti-dumping investigations as an example, investigations are generally initiated after receiving a complaint from producers of a homogeneous product in the U.S. alleging that foreign exporters are dumping a like product in the U.S. The U.S. Department of Commerce is responsible for investigating antidumping allegations, and the process begins with a decision about whether or not the evidence provided in the complaint warrants an investigation. The decision must be made within 20 days of receiving the complaint. Importantly, the complaint filed by the U.S. producers must provide detailed information about the alleged dumping, including evidence of dumping and injury and a causal link between this two so that this information is available to the U.S. Department of Commerce to infer the initiation decision.

When the U.S. Department of Commerce decides to investigate a complaint, it publishes a notice indicating that it is opening an investigation and should give a preliminary determination **within two months**. An investigation into an allegation that foreign companies are dumping products involves two critical determinations, one is whether foreign goods are in fact being sold below fair market value, and another is whether the domestic producers of the goods have been injured by the alleged dumping. Once the preliminary determination is affirmative, it can apply provisional measures such as provisional anti-dumping duty based on estimated margin of dumping. And then it will go into further investigation to give a final determination **within one year**. If the final determination is affirmative, it will publish a determination on imposing anti-dumping duties and detail the amount of the duties. Fig. 2 shows the flow of anti-dumping investigations.

2.2. Hypothesis development

Ball and Brown (1968) points that of all the information about an individual firm which becomes available during a year, one-half or more is captured in that year's income number. Considering that earnings information plays such an important role, earnings management occurs when manager uses the flexibility inherent in accounting standards to manage the firm's reported accounting earnings to influence some economic outcome to the firm's (or manager's) benefit (Schipper, 1989). Healy and Wahlen (1999) concludes that the widespread use of accounting information by investors and security analysts to help value stocks can create an incentive for managers to manipulate earnings in an attempt to influence short-term stock price performance. And lots of studies provide empirical evidence for the capital market motivations, they have examined whether

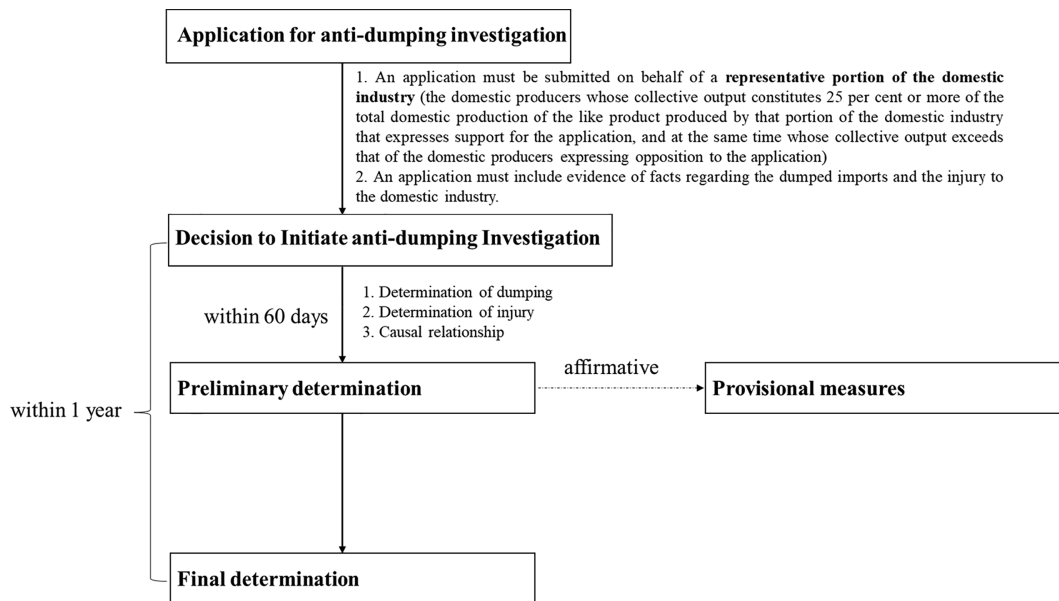


Fig. 2. Flow of anti-dumping investigations.

managers “overstate” earnings in periods prior to equity offers. The findings suggest that firms manage earnings upward prior to initial public offers (Aharony et al., 1993; Teoh et al., 1998a), seasoned equity offers (Teoh et al., 1998b), and stock-financed acquisitions (Erickson and Wang, 1999). Teoh et al. (1998a) and Aharony et al. (1993) find that firms with income-increasing abnormal accruals in the year of a seasoned equity offer have significant subsequent stock underperformance. Teoh et al. (1998b) find a similar pattern for initial public offers. These findings, therefore, suggest that upward earnings management prior to equity issues does prop up share prices.

Additionally, previous studies also suggest that managers have incentives to manipulate firms’ reported financial performance to bolster their compensation (Bergstresser and Philippon, 2006; Burns and Kedia, 2006; Efendi, Srivastava, and Swanson, 2007) or gain through stock sales (Beneish and Vargus, 2002). These findings imply that managers can earn a personal benefit from managing earnings to inflate the stock price. Since the U.S.-initiated trade dispute investigations can decrease the stock prices of Chinese firms affected by the investigations (Wu et al., 2015), which will hurt managers’ personal benefits affiliated to stock price, and upward earnings management can inflate the stock price to mitigate the negative effect of investigations. Therefore, we could expect a positive relation between U.S.-initiated trade dispute investigations and Chinese firms’ upward earnings management. Based on this discussion, we propose our first hypothesis as follows:

H1. Firms affected by the U.S.-initiated trade dispute investigations engage in more upward earnings management than unaffected firms.

Wu et al. (2015) applies the event study method to evaluate the negative effect of U.S.-initiated trade dispute investigations on CAR and finds that Chinese listed firms which are affected by trade dispute investigations do experience a large drop in stock price. Given that upward earnings management can help firms to mitigate the negative influence of trade dispute investigations on market valuation, we predict that firms which experience a larger drop of stock prices have stronger incentive to conduct upward earnings management. To provide evidence on this issue, we test the following hypothesis stated in alternative form:

H2. The relation between trade dispute investigations and upward earnings management is more pronounced for firms with more negative market reactions.

For the firms’ main business composition, we propose that firms which have closer business connections with U.S. should be affected more by the trade dispute investigations, thus they may be more eager to offset the negative effect brought by U.S.-initiated trade dispute investigations. To provide evidence on this issue, we test the following hypothesis stated in alternative form:

H3. The relation between trade dispute investigations and upward earnings management is more pronounced for firms with higher percentages of U.S. revenues.

Lots of previous research imply that managers can earn a personal benefit from managing earnings upward to inflate the stock price (Beneish and Vargus, 2002). Bergstresser and Philippon (2006) finds that the use of discretionary accruals to manipulate reported earnings is more pronounced at firms where the CEO's potential total compensation is more closely tied to the value of stock and option holdings, suggesting that managers manipulate firms' reported financial performance to bolster their compensation. Therefore, we predict that firms whose executives own more shares have stronger incentives to conduct upward earnings management. To provide evidence on this issue, we test the following hypothesis stated in alternative form:

H4. The relation between trade dispute investigations and upward earnings management is more pronounced for firms with higher level of management ownership.

Although earnings management conveys benefits to firms, firms cannot manipulate earnings with impunity. Prior research has shown that strong investor protection limits insiders' ability to acquire private benefits, which reduces their incentives to mask firm performance (Leuz et al., 2003). Therefore, we conjecture that

Table 1
Sample distribution by year.

Year	<i>TD</i> = 1	<i>TD</i> = 0	Total	Percentage of <i>TD</i> = 1 (%)
2001	48	885	933	5.14
2002	111	905	1016	10.93
2003	194	888	1082	17.93
2004	168	979	1147	14.65
2005	97	1143	1240	7.82
2006	96	1142	1238	7.75
2007	122	1201	1323	9.22
2008	168	1263	1431	11.74
2009	310	1180	1490	20.81
2010	63	1576	1639	3.84
2011	261	1732	1993	13.10
2012	376	1853	2229	16.87
2013	271	2104	2375	11.41
2014	314	2110	2424	12.95
2015	243	2297	2540	9.57
2016	502	2214	2716	18.48
2017	688	2265	2953	23.30
2018	825	2494	3319	24.86
Total	4857	28,231	33,088	14.68

This table reports sample distribution by year. Affected firms (*TD* = 1) are firms whose industry involved in U.S.-initiated trade dispute investigations in the current year. Percentage of *TD* = 1 is calculated as the observations of *TD* = 1 scaled by total observations in that year.

Table 2
Descriptive statistics.

Variable	N	Mean	Median	Standard deviation
<i>DA_MJONES</i>	33,088	0.0054	0.0041	0.0897
<i>DA_INTAN</i>	33,088	0.0057	0.0043	0.0891
<i>TD</i>	33,088	0.1468	0.0000	0.3539
<i>SIZE</i>	33,088	21.8327	21.6835	1.2764
<i>LEV</i>	33,088	0.4628	0.4597	0.2179
<i>ROA</i>	33,088	0.0307	0.0328	0.0679
<i>MTB</i>	33,088	3.7615	2.6896	3.8096
<i>LOSS</i>	33,088	0.1121	0.0000	0.3155
<i>DUAL</i>	33,088	0.2023	0.0000	0.4017
<i>TOPTEN</i>	33,088	57.7060	58.8400	15.2529
<i>SOE</i>	33,088	0.4801	0.0000	0.4996

the effect of trade dispute investigations on upward earnings management should be stronger for firms located in provinces with weak investor protection. To provide evidence on this issue, we test the following hypothesis stated in alternative form:

H5. The relation between trade dispute investigations and upward earnings management is more pronounced for firms located in provinces with weak investor protection.

Lastly, we propose that firms' expectation of the eventual investigation results may affect firms' responsive earnings disclosure strategy. For firms that can better counter the potential trade effect, the cost of upward earnings management is less than firms that are more vulnerable to the potential trade dispute, therefore, they are more likely to manage earnings up to send a positive signal to the market. To provide evidence on this issue, we test the following hypothesis stated in alternative form:

H6. The relation between trade dispute investigations and upward earnings management is more pronounced for firms that performed well one year after the initiation.

3. Research design

3.1. Sample and data

Our sample covers firms traded on China's A-share market from 2001 to 2018. Following previous literature, we exclude firms in financial industries because their financial ratios are not comparable with other firms. We also eliminate firms with missing data. Our final sample contains 33,088 firm-year observations with 3395 firms.

Table 3
Influence of U.S.-initiated trade dispute investigations on upward earnings management.

	(1) <i>DA_MJONES</i>	(2) <i>DA_INTAN</i>
<i>TD</i>	0.0054*** (2.93)	0.0052*** (2.83)
<i>SIZE</i>	0.0131*** (8.46)	0.0133*** (8.63)
<i>LEV</i>	-0.0369*** (-5.82)	-0.0356*** (-5.65)
<i>ROA</i>	0.5338*** (31.26)	0.5271*** (30.97)
<i>MTB</i>	0.0002 (0.66)	0.0002 (0.63)
<i>LOSS</i>	-0.0003 (-0.14)	-0.0005 (-0.20)
<i>DUAL</i>	0.0023 (1.13)	0.0022 (1.08)
<i>TOPTEN</i>	0.0004*** (4.93)	0.0004*** (4.96)
<i>SOE</i>	-0.0014 (-0.44)	-0.0018 (-0.58)
Constant	-0.2920*** (-9.47)	-0.2956*** (-9.63)
Year FE	YES	YES
Firm FE	YES	YES
Observations	33,088	33,088
R-squared	0.3259	0.3235

This table examines the influence of U.S.-initiated trade dispute investigations on upward earnings management. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 4
Cross-sectional analyses: market reaction of U.S.-initiated trade dispute investigations.

	High CAR		Low CAR	
	(1) <i>DA_MJONES</i>	(2) <i>DA_INTAN</i>	(3) <i>DA_MJONES</i>	(4) <i>DA_INTAN</i>
<i>TD</i>	0.0028 (1.12)	0.0024 (0.96)	0.0053** (2.01)	0.0052** (2.02)
<i>SIZE</i>	0.0126*** (5.94)	0.0127*** (6.01)	0.0118*** (6.29)	0.0121*** (6.46)
<i>LEV</i>	-0.0448*** (-5.31)	-0.0424*** (-5.06)	-0.0289*** (-3.62)	-0.0289*** (-3.67)
<i>ROA</i>	0.5171*** (21.43)	0.5134*** (21.37)	0.5559*** (25.46)	0.5463*** (25.24)
<i>MTB</i>	-0.0001 (-0.32)	-0.0002 (-0.48)	0.0005 (1.21)	0.0005 (1.21)
<i>LOSS</i>	-0.0007 (-0.19)	-0.0004 (-0.12)	-0.0004 (-0.12)	-0.0008 (-0.25)
<i>DUAL</i>	0.0032 (1.14)	0.0027 (0.99)	0.0027 (0.93)	0.0029 (1.02)
<i>TOPTEN</i>	0.0004*** (3.83)	0.0004*** (3.73)	0.0004*** (3.82)	0.0004*** (4.00)
<i>SOE</i>	-0.0006 (-0.15)	-0.0012 (-0.29)	-0.0019 (-0.45)	-0.0020 (-0.48)
Constant	-0.2758*** (-6.50)	-0.2753*** (-6.56)	-0.2743*** (-7.11)	-0.2802*** (-7.31)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	16,455	16,455	16,449	16,449
R-squared	0.1617	0.1596	0.1952	0.1935

This table shows the results of subsample tests based on market reaction of U.S.-initiated trade dispute investigations. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

We hand collect all investigations including anti-dumping, countervailing and safeguard initiated by the United States against China during the period between 2001 and 2018 from China Trade Remedies Information (CTRI)³. Other information is obtained from CSMAR and WIND.

3.2. Variables

3.2.1. Measures of earnings management

We use two methods to calculate accrual-based earnings management. First, we use modified Jones model (Dechow et al., 1995) to obtain a measure of accrual-based earnings management. The modified Jones model is estimated for each industry-year group as follows:

$$\frac{TA_{i,t}}{ASSET_{i,t-1}} = \beta_1 \frac{1}{ASSET_{i,t-1}} + \beta_2 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{ASSET_{i,t-1}} + \beta_3 \frac{PPE_{i,t}}{ASSET_{i,t-1}} + \varepsilon_{i,t} \quad (1)$$

where i indexes firms and t indexes fiscal years. Total accruals $TA_{i,t}$ are defined as net income minus operating cash flows for fiscal year t ; $ASSET_{i,t-1}$ is total assets at the end of year $t - 1$; $\Delta REV_{i,t}$ is the change in sales revenue from year $t - 1$ to year t ; $\Delta REC_{i,t}$ is the change in accounts receivable from year $t - 1$ to year t ; and $PPE_{i,t}$ is the gross value of property, plant and equipment at the end of year t . The residual from this model is discretionary accruals (DA_MJONES), and the higher discretionary accruals indicates more upward earnings management.

³ <http://cacs.mofcom.gov.cn/cacsms/view/notice/ckys#>

Second, we use intangible assets-adjusted discretionary accruals model (Lu, 1999) for robustness. The model is as follows:

$$\frac{TA_{i,t}}{ASSET_{i,t-1}} = \beta_1 \frac{1}{ASSET_{i,t-1}} + \beta_2 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{ASSET_{i,t-1}} + \beta_3 \frac{PPE_{i,t}}{ASSET_{i,t-1}} + \beta_4 \frac{IA_{i,t}}{ASSET_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

where $IA_{i,t}$ is intangible assets at the end of year t and other variables are the same as model (1). The residual is intangible assets-adjusted discretionary accruals (DA_INTAN), and the higher value indicates more upward earnings management.

3.2.2. Measure of affected by the U.S.-initiated trade dispute investigations

China Trade Remedies Information website lists details of the trade dispute investigation information including investigation date, investigation product and the affected industry. Dummy variable of whether firms are affected by the trade dispute investigations (TD) equals 1 if the industry of the firm is involved in the U.S.-initiated trade dispute investigations in the current year, and 0 otherwise.

3.2.3. Control variables

Following the existing literatures (Kothari et al., 2005; Bergstresser and Philippon, 2006), we include various firm-level variables to control for confounding factors that may affect earnings management. We control for firm size ($SIZE$), firm leverage (LEV), return on assets (ROA), market-to-book ratio (MTB), a dummy variable for loss firms ($LOSS$), whether CEO also serves as board chairman ($DUAL$), top ten shareholders' ownership ($TOPTEN$) and an indicator for firms owned by the state (SOE). Detailed definitions of these main variables are reported in Appendix A.

Table 5
Cross-sectional analyses: U.S. operating revenue.

	High U.S. operating revenue		Low U.S. operating revenue	
	(1) <i>DA_MJONES</i>	(2) <i>DA_INTAN</i>	(3) <i>DA_MJONES</i>	(4) <i>DA_INTAN</i>
<i>TD</i>	0.0077*** (2.79)	0.0074*** (2.70)	0.0040 (1.54)	0.0037 (1.43)
<i>SIZE</i>	0.0122*** (3.90)	0.0123*** (3.97)	0.0149*** (7.77)	0.0152*** (8.00)
<i>LEV</i>	-0.0145 (-1.17)	-0.0154 (-1.27)	-0.0479*** (-6.30)	-0.0460*** (-6.06)
<i>ROA</i>	0.6021*** (20.08)	0.5979*** (20.04)	0.5098*** (24.62)	0.5017*** (24.36)
<i>MTB</i>	0.0003 (0.51)	0.0002 (0.43)	0.0001 (0.47)	0.0001 (0.45)
<i>LOSS</i>	0.0005 (0.12)	0.0005 (0.13)	0.0017 (0.57)	0.0015 (0.48)
<i>DUAL</i>	0.0059* (1.95)	0.0063** (2.09)	0.0009 (0.33)	0.0004 (0.16)
<i>TOPTEN</i>	0.0004*** (2.65)	0.0004*** (2.63)	0.0003*** (3.47)	0.0003*** (3.47)
<i>SOE</i>	0.0038 (0.50)	0.0022 (0.30)	-0.0028 (-0.73)	-0.0033 (-0.86)
Constant	-0.2875*** (-4.48)	-0.2877*** (-4.55)	-0.3211*** (-8.35)	-0.3269*** (-8.58)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	11,651	11,651	21,437	21,437
R-squared	0.3947	0.3933	0.3365	0.3338

This table shows the results of subsample tests based on U.S. operating revenue. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

3.3. Summary statistics

Table 1 reports the sample distribution by year. The results show that the average ratio of affected firm-year observations of U.S.-initiated trade dispute investigations is 14.68%. In addition, the ratio ranks the highest in 2018 with 24.68%, which is not surprising since a trade war broke out between China and the United States.

Table 2 presents descriptive statistics of the main variables used in regressions. We winsorize all continuous variables at the top and bottom 1% of their distributions to mitigate the influence of outliers. The mean of both discretionary accruals (DA_MJONES , DA_INTAN) are above zero, suggesting that the Chinese firms generally have a tendency of upward earnings management. The mean of TD is 0.1468, which means that 14.68% of firm-year observations are affected by the U.S.-initiated trade dispute investigations. Additionally, 11.21% of firm-year observations experience losses, and about 48% of firm-year observations are SOEs.

4. Empirical results

4.1. Influence of U.S.-initiated trade dispute investigations on upward earnings management

To test the H1, we estimate the following regression:

$$DA_{i,t} = \beta_0 + \beta_1 TD_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \beta_5 MTB_{i,t} + \beta_6 LOSS_{i,t} + \beta_7 DUAL_{i,t} + \beta_8 TOPTEN_{i,t} + \beta_9 SOE_{i,t} + YearFE + FirmFE + \varepsilon_{i,t} \quad (3)$$

Table 6
Cross-sectional analyses: management ownership.

	High management ownership		Low management ownership	
	(1) DA_MJONES	(2) DA_INTAN	(3) DA_MJONES	(4) DA_INTAN
TD	0.0063** (2.28)	0.0062** (2.24)	0.0043 (1.54)	0.0041 (1.47)
$SIZE$	0.0228*** (6.90)	0.0221*** (6.72)	0.0125*** (5.56)	0.0127*** (5.68)
LEV	-0.0411*** (-3.39)	-0.0393*** (-3.26)	-0.0434*** (-4.89)	-0.0420*** (-4.84)
ROA	0.5792*** (20.02)	0.5737*** (19.69)	0.5014*** (20.47)	0.4944*** (20.54)
MTB	-0.0003 (-0.50)	-0.0003 (-0.57)	0.0003 (0.97)	0.0003 (0.93)
$LOSS$	-0.0044 (-1.03)	-0.0047 (-1.11)	0.0020 (0.63)	0.0021 (0.64)
$DUAL$	0.0001 (0.05)	-0.0001 (-0.05)	0.0032 (0.95)	0.0033 (1.01)
$TOPTEN$	0.0005*** (3.87)	0.0006*** (4.01)	0.0002* (1.80)	0.0002* (1.75)
SOE	-0.0087 (-1.48)	-0.0088 (-1.52)	-0.0007 (-0.15)	-0.0011 (-0.24)
Constant	-0.4841*** (-7.28)	-0.4720*** (-7.11)	-0.2732*** (-6.06)	-0.2772*** (-6.17)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	16,009	16,009	15,998	15,998
R-squared	0.4102	0.4077	0.3209	0.3192

This table shows the results of subsample tests based on management ownership. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

where *DA* is discretionary accruals, including *DA_MJONES* and *DA_INTAN*. *TD* is an indicator variable equals to one if the industry of the firm is involved in the U.S. initiated trade dispute investigations in the current year and zero otherwise. We include firm-level control variables that are known to be related to earnings management, such as firm size (*SIZE*), leverage (*LEV*), return on assets (*ROA*), market-to-book ratio (*MTB*), loss indicator (*LOSS*), CEO duality (*DUAL*), top ten shareholders' ownership (*TOPTEN*) and SOE indicator (*SOE*). Besides, we include firm and year fixed effects to control for heterogeneity across firm and time. Standard errors are clustered by firm.

Table 3 presents the result from estimating model (3). In column (1), where dependent variable is *DA_MJONES*, the coefficient of *TD* is positive and significant at the 1% level; and in column (2), where the dependent variable is *DA_INTAN*, the coefficient of *TD* is positive and significant at the 1% level. These findings are consistent with the prediction in H1 that firms affected by the U.S.-initiated trade dispute investigations engage in more upward earnings management than unaffected firms.

4.2. Cross-sectional analysis of the impact of U.S.-initiated trade dispute investigations on upward earnings management

4.2.1. Market reaction of U.S.-initiated trade dispute investigations

To test H2, we use 5-day market-adjusted excess return (“*CAR*”) around the announcement date when there is a U.S.-initiated trade dispute investigation to measure market reaction and then split the sample into two groups by the median of *CAR* and compare the difference between these two groups. High *CAR* means that firms experience relatively small negative market impact. We drop 184 observations due to missing data of stock return and final sample consists of 32,904 firm-year observations, of which the High *CAR* group has 16,455 observations and the Low *CAR* group has 16,449 observations. Among firms that are affected by trade

Table 7
Cross-sectional analyses: regional investor protection.

	Weak investor protection		Strong investor protection	
	(1) <i>DA_MJONES</i>	(2) <i>DA_INTAN</i>	(3) <i>DA_MJONES</i>	(4) <i>DA_INTAN</i>
<i>TD</i>	0.0058** (2.02)	0.0058** (2.02)	0.0044 (1.45)	0.0042 (1.37)
<i>SIZE</i>	0.0193*** (8.06)	0.0193*** (8.09)	0.0158*** (5.61)	0.0157*** (5.56)
<i>LEV</i>	-0.0588*** (-6.19)	-0.0574*** (-6.06)	-0.0351*** (-3.10)	-0.0339*** (-3.01)
<i>ROA</i>	0.5170*** (19.60)	0.5111*** (19.48)	0.5547*** (15.97)	0.5494*** (15.94)
<i>MTB</i>	0.0006** (2.13)	0.0006** (2.01)	-0.0000 (-0.06)	0.0000 (0.03)
<i>LOSS</i>	0.0063* (1.92)	0.0063* (1.92)	-0.0036 (-0.81)	-0.0039 (-0.88)
<i>DUAL</i>	0.0037 (1.03)	0.0038 (1.04)	0.0023 (0.71)	0.0021 (0.64)
<i>TOPTEN</i>	0.0001 (0.85)	0.0001 (0.90)	0.0005*** (4.33)	0.0005*** (4.28)
<i>SOE</i>	0.0023 (0.48)	0.0016 (0.33)	-0.0079 (-1.16)	-0.0086 (-1.28)
Constant	-0.3968*** (-8.26)	-0.3983*** (-8.27)	-0.3597*** (-6.27)	-0.3559*** (-6.20)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	13,771	13,771	15,996	15,996
R-squared	0.3304	0.3273	0.3206	0.3193

This table shows the results of subsample tests based on regional investor protection. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

dispute investigations, 2286 observations are in the High *CAR* group and 2422 observations are in the Low *CAR* group. Table 4 shows the results.

In columns (1)–(2), where observations with relatively high *CAR* are estimated, the coefficients of *TD* are not significant. In columns (3)–(4), where observations with low *CAR* are estimated, the coefficients of *TD* are significantly positive at the 5% level. Table 4 suggests that the effect of U.S.-initiated trade dispute investigations on upward earnings management is more pronounced for firms with more negative market reactions, which is consistent with the prediction in H2.

4.2.2. U.S. operating revenue

To test H3, we split the sample into two groups by the median of percentage of U.S. operating revenue (*PCTUSREVENUE*), calculated as operating revenue from the U.S. scaled by total operating revenue and compare the difference between these two groups. The number of observations in High U.S. operating revenue group is 11,651, of which the number of observations in the investigated industries is 2468 and the number in the un-investigated industries is 9183. The number of observations in Low U.S. operating revenue group is 21,437, of which the number of observations in the investigated industries is 2389 and the number in the un-investigated industries is 19,048. The median of *PCTUSREVENUE* is 0, which means that most firms don't export to the U.S. We get U.S. operating revenue data from firms' annual report. In detail, firms may disclose their top five operating revenue by region, we identify operating revenue from the U.S. or overseas as U.S. operating revenue, for reason that only a small part of firms disclose sales from a specific country and the U.S. is the country that imports most from China from 2001 to 2008 among the countries that China exports to. Table 5 presents the results.

Table 8
Cross-sectional analyses: firms' expectation of eventual investigation.

	High expectation		Low expectation	
	(1) <i>DA_MJONES</i>	(2) <i>DA_INTAN</i>	(3) <i>DA_MJONES</i>	(4) <i>DA_INTAN</i>
<i>TD</i>	0.0077*** (2.66)	0.0075*** (2.61)	0.0037 (1.43)	0.0033 (1.31)
<i>SIZE</i>	0.0118*** (4.57)	0.0117*** (4.62)	0.0134*** (5.81)	0.0138*** (6.02)
<i>LEV</i>	-0.0406*** (-3.73)	-0.0368*** (-3.45)	-0.0375*** (-4.18)	-0.0378*** (-4.22)
<i>ROA</i>	0.5032*** (15.51)	0.4992*** (15.50)	0.5939*** (25.99)	0.5850*** (25.99)
<i>MTB</i>	-0.0000 (-0.09)	-0.0001 (-0.13)	0.0005 (1.36)	0.0005 (1.39)
<i>LOSS</i>	-0.0002 (-0.02)	-0.0006 (-0.10)	0.0038 (1.38)	0.0036 (1.31)
<i>DUAL</i>	0.0026 (0.82)	0.0024 (0.78)	0.0037 (1.25)	0.0036 (1.21)
<i>TOPTEN</i>	0.0005*** (4.10)	0.0005*** (4.18)	0.0003*** (2.64)	0.0003** (2.54)
<i>SOE</i>	0.0037 (0.63)	0.0032 (0.54)	-0.0029 (-0.68)	-0.0032 (-0.77)
Constant	-0.2729*** (-5.21)	-0.2724*** (-5.28)	-0.2879*** (-6.40)	-0.2954*** (-6.60)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Observations	16,542	16,542	16,534	16,534
R-squared	0.4004	0.3987	0.3657	0.3630

This table shows the results of subsample tests based on firms' expectation of eventual investigation. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Columns (1)–(2) are results of High U.S. operating revenue group, the coefficients of *TD* are significantly positive at the 1% level. Columns (3)–(4) are results of Low U.S. operating revenue group, the coefficients of *TD* are not significant. Table 5 reveals that the effect of U.S.-initiated trade dispute investigations on upward earnings management is more pronounced for firms with high level of U.S. operating revenue, which is consistent with the prediction in H3.

4.2.3. Management ownership

Previous studies indicate that executives have incentives to distort their firms' reported financial performance to bolster gains through stock sales (Beneish and Vargus, 2002). The more shares executives owned, the more benefit they can gain through stock sales when stock price are high, therefore, they have more incentive to manage earnings upward to prop up stock price. We split the sample into two groups by the median of percentage of management ownership and compare the difference between these two groups. We drop 1081 observations due to missing data of management ownership and final sample consists of 32,007 firm-year observations, of which the High management ownership group has 16,009 observations and the Low management ownership group has 15,998 observations. Table 6 presents the results.

Table 9
Consequences.

	(1)	(2)
	<i>CAR</i>	<i>CAR</i>
<i>TD*MOREDA_MJONES</i>	0.0042*	
	(1.86)	
<i>TD*MOREDA_INTAN</i>		0.0044*
		(1.96)
<i>MOREDA_MJONES</i>	−0.0008	
	(−0.93)	
<i>MOREDA_INTAN</i>		−0.0006
		(−0.72)
<i>TD</i>	−0.0024	−0.0025
	(−1.27)	(−1.32)
<i>SIZE</i>	−0.0055***	−0.0055***
	(−5.87)	(−5.87)
<i>LEV</i>	0.0163***	0.0163***
	(4.46)	(4.48)
<i>ROA</i>	0.0816***	0.0813***
	(6.98)	(6.96)
<i>MTB</i>	−0.0006***	−0.0006***
	(−3.80)	(−3.80)
<i>LOSS</i>	−0.0083***	−0.0083***
	(−4.26)	(−4.25)
<i>DUAL</i>	0.0007	0.0007
	(0.52)	(0.51)
<i>TOPTEN</i>	0.0001***	0.0001***
	(2.87)	(2.86)
<i>SOE</i>	−0.0002	−0.0002
	(−0.09)	(−0.09)
Constant	0.1037***	0.1039***
	(5.54)	(5.55)
Year FE	YES	YES
Firm FE	YES	YES
Observations	32,877	32,877
R-squared	0.1408	0.1408

This table examines the short-term market reaction of investors to release of affected firm's annual report. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

In columns (1)–(2), where observations with high management ownership are estimated, the coefficients of *TD* are significantly positive at the 5% level. In columns (3)–(4), where observations with low management ownership are estimated, the coefficients of *TD* are not significant. Table 6 reveals that the effect of U.S.-initiated trade dispute investigations on upward earnings management is stronger for firms with high management ownership, which is consistent with the prediction in H4.

4.2.4. Regional investor protection

The existing literature has shown that strong investor protection could limit insiders' ability to acquire private benefits, which reduces their incentives to mask firm performance (Leuz et al., 2003). Therefore, the effect of trade dispute investigations on upward earnings management will be stronger for firms located in the provinces with weak investor protection. Specifically, we use the marketization index provided in Fan et al., (2016) to proxy investor protection, a higher index score suggests better investor protection (Wang et al., 2020). We split the sample into two groups by the median of marketization index and compare the difference between these two groups. We drop 3321 observations due to missing data of marketization index and the final sample consists of 29,767 firm-year observations, of which the observation of weak investor protection group is 15,996 and the observation of strong group is 13,771. Table 7 shows the results.

Columns (1)–(2) are results of firms located in provinces with weak investor protection, and the coefficients of *TD* are significantly positive at the 5% level. Columns (3)–(4) are results of firms located in provinces with strong investor protection, and the coefficients of *TD* are not significant. Table 7 suggests that the effect of trade dispute investigations on upward earnings management are stronger for firms located in the provinces where investor protection is weak, which is consistent with the prediction in H5.

Table 10
Rule out alternative explanation: foreign buyers increasing their order.

<i>VARIABLES</i>	(1) <i>DA_MJONES</i>	(2) <i>DA_INTAN</i>
<i>TD</i>	0.0054*** (2.94)	0.0052*** (2.84)
<i>SIZE</i>	0.0129*** (8.45)	0.0131*** (8.61)
<i>LEV</i>	−0.0363*** (−5.79)	−0.0350*** (−5.61)
<i>ROA</i>	0.5347*** (31.23)	0.5281*** (30.94)
<i>MTB</i>	0.0001 (0.52)	0.0001 (0.49)
<i>LOSS</i>	−0.0003 (−0.13)	−0.0004 (−0.19)
<i>DUAL</i>	0.0024 (1.16)	0.0023 (1.11)
<i>TOPTEN</i>	0.0004*** (4.97)	0.0004*** (4.99)
<i>SOE</i>	−0.0014 (−0.42)	−0.0018 (−0.56)
<i>ACCREC</i>	0.0002** (2.07)	0.0002** (2.14)
Constant	−0.2895*** (−9.45)	−0.2931*** (−9.62)
Year FE	YES	YES
Firm FE	YES	YES
Observations	33,084	33,084
R-squared	0.3264	0.3239

This table shows the results of controlling for accounts receivable. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

4.2.5. Firms' expectation of the eventual investigation results

To test H6, we use firms' next year's performance ("FIROA") to proxy firms' expectation of eventual investigation results and split the sample into two groups by the median of *FIROA* and compare the test results between these two groups. High *FIROA* means that firms can better counter the potential investigation effect, in other words, firms that have higher expectation of eventual investigation results. We drop 12 observations due to missing data of next year's ROA and the final sample consists of 33,076 firm-year observations, of which the High expectation group has 16,542 observations and the Low expectation group has 16,534 observations. Table 8 shows the results.

In columns (1)–(2), where observations with high expectation are estimated, the coefficients of *TD* are significantly positive at the 1% level. In columns (3)–(4), where observations with low expectation are estimated, the coefficients of *TD* are not significant. Table 8 reveals that the effect of U.S.-initiated trade dispute investigations on upward earnings management is more pronounced for firms with high expectation about the eventual investigation results, which is consistent with the prediction in H6.

4.3. Consequence analysis

We argue that firms engage in upward earnings management to improve the market valuation to mitigate the negative impact of trade dispute investigations. Then we examine the market reaction when firms release their annual reports. Following Wang et al. (2018), we estimate the following regression:

$$CAR[-3, 1]_{i,t} = \beta_0 + \beta_1 TD_{i,t} \times MOREDA_{i,t} + \beta_2 MOREDA_{i,t} + \beta_3 TD_{i,t} + ControlVariables + YearFE + FirmFE + \varepsilon_{i,t} \quad (4)$$

Table 11
Real effect of U.S.-initiated trade dispute investigations on firms' performance.

	(1)
	<i>PCTUSREVENUE</i>
<i>TD</i>	-0.1469* (-1.78)
<i>SIZE</i>	-0.0061 (-0.09)
<i>LEV</i>	0.1889 (0.99)
<i>ROA</i>	-0.3389 (-0.88)
<i>MTB</i>	-0.0001 (-0.02)
<i>LOSS</i>	-0.1097 (-1.61)
<i>DUAL</i>	-0.0031 (-0.03)
<i>TOPTEN</i>	0.0042 (1.39)
<i>SOE</i>	-0.1434* (-1.70)
Constant	0.3103 (0.22)
Year FE	YES
Firm FE	YES
Observations	33,088
R-squared	0.5845

This table shows the result of real effect of trade dispute investigations of firms' performance. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

The dependent variable of model (4), $CAR[-3,1]_{i,t}$, measures short-term market reaction when firms release their annual reports, calculated as the five-day cumulative abnormal stock return during the $[t - 3, t + 1]$ announcement window. $MOREDA_{i,t}$ is a dummy variable equals to one if the value of earnings management is higher than the median for that year, and zero otherwise. We drop 211 observations due to missing data of stock return and the final sample for the regression consists of 32,877 firm-year observations. Table 9 presents the results.

In Table 9, the coefficients on TD are negative, suggesting that trade dispute investigations reduce the market value, and we find that the coefficients on $TD * MOREDA$ are significantly positive in the analyses of $MOREDA_MJONES$ and $MOREDA_INTAN$ ($t = 1.86, 1.96$, respectively), indicating that upward earnings management can alleviate the negative effect of investigation. The coefficients of $MOREDA_MJONES$ and $MOREDA_INTAN$ are not significant, suggesting that investors cannot distinguish upward earnings management.

5. Additional analyses

5.1. Rule out alternative explanation

It is not easy to accurately estimate the accrual process. The increased discretionary accruals may be caused by foreign buyers increasing their order to avoid the potential tariff. To address this issue, we include the level of accounts receivable ($ACCREC$) as a control variable into the main regression model and Table 10 shows the results.

In Table 10, the coefficients of TD are still significantly positive when controlling the potential influence of accounts receivable, indicating that our results are not likely to be driven by the foreign buyers increasing their order.

Table 12
Robust test – DID test.

	(1)	(2)
	DA_MJONES	DA_INTAN
$TDPOST$	0.0056** (2.16)	0.0053** (2.05)
$SIZE$	0.0106*** (6.21)	0.0109*** (6.42)
LEV	-0.0003* (-1.95)	-0.0003** (-1.97)
ROA	-0.0000*** (-3.84)	-0.0000*** (-3.78)
MTB	0.0000 (1.40)	0.0000 (1.45)
$LOSS$	-0.0769*** (-27.53)	-0.0761*** (-27.17)
$DUAL$	0.0027 (0.93)	0.0025 (0.85)
$TOPTEN$	0.0007*** (7.00)	0.0007*** (6.92)
SOE	-0.0124*** (-3.43)	-0.0127*** (-3.51)
Constant	-0.2439*** (-6.96)	-0.2495*** (-7.16)
Year FE	YES	YES
Firm FE	YES	YES
Observations	23,757	23,757
R-squared	0.2656	0.2646

This table reports the results of DID test. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

5.2. Real effect of trade dispute investigations on firms' performance

In this section we test the real effect of trade dispute investigations on firms' performance. Considering that ROA or net income may be influenced by discretionary accruals, they may not reflect real effect well, and the direct impact of investigation is export, we use percentage of U.S. operating revenue (*PCTUSREVENUE*) to proxy real effect and results are shown in Table 11.

The coefficient of *TD* is significantly negative, indicating that the investigation hurts firms' export to the U.S.

5.3. Robust tests

5.3.1. Difference-in-Difference test (DID)

Although we control for firm fixed effect, which can alleviate endogenous problem of omitted variables to some extent, there still may be some unobserved time-variant characteristics can affect both U.S.-initiated trade dispute investigations and upward earnings management. To address this issue, refer to Liu et al., (2018), we keep the observations during the year of U.S.-initiated trade dispute investigations and one year before the U.S.-initiated trade dispute investigations, then estimate the following Difference-in-Difference model (Bertrand and Mullainathan, 2003; Huang et al., 2016):

$$DA_{i,t} = \beta_0 + \beta_1 TDPOST_{i,t} + ControlVariables + YearFE + FirmFE + \varepsilon_{i,t} \quad (5)$$

where *TDPOST* is a dummy variable that indicates whether firms have been involved in U.S.-initiated trade dispute investigations and equals 1 if firm is in the industry that involved in U.S.-initiated trade dispute

Table 13
Robust test – Placebo test.

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>DA_MJONES</i>	<i>DA_INTAN</i>	<i>DA_MJONES</i>	<i>DA_INTAN</i>	<i>DA_MJONES</i>	<i>DA_INTAN</i>
<i>PSEUDOTD1</i>	−0.0015 (−0.85)	−0.0013 (−0.71)				
<i>PSUEDOTD2</i>			−0.0018 (−0.97)	−0.0016 (−0.86)		
<i>PSUEDOTD3</i>					−0.0015 (−0.80)	−0.0016 (−0.88)
<i>SIZE</i>	0.0131*** (8.47)	0.0133*** (8.63)	0.0131*** (8.47)	0.0133*** (8.63)	0.0131*** (8.47)	0.0133*** (8.64)
<i>LEV</i>	−0.0368*** (−5.80)	−0.0355*** (−5.63)	−0.0368*** (−5.80)	−0.0355*** (−5.63)	−0.0368*** (−5.80)	−0.0355*** (−5.62)
<i>ROA</i>	0.5339*** (31.27)	0.5273*** (30.98)	0.5339*** (31.28)	0.5273*** (30.99)	0.5339*** (31.27)	0.5272*** (30.98)
<i>MTB</i>	0.0002 (0.68)	0.0002 (0.64)	0.0002 (0.68)	0.0002 (0.64)	0.0002 (0.67)	0.0002 (0.63)
<i>LOSS</i>	−0.0003 (−0.11)	−0.0004 (−0.16)	−0.0002 (−0.10)	−0.0004 (−0.16)	−0.0003 (−0.11)	−0.0004 (−0.17)
<i>DUAL</i>	0.0023 (1.13)	0.0022 (1.08)	0.0023 (1.13)	0.0022 (1.08)	0.0023 (1.13)	0.0022 (1.08)
<i>TOPTEN</i>	0.0004*** (4.91)	0.0004*** (4.94)	0.0004*** (4.92)	0.0004*** (4.94)	0.0004*** (4.92)	0.0004*** (4.95)
<i>SOE</i>	−0.0014 (−0.45)	−0.0019 (−0.58)	−0.0014 (−0.44)	−0.0019 (−0.58)	−0.0014 (−0.44)	−0.0019 (−0.58)
Constant	−0.2917*** (−9.46)	−0.2953*** (−9.62)	−0.2916*** (−9.45)	−0.2952*** (−9.62)	−0.2918*** (−9.46)	−0.2954*** (−9.62)
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Observations	33,088	33,088	33,088	33,088	33,088	33,088
R-squared	0.3258	0.3233	0.3258	0.3233	0.3258	0.3233

This table shows the results of placebo test. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

investigations at the current year, and 0 otherwise. Treatment sample are firms that in the industry involved in U.S.-initiated trade dispute instigations, control sample are firms in the industry that has never been investigated. If firms encounter U.S.-initiated trade dispute investigations for two consecutive years or more, we use the first one. Table 12 presents the results.

In columns (1)–(2), the coefficients of *TDPOST* are significantly positive at the 5% level, which indicate that our findings in main test are robust when considering the endogenous problem of unobserved time-variant characteristics.

5.3.2. Placebo test

To rule out the explanation of some other random factors rather than U.S.-initiated trade dispute investigations, we conduct a placebo test. Specifically, we move the U.S.-initiated trade dispute investigations event date forward one year, two years and three years, defined as *PSEUDOTD1*, *PSEUDOTD2* and *PSEUDOTD3* respectively. Then we re-estimate the regressions in Table 3. The results of placebo test are showed in Table 13.

Table 13 shows that the coefficients of *PSEUDOTD1*, *PSEUDOTD2* and *PSEUDOTD3* are not significant at the 10% level, which indicates that it is U.S.-initiated trade dispute investigations rather than some other random factor that drives upward earnings management.

5.3.3. Matching sample

To further address the issue of omitted variables, we use the matching sample to re-estimate the regressions in main test. Specifically, we match each treat firm (*TD* = 1) with one control firm (*TD* = 0) by size and year. Table 14 reveals the results.

The coefficients of *TD* in Table 14 are still significantly positive, our results are robust to matching sample.

Table 14
Robust test - Matching sample.

	(1)	(2)
	<i>DA_MJONES</i>	<i>DA_INTAN</i>
<i>TD</i>	0.0059** (2.17)	0.0056** (2.07)
<i>SIZE</i>	0.0104*** (4.24)	0.0106*** (4.34)
<i>LEV</i>	-0.0175 (-1.60)	-0.0171 (-1.56)
<i>ROA</i>	0.5552*** (19.68)	0.5488*** (19.43)
<i>MTB</i>	0.0003 (0.65)	0.0003 (0.67)
<i>LOSS</i>	-0.0029 (-0.68)	-0.0030 (-0.68)
<i>DUAL</i>	0.0042 (1.11)	0.0038 (1.02)
<i>TOPTEN</i>	0.0004*** (3.14)	0.0004*** (3.26)
<i>SOE</i>	-0.0006 (-0.12)	-0.0008 (-0.14)
Constant	-0.2518*** (-5.03)	-0.2551*** (-5.12)
Year FE	YES	YES
Firm FE	YES	YES
Observations	9714	9714
R-squared	0.2034	0.2013

This table shows the results of using matching sample by firm size. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 15
Robust test – subsample in 2007–2018.

	(1)	(2)
	<i>DA_MJONES</i>	<i>DA_INTAN</i>
<i>TD</i>	0.0078*** (3.55)	0.0075*** (3.45)
<i>SIZE</i>	0.0156*** (7.71)	0.0156*** (7.73)
<i>LEV</i>	-0.0432*** (-5.31)	-0.0421*** (-5.19)
<i>ROA</i>	0.5460*** (26.17)	0.5399*** (25.92)
<i>MTB</i>	0.0003 (1.11)	0.0003 (1.10)
<i>LOSS</i>	-0.0004 (-0.16)	-0.0006 (-0.22)
<i>DUAL</i>	0.0043* (1.87)	0.0042* (1.84)
<i>TOPTEN</i>	0.0005*** (5.64)	0.0005*** (5.64)
<i>SOE</i>	-0.0061 (-1.42)	-0.0063 (-1.49)
Constant	-0.3777*** (-8.60)	-0.3765*** (-8.61)
Year FE	YES	YES
Firm FE	YES	YES
Observations	26,432	26,432
R-squared	0.3578	0.3554

This table shows the results of using sub-sample after the changes in accounting standards. T-statistics based on robust standard errors clustered at firm levels are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

5.3.4. Sub-sample after the changes in accounting standards

Considering that the changes of accounting standards in 2007 may affect the calculation of discretionary accruals, we use the subsample of 2007–2018 to re-estimate the main test. Table 15 shows that our findings are robust to controlling for influence of changes in accounting standards.

6. Conclusion

In this paper, we study the impact of U.S.-initiated trade dispute investigations on affected Chinese firms' earnings management strategy. We find that affected firms will engage in more upward earnings management. The relation between U.S.-initiated trade dispute investigations and upward earnings management is more pronounced in firms with more negative market reaction, firms whose U.S. operating revenue and management ownership is high, firms in provinces with weak investor protection, and firms that perform well one year after initiation of the investigations. Further, firms would improve their market valuation through upward earnings management. Finally, our findings are robust to a series of test such as DiD and placebo test.

Our findings indicate that firms may manipulate earnings upward to offset or mitigate the negative impact when they suffer negative impact during the U.S.-initiated trade dispute investigations. As for implications of this paper, we suggest that regulators should strengthen the supervision of firms' disclosure behavior under the trade dispute environment and we also suggest investors carefully analyzing earnings of firms involved in U.S.-initiated trade dispute investigations.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Variable definitions

Variables	Definition
<i>DA_MJONES</i>	Value of discretionary accruals estimated following Dechow et al. (1995)
<i>DA_INTAN</i>	Value of discretionary accruals estimated following Lu (1999)
<i>TD</i>	Indicator variable of whether firms are affected by the investigations (<i>TD</i>), which equals 1 when firm's industry is related to the U.S.-initiated trade dispute investigations in the current year, and 0 otherwise
<i>SIZE</i>	Natural logarithm of total assets
<i>LEV</i>	Total liabilities deflated by total assets
<i>ROA</i>	Net income deflated by total assets
<i>MTB</i>	Market value of equity divided by the book value of equity at the end of the year
<i>LOSS</i>	Indicator variable equals to one if the net income is negative and zero otherwise
<i>DUAL</i>	Indicator variable equals to one if CEO is duality and zero otherwise
<i>TOPTEN</i>	Sum of top ten shareholders' ownership
<i>SOE</i>	Indicator variable equals to one if firm is state owned enterprise and zero otherwise

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Official rotation and corporate innovation: Evidence from the governor rotation



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ABSTRACT

Rotation is a practice whereby officials are regularly moved between equally ranked positions. Focusing on governor rotation, this paper examines the effect of official rotation on corporate innovation in China. First, we find that official rotation significantly promotes corporate innovation, including enterprises' innovation investment, quantity, and quality. Second, we find that the effect of official rotation on corporate innovation varies because of official and regional heterogeneity. Officials rotating from other provinces significantly stimulate corporate innovation, but officials rotating from the central government have an insignificant influence on corporate innovation. In addition, officials rotating to non-eastern regions significantly enhance corporate innovation, while officials rotating to eastern regions have a negligible impact on corporate innovation. We further examine the driving mechanism behind the effect of official rotation on corporate innovation and find that officials rotating from eastern regions to non-eastern regions can significantly promote corporate innovation, but officials rotating from non-eastern regions to eastern regions do not boost corporate innovation. These findings imply that the different effects of official rotation on corporate innovation are due to the official experience effect. We also find that official rotation can promote corporate innovation through reducing corporate charitable donations and increasing corporate innovation subsidies. In a supplementary analysis, we find that GDP-oriented performance appraisal pressure weakens the effect of official rotation on corporate innovation. The lower the pressure on officials regarding their performance, the more significant the effect of official rotation on corporate innovation. In addition, official rotation can significantly promote the development of the regional economy and improve the GDP growth rate via corporate innovation, which is a micro-level economic growth effect of official rotation. Overall, our findings further verify the economic effect of official rotation and extend our understanding of the influencing factors of corporate innovation.

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vation from the perspective of the official governance system. Our findings also have clear policy implications for how the government can improve the official governance model to promote corporate innovation during the transition period of the national innovation system.

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1. Introduction

After 40 years of reform and opening-up, China has achieved sustained and rapid economic development and has considerably improved its national strength. From 1978 to 2016, China's average annual GDP growth rate was 9.7%, far higher than that of other major economies during the same period. China's GDP surpassed that of Japan in 2010 and is now second in the world. From 2010 to 2016, China's average contribution to world economic growth has been as high as 27.6%, ranking first in the world and surpassing the combined contributions of the United States, the Eurozone, and Japan. Economists have sought to explain China's rapid economic growth using two theories. The theory of fiscal decentralization explains China's economic growth from a government system perspective using the famous theory of "Federalism, Chinese Style" (Qian and Weingast, 1997; Qian and Roland, 1998). Political promotion tournament theory interprets the economic growth from an official governance system perspective and suggests that Chinese officials' political promotion incentives related to GDP growth are the key to China's economic growth (Zhou, 2007). However, China's high-growth economy is largely a low-efficiency, high-cost extensive economy. However, the fiscal decentralization system and political promotion tournaments have not only promoted rapid economic growth but have also produced some adverse effects. In the context of the fiscal decentralization system, the local government and officials control huge amounts of fiscal and economic resources, make relatively independent economic decisions, and have a variety of administrative powers to intervene in resource allocation in the market. Thus, the economy is government-dominated. Under centralized political governance, local officials are mainly supervised by central authorities. The central government assesses, appoints, and removes local officials based on economic indicators, which motivates local officials to compete fiercely in terms of GDP and to focus exclusively on short-term economic performance. Local officials can affect the investment behaviors of various market participants through the local government's "visible hand", and have led local governments, enterprises, and even society to invest more in production than in innovation, resulting in extensive economic growth (Wu, 2017).

However, the central government attaches great importance to the economic growth pattern and emphasizes the key role of technological innovation in achieving growth model transformation. Since the 18th National Congress of the Party, the central government has unwaveringly implemented innovation-driven development strategies and constantly emphasized the transformation of the economic growth pattern. China continues to pursue innovative development through technological innovation and improvement of the quality and efficiency of development. Relying on resources, capital, labor, and other production factors to support economic growth and scale expansion is an unsustainable development model. However, regional economic growth increasingly faces a number of practical challenges, including momentum conversion, economic growth style transition, and industrial transformation and upgrading. It is time to give scientific and technological innovation a leading role in the great leap of Chinese economic development. Scientific and technological innovation is the driving force behind the continued growth of the national economy, and the vigorous implementation of innovation-driven development strategies will more closely link science and technology with economic growth and improve and shift the growth model. Furthermore, corporate innovation is the micro-foundation for sustained economic growth and the core driving force for improving independent innovation at the national level. During this crucial period of innovation-driven transformation, it is necessary to fully understand the current development status, laws, problems, and trends of Chinese enterprises' innovation. Research on the influential factors of corporate innovation suggest that corporate innovation is affected by the internal governance environment and the external political and economic environment.

The internal governance environment mainly includes the equity structure, equity pledge, director network, salary gap, equity incentives, and executive background (Li and Yu, 2015; Li et al., 2018; Wang and Zhang, 2018; Kong et al., 2017; Liu and Wang, 2018; Yu et al., 2018). The external political and economic environment mainly includes the impact of government subsidies, government officials, and industrial policies on corporate innovation (Guo, 2018; Wang et al., 2018; Chen et al., 2016; Gu and Shen, 2012; Dang et al., 2015; Yu et al., 2016; Li and Zheng, 2016). Innovation-driven development is key to succeeding in the international economy. As the economy enters a new normal and growth slows, China's economy will rely increasingly on innovation to drive its growth and must therefore quickly be put on the path of endogenous growth driven by innovation. Therefore, during the transformation of the national innovation system, it is necessary to systematically solve the problems of how the local government improves the official governance model to promote corporate innovation and plays a lead role in this effort.

Compared with enterprises in a mature market economy, Chinese enterprises tend to maintain closer ties with the government. As an important institutional force, the Chinese government has greater influence over enterprises' operational activities than governments in mature economies. In the innovation-driven wave, the local government has served as a commander-in-chief, improving regional economic development capability through guiding production factors to flow into R&D departments and encouraging enterprises to carry out technological innovation. The efficiency and quality of official governance are regarded as fundamental factors affecting economic development, and local officials also play an important role in China's economic and social development (Li, 1998). Local officials have received incentives to promote economic growth through fiscal decentralization and political promotion tournaments, but such incentives for economic growth are ultimately determined by specific official governance systems. Without proper monitoring and control mechanisms, the incentive effects of fiscal decentralization and political promotion tournaments on local officials may not be effective. Official rotation is an implicit control mechanism and an important way for the central government to coordinate regional coordinated development and achieve balanced regional development. The current "Regulations on the Rotation of Party and Government Leaders," which was formulated in accordance with the civil servant law of the PRC, the regulations on the selection and appointment of leading party and government cadres, and other relevant laws and administrative rules, was promulgated to further promote the work of official rotation, optimize the leadership structure, improve the quality and ability of leading cadres, strengthen the Party culture, promote a corruption-free Party, and boost economic and social development. The literature has found that official rotation positively affects regional economic growth, suggesting that it has an economic growth effect (Zhang and Gao, 2007; Xu et al., 2007; Wang and Xu, 2008). From a micro-level perspective, long-term economic growth may be mainly achieved through the optimal allocation of R&D investments, innovation activities, and input factors between enterprises.

If official rotation promotes economic growth, does it also influence corporate innovation? On the one hand, official rotation can result in the replication or transplant of successful economic growth experiences in developed regions when officials in developed regions are rotated into the less-developed regions. In addition, central officials transferred to local government can improve communication between central and local governments, monitor and restrict inappropriate local government actions, and more effectively ensure the implementation of central policy at the local level. On the other hand, official rotation can limit officials' terms in the same area or department and break officials' local personal and relationship networks, indicating that rotation can restrain factionalism and prevent corruption (Pu, 1999; Chen and Li, 2012). As a result, rotation increases the relative cost of creating political connections and improves incentives for companies to innovate (Yang, 2011; Dang et al., 2015). Therefore, this paper studies the impact of official rotation on corporate innovation in the current Chinese political system.

This paper makes several contributions to the literature. First, the literature has confirmed that official rotation matters for regional economic growth, which we call the effect of official rotation. However, the specific way in which the official rotation affects regional economic growth has not been systematically explored. Our findings provide micro-level evidence on the effect of official rotation on regional economic growth by analyzing the impact of official rotation on corporate innovation. Second, our paper not only clarifies how official rotation affects corporate innovation but also distinguishes the different effects of official rotation on corporate innovation due to the heterogeneity of officials and regions, examines the mechanism behind the effect of official rotation, helps to optimize official governance, and provides a theoretical basis for enhancing regional

coordinated development. Third, different from the numerous studies that examine either R&D expenses or patent applications, our paper comprehensively and systematically examines the impact of official rotation on the status of R&D investments, total patent applications, and invention patent applications. Moreover, our paper has implications for policy makers, especially now that China's economic model has shifted from the high-speed development stage to the high-quality development stage, and from being factor-driven and investment driven to being innovation driven. As our paper finds that official rotation can effectively increase innovation investment, quantity, and quality, it is a practical problem of how to design a reasonable official governance system and give full play to the role of local government as an engine of innovation-driven strategies in the transitional economy.

2. Literature review and hypothesis development

2.1. Literature review

China's market-oriented economy is characterized by government dominance, and it has been repeatedly observed that local officials play an active role in China's economic development process. Many studies have directly examined the influence of officials on the economic behavior and performance of the country.

First, the literature directly examines the economic growth effect of official rotation. Xu et al. (2007) systematically explore the direct effect of governor rotation on provincial economic growth and verify that governor rotation has improved provincial economic growth. Zhang and Gao (2007) find that both vertical and horizontal official rotation have positive effects on economic growth, and that term limits and economic growth exhibit a weak inverse-U relationship. They also show that the effect of governor rotation varies by region, as the positive impact on local growth is more obvious in eastern provinces. Wang and Xu (2008) examine the influence of the official governance system on regional economic growth from the perspective of official source and destination, and find that governors and party secretaries who come from the central government have insignificant effects on local economic growth, and governors and provincial party secretaries rotating to the central government also achieve negligible effects on economic growth. Yang et al. (2010) study the influence of officials on regional economic growth from the resource endowment effect perspective and find that horizontal official rotation contributes to economic growth but that vertical official rotation hinders local economic growth. They also observe regional variation: officials rotating to developed regions have a positive impact on economic growth, while officials rotating to underdeveloped regions have a negative effect on economic growth. Wang and Xu (2017) empirically examine how local officials affect foreign investment behavior and find that official rotation has significantly different effects on foreign investment between coastal areas and non-coastal areas, as officials rotating to coastal areas significantly reduce foreign investment and officials rotating to non-coastal provinces significantly increase foreign investment. They find that this difference is embedded in the official experience effect. Officials rotating from coastal areas to non-coastal areas can improve regional economic openness, foster a market-oriented economic system, bring more economic development experience, and promote the flow of information across regions, thus significantly promoting foreign investment in non-coastal regions. However, in coastal areas, official rotation may disturb the stability of the local economic development strategy, and it is difficult to bring more useful information and experience, and thus to promote foreign investment. These findings send the important signal that official rotation matters for economic growth, but that this effect will vary across officials and regions.

Second, the literature directly explores the social management effect of official rotation. Rotation can curb factionalism by requiring rotated officials to work with new officials. Chen and Zhao (1996) confirm that to a certain extent, official rotation can prevent factionalism, enable local officials to better implement central policies, and curb corruption. Officials rotated to different positions and areas can gain a new working environment, escape the shackles of conservatism and interpersonal relationships, update working ideas and methods, and foster their working ability. Thus, the official rotation system is generally considered to help break down the personal and relationship networks formed by local officials due to geographical relations, and to address corruption (Pu, 1999). Chen and Li (2012) evaluate the anti-corruption effects of official rotation and find it can significantly reduce corruption. They also find that both vertical official rotation and horizontal official rotation have a significant anti-corruption effect, and that there is a U-shaped relationship between term limits

and the anti-corruption effect. Bu and Di (2018) analyze the relationship between corporate investment and government subsidies and test whether official rotation can play a regulatory role. They find that official rotation can restrain the local government's rent-seeking behavior to some extent, and that both vertical and horizontal official rotation have significant effects. The Chinese government can be divided into central and local levels. The central level consists of the State Council and ministries, and the local level consists of provincial and sub-provincial governments. There are two types of bureaucrats in the Chinese political system: those who perform multiple tasks that have complex relationships, and those who perform single, relatively homogenous tasks (Huang, 2002). This division between multi-task bureaucrats and single-task bureaucrats roughly corresponds to the division between local officials and central officials. Central officials, classified as single-task bureaucrats, usually specialize in a certain field, have a well-defined sphere of responsibilities, and accumulate relevant management experience, whereas local officials, classified as multi-task bureaucrats, must comprehensively manage all the problems related to regional economic and social development and accumulate comprehensive economic and social management experience. Thus, local officials have more experience advantages than central officials. However, central officials have a closer relationship with the central government and are better able to effectively transmit and implement central policies, weakening the information asymmetry between local and central governments and strengthening the supervision and control of local governments. Therefore, both vertical and horizontal official rotation have significant effects on regional corruption and the local government's rent-seeking behavior.

Third, the literature empirically examines the economic consequences of official turnover. Wang et al. (2009) find that policy uncertainty caused by local official turnover has a significant negative impact on regional economic growth, but official turnover mainly affects short-term economic growth fluctuations rather than long-term economic growth trends. When enterprises face policy uncertainty, they will significantly reduce the scale of investment expenditure to avoid potential policy risks. Cao (2013) finds that the turnover of the provincial secretary will significantly reduce the investments of state-owned enterprises, and Xu et al. (2013) find that official turnover will also affect the investments of private enterprises. Chen et al. (2016) find that the policy uncertainty caused by a change of the municipal party secretary increases the uncertainty of the financing environment and reduces government subsidies and bank borrowing, leading to reductions in patent applications and innovation efficiency. Wang et al. (2018) find that the incentives created by the impending promotion of local politicians reduce firms' innovation quantity and quality. The findings of Cao (2013) and Xu et al. (2013) are consistent with those of Wang et al. (2009): official turnover has a significantly negative impact on economic growth from the perspective of corporate investment expenditure. Chen et al. (2016) and Wang et al. (2018) verify the negative impact of official turnover on the economy from the perspective of corporate innovation. The above studies are consistent with transnational research. Numerous economic studies have examined the influence of official turnover on economic growth and other economic development from the perspective of political power arrangements. Jones and Olken (2005) find that a change in national leaders can significantly affect policy choices and economic growth performance. Julio and Yook (2012) find that companies significantly reduce investment expenditure in political election years due to economic policy uncertainty during elections. Julio and Yook (2016) empirically test the impact of political uncertainty on FDI and find that FDI inflows in the upcoming quarter that includes a leader election decrease significantly, and that this relative decline only occurs in the election quarter, suggesting that the impact of political uncertainty on FDI is short term.

The above literature shows that under the current cadre personnel system and fiscal system, local officials have complex effects on economic and social development. It is crucial to set up an effective official incentive system and a well-designed official governance system. Most current papers are focused on identification effects, and the literature has not paid enough attention to heterogeneity effects or to explaining the driving mechanism behind these effects. From the perspective of policy uncertainty, a large body of literature has examined the impact of official turnover on macroeconomic growth and microenterprises' behavior. However, as stated, these effects of official turnover are short term. In terms of official rotation, the current literature mainly focuses on the long-term impact on the economy and society of a change in political rights. In general, the transfer of political rights at the level of regional leaders not only brings short-term uncertainty and affects short-term economic operation, but also has medium- and long-term effects on economic growth, such as through changes in economic policies, development models, and economic environments. Furthermore, the

influence of these longer-term effects is more important and far-reaching. Therefore, following the seminal work of Zhang and Gao (2007) and Xu et al. (2007), our paper examines the long-term effect of official rotation. Specifically, our paper analyzes the positive effect of official rotation on economic growth from the perspective of corporate innovation, studies the differences in the effect of official rotation from the perspective of official and regional heterogeneity, and reveals the driving mechanism behind these effects to provide empirical evidence for the current innovation-driven development.

2.2. Hypotheses

2.2.1. Official rotation and corporate innovation

Official rotation has made tremendous contributions to the development of regional economic growth, the micro-foundation of which may depend on corporate innovation. The effect of official rotation on corporate innovation stems from the following logic.

First, foreign officials and native officials have different career experience, especially economic development experience. Rotation across different provinces and positions can replicate and transplant successful economic and social management experience across regions (or departments), especially rotation from developed to undeveloped regions, which is conducive to introducing successful experiences to and promoting the economic development of undeveloped regions. Official rotation may also strengthen economic cooperation between undeveloped and developed areas, break market segmentation, and promote the economic development of undeveloped areas (Zong and Yue, 2013). Rotation has become an important method for the central government to coordinate and implement regional development strategies (Xu et al., 2007). The current “Regulations on the Rotation of Party and Government Leaders” clearly states that the purpose of official rotation is to promote economic and social development. Officials rotating from developed regions can bring superior economic development experience and information, and improve regional economic and political environment, and will thus be more effective in cultivating market mechanisms. Thus, official rotation can promote corporate innovation through sharing the advanced economic development experience of booming regions.

Second, official rotation can improve the business environment. In the context of regional economic decentralization, local governments and officials control huge amounts of fiscal and economic resources and resource disposal rights. Local officials can obtain more rent-seeking benefits by setting up cumbersome approval links, which make the decision-making and development of enterprises increasingly subject to the local government (Shleifer and Vishny, 1994). Under the GDP-oriented official performance evaluation model, economic growth, tax revenue, and infrastructure are the most important rigid targets for political promotion, which made officials show self-interested investment preferences and resulted in an emphasis on production and the neglect of innovation. Gu and Shen (2012) find that the GDP-oriented political promotion standard has significantly reduced government R&D subsidies to enterprises, which has affected enterprises’ R&D investment expenditure. Li and Zheng (2016) find a contradiction between the goal of short-term political promotion and the long-term nature of substantive innovation, and that firms tend to strategic innovate to seek support, pursuing “innovation by quantity” instead of quality to obtain more subsidies and tax incentives and to cater to the political needs of officials. Wang et al. (2018) find that officials’ expectations of political promotion significantly reduce the quantity and quality of corporate innovation, and that companies seek to establish political connections with the local government through charitable donations, which results in reduced innovation investment expenditure. Yang (2011) believes that enterprises not only seek to build their own internal capacity but also to obtain government assistance and, thus, competitive advantages. However, they are constrained by limited resources and must balance capacity-building and political connections. If the government controls a large amount of economic resources and is granted great discretion, and it is very difficult for enterprises to upgrade and maintain product quality advantages, and they will pursue political association rather than capacity-building. In other words, seeking political connections and strengthening innovation are two ways for enterprises to develop themselves. Correspondingly, in an environment where corruption costs are relatively low, enterprises tend to develop themselves by establishing political connections, which will further squeeze R&D investment expenditure and hinder corporate innovation. Officials rotating from other provinces can help to eliminate the interest-based relationship networks formed by officials who have been worked in the same areas (or departments) for a long time, resulting in reduced corrup-

tion, increased cost to establish political connections, and improved business environments. China's official governance system is an important part of the central government's anti-corruption strategy, and rotation not only promotes economic and social development, but also strengthens Party conduct and integrity. As anti-corruption efforts increase, the relative costs of seeking political connections also increase, which in turn increases corporate innovation incentives. Therefore, anti-corruption effort has a positive effect on corporate innovation (Dang et al., 2015), and the anti-corruption effect of official rotation can thus promote corporate innovation.

Third, official rotation can decrease the information asymmetry between the central and local governments. There may be differences and conflicts between the interests and goals of the central and local governments, and in many cases, the local government and officials may conceal regional bad news from the central government, such as regarding economic development, social governance, and environmental pollution, to protect their own interests and avoid accountability. However, rotating officials have no motive to conceal bad news and will pass it to the central government, thus building an information exchange bridge that can effectively communicate news and reduce the information asymmetry between the central and local governments (Huang, 2002). If officials expect to be rotated to different positions, their incentives to abide by the policies of the central government are strengthened because they gain little by over-aggressively pursuing the interests associated with their current position, which they will soon leave. They may be motivated to cooperate with other agencies because they may head these agencies in the future. The central government can thus gradually obtain accurate information about local economic and social development, and understand problems concerning economic patterns, environmental pollution, embezzlement, and corruption, and will be better able to use targeted measures and policies to overcome these problems. Rotating officials also effectively delivers central policy indicators to make the local government serve the national strategy (Bu and Di, 2018). Thus, official rotation can promote corporate innovation through information exchange and central policy transmission.

Based on the above analysis, we propose the following hypothesis:

H1: Official rotation effectively promotes corporate innovation, improving innovation investment, quantity, and quality.

2.2.2. *Official heterogeneity and corporate innovation*

The effect of official rotation on corporate innovation may vary due to the heterogeneity of officials. The differences in officials' educational background, career history, and economic development ideas may result in heterogeneities in their economic behavior and policy decisions. Officials rotating from different positions (departments) have different initial endowments, which represent their differences in backgrounds, abilities, and qualifications. Accordingly, there are two types of official rotation: horizontal official rotation, where officials come from other provinces, and vertical official rotation, where officials come from the central government. Yang et al. (2010) show that officials rotating from the central or local government have different economic performance, and find that horizontal official rotation improves economic growth but vertical official rotation hinders local economic growth, suggesting that the effects of official rotation are heterogeneous. As documented, central ministries perform single, relatively homogenous tasks, and the knowledge acquired from governing one ministry is not necessarily readily transferable to governing another ministry. However, provincial secretaries and governors are involved in multi-dimensional tasks: they must deal with many kinds of problems and accumulate comprehensive economic and social management experience, which can be readily transferable between provinces. Thus, officials rotating from other provinces have the experience of previous local economic affairs management, which can be transferred or popularized between provinces, suggesting that the horizontally rotating officials have an advantage in economic development experience. Vertically rotating officials have a closer relationship with the central government, are more familiar with its intentions, and can more effectively deliver its strategic policies. Thus, compared with horizontally rotating officials, vertically rotating officials may be more efficient in information dissemination and policy coordination between the central and local governments and can more effectively guarantee the implementation of central policy intentions. Vertically rotating officials may also help local governments obtain more central fiscal and economic resources. Therefore, the differences between horizontally rotating officials and vertically rotating officials—the communication of information between the central and local governments and the replication and promo-

tion of successful economic development experience—may create distinct differences in the corporate innovation effects of official rotation.

Based on the above analysis, we propose the following hypothesis:

H2: The effect of official rotation on corporate innovation varies due to official heterogeneity.

2.2.3. Regional heterogeneity and corporate innovation

Although China's system reform and marketization have accelerated significantly, non-eastern regions' economic and social development is lagging behind that of the eastern regions for natural, historical, and other reasons. These regions have significant differences in terms of resource endowment, economic policy, regional governance, and economic development, indicating substantial regional heterogeneity in terms of marketization (Fan et al., 2011). Yang et al. (2010) find that the economic growth effect of official rotation shows regional variation, as officials rotating to good resource endowment areas have positive roles in promoting economic growth. Wang and Xu (2017) find that the foreign investment effect of official rotation has obvious regional heterogeneity. Officials rotating to coastal areas significantly reduce foreign investment, while officials rotating to non-coastal provinces significantly increase foreign investment. According to the findings of the above literature, regional heterogeneity may also influence the effect of official rotation on corporate innovation. Official rotation can affect corporate innovation, but the effect of official rotation depends not only on the heterogeneous characteristics of the rotating officials but also on those of the areas. First, the market environment has a significant impact on transaction costs. Reducing government intervention, improving government services, and strengthening legal protection are conducive to reducing non-productive expenditure on rent-seeking (Wan and Chen, 2010). Local officials control abundant economic and administrative resources and can engage in rent-seeking through setting up cumbersome approval processes. Enterprises can also seek establish political connections to obtain more economic resources, such as government subsidies, bank loans, and tax incentives. If the degree of regional marketization is relatively low, there will be a large rent-seeking space, such that enterprises notably increase non-productive expenditure and local governments frequently interfere in business operations. Therefore, compared with eastern regions, officials rotating to a non-eastern region will significantly change the regional political and ecological environment. Second, eastern regions have a higher degree of marketization, better economic development, and higher government efficiency, resulting in inherently superior conditions and more mature development experience in promoting economic development and corporate innovation. Correspondingly, in eastern regions, native officials are more familiar with local superior conditions and have advanced experience, but foreign officials do not have these unique experiences and information. However, in non-eastern regions, the market environment and economic system are not mature enough, and the development of non-eastern regions requires the experience, information, and resources of developed areas. Therefore, officials rotating from an eastern region to a non-eastern region can introduce the economic development experience of developed regions and foster more efficient and transparent economic and political systems, and thus promote corporate innovation.

Based on the above analysis, we propose the following hypothesis:

H3: The effect of official rotation on corporate innovation may vary due to regional heterogeneity.

3. Research design

3.1. Data and sample selection

The innovation investment data in this paper are mainly obtained from the Wind database, which provides the R&D expense data of Chinese listed firms from 2007. The innovation quantity and quality data are obtained from the patent database of CSMAR, which provides information about the patent applications and authorization of listed firms, subsidiaries, sub-subsidiaries, and their associated joint venture companies from 1990. Because the actual innovation time is better reflected by the patent application year than the patent grant year, this paper uses patent application to proxy for corporate innovation. Because listed companies not only carry out R&D activities by themselves but also rely on subsidiaries, associated companies, and joint ven-

tures for R&D, this paper uses the patent applications of listed companies and their subsidiaries, associated companies, and joint ventures to comprehensively measure the level of corporate innovation. Because the new accounting standards have required listed companies to disclose the expended and capitalized parts of their R&D expenditure separately since 2007, the innovation data effectively starts from 2007.

The data for the provincial officials in this paper are obtained from the CSMAR database, and the basic information for governors (those responsible for autonomous regions and municipalities directly under the central government) are manually collected from the Baidu encyclopedia. We abstract the effective samples from 2007 to 2015, covering 31 provinces, cities, and autonomous regions. Firms' financial and corporate governance data are obtained from the CSMAR database. The provincial data are all obtained from the National Bureau of Statistics. To eliminate the influence of outliers, all the continuous variables are winsorized at the 1% and 99% levels. We first delete observations for financial institutions, firms' listing year, special treatment firms, and firms whose debt-to-assets ratio is greater than 1. We also delete observations with missing data. The sample has 12,034 firm-year observations from 2007 to 2015.

3.2. Model

$$\text{Innovation}_{i,t+1} = \beta_0 + \beta_1 * \text{Rotation}_t + \text{Controls} + \varepsilon \dots \quad (1)$$

3.2.1. Explained variable: corporate innovation (innovation)

$\text{Innovation}_{i,t+1}$, the dependent variable of the model, represents the corporate innovation of firm i in year $t + 1$. This paper measures corporate innovation from three aspects: innovation investment, innovation quantity, and innovation quality. R&D expense (LnRD) is the proxy for innovation investment. According to Chinese Patent Law, national patents include three categories—*invention patents*, *utility model patents*, and *appearance design patents*—of which *invention patents* are the most original. We thus use *invention patent applications* (Patenti) as a proxy for innovation quality and *total patent applications* (Patent) as a proxy for innovation quantity. To solve the problem of sample skewness, natural logarithmic treatments was carried out for LnRD, Patent, and Patenti after adding 1 to them.

3.2.2. Explanatory variables: official rotation (rotation)

Rotation is an explanatory variable in the model. We primarily investigate the effect of governor rotation on corporate innovation. The setting for rotation is based on the method of Zhang and Gao (2007): if new governors are rotated from the central government or other provinces, the value of Rotation equals 1 during their term of office; if they are promoted from native provinces, then the value of Rotation is 0.

There are three main sources of governors: promotion from native provinces, rotation from other provinces, and rotation from the central government. Correspondingly, our paper introduces two variables, Central and Province, to indicate the origin of a governor. If governors are rotated from the central government, the value of Central is 1, and 0 otherwise; if governors are rotated from other provinces, the value Province equals 1, and 0 otherwise. We also compare the difference in the effect of official rotation on corporate innovation between east and non-east regions. The east regions include the following provinces and municipalities: Liaoning, Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Hainan. Other provinces are classified as non-eastern.

In addition, we further divide rotating officials into Central, those rotating from the central government, EastProvinces, those rotating from eastern regions, and NonEastProvinces, those rotating from non-eastern regions, to further identify the driving mechanism behind the effect of official rotation on corporate innovation.

3.2.3. Control variables

The other explanatory variables in Eq. (1) are control variables. Size, the natural logarithm of the firm's total assets at the end of year t , captures the effects of size. Lev captures the financial leverage of the firm and is measured as the ratio of total debt to total assets. Growth is the percentage change in sales and indicates the firm's future development capabilities. Roa proxies for financial performance and is calculated as net

income divided by total assets. CFO is the cash flow from operations divided by total assets. PPE is the current-year level of property, plant, and equipment scaled by total assets. Age captures the maturity level of the firm, and we use the number of years the firm has been publicly traded. The two control variables of corporate governance in Eq. (1) are Board, defined as the number of directors on the board, and Indep, defined as the proportion of independent directors on the board. We also add three provincial control variables: Fin represents the local fiscal revenue and is measured as the natural logarithm of the annual general budget revenue of each province, Dgdp is the percentage change in GDP, and Pgdpc is the natural logarithm of GDP per capita for each province. We also include the industry and year fixed effects to remove the influences of industry and year on the estimation of the coefficients of the official rotation variable.

4. Empirical evidence

4.1. Descriptive analysis

Table 1, Panel A reports the descriptive statistics of the main variables. Official rotation (Rotation) has a mean of 0.395, and horizontal official rotation (Province) and vertical official rotation (Central) account for 17.6% and 21.9%, respectively. The means (standard deviations) of R&D expenses (LnRD), total patent applications (Patent), and invention patent applications (Patenti) are 14.918 (6.086), 2.561 (1.557), and 1.758 (1.408), respectively, suggesting that companies' innovation investment, quantity, and quality have different characteristics.

Table 1, Panel B provides information about official rotation and corporate innovation from 2007 to 2015. There are 114 rotating governors from 2007 to 2015: 51 horizontally rotating governors and 63 vertically rotating governors. Of these, 34 rotated to eastern regions and 80 rotated to non-eastern regions. In eastern regions, 24 governors rotated from the central government, 2 rotated from eastern regions, and 8 rotated from non-eastern regions, which indicates that governors rotating to eastern regions mainly came from the central government. In non-eastern regions, 27 governors rotated from the central government, 28 rotated from eastern regions, and 25 rotated from non-eastern regions. Thus, the number of governors rotating from eastern to non-eastern regions is higher than that from non-eastern to eastern regions. Potential reasons are that the marketization degree is relatively low and the market economy is underdeveloped in non-eastern areas; however, governor rotation from eastern to non-eastern regions may bring superior economic development experience, which is conducive to improving the market environment. In addition, from 2007 to 2015, the figures for official rotation and corporate innovation show increasing trends year by year, as do the numbers of governors rotating in eastern and non-eastern regions. These findings suggest that there is a linear relationship between the governor rotation and corporate innovation data.

4.2. Empirical results

To identify the effect of official rotation on corporate innovation, we conduct a regression analysis of three proxy indicators that measure corporate innovation according to Eq. (1). Because official rotation has a lag effect on R&D investment and patent applications, our paper constructs a proxy variable of corporate innovation with a lag of one year.

4.2.1. Official rotation and corporate innovation

Table 2 reports the estimation results for Eq. (1). The official rotation variable (Rotation) is significantly positively associated with the three corporate innovation variables. In column (1), the coefficient on Rotation is 0.272 with a t-statistic of 2.013, which is significantly positive at the 5% level. In columns (2) and (3), the coefficients on Rotation are positive and significant, 0.079 (t-statistic = 1.762) and 0.101 (t-statistic = 2.459), respectively, suggesting that the quantities of total patent applications and invention applications significantly increase during the term of the rotating official. These findings are consistent with our hypothesis H1 and support the notion that official rotation promotes corporate innovation, including innovation investment, quantity, and quality.

Table 1
Descriptive Statistics. Panel A reports the summary statistics for our main variables. Panel B reports the descriptive statistics for official rotation and corporate innovation by year.

Panel A: Summary statistics for the main variables										
Variables	Obs	Mean	SD	Min	Median	Max				
LnRD	12,034	14.918	6.086	0.000	17.053	21.280				
Patent	12,034	2.561	1.557	0.000	2.565	6.682				
Patenti	12,034	1.758	1.408	0.000	1.609	5.805				
Rotation	12,034	0.395	0.489	0.000	0.000	1.000				
Central	12,034	0.219	0.414	0.000	0.000	1.000				
Province	12,034	0.176	0.381	0.000	0.000	1.000				
Size	12,034	21.932	1.248	19.755	21.730	25.961				
Lev	12,034	0.432	0.205	0.047	0.431	0.867				
Growth	12,034	0.086	0.235	-0.840	0.106	0.707				
Roa	12,034	0.042	0.049	-0.114	0.037	0.197				
CFO	12,034	0.045	0.068	-0.149	0.043	0.237				
PPE	12,034	0.237	0.151	0.008	0.207	0.677				
Age	12,034	8.524	5.873	1.000	7.000	22.000				
Board	12,034	8.877	1.757	5.000	9.000	15.000				
Indep	12,034	0.371	0.053	0.308	0.333	0.571				
Fin	12,034	7.893	0.768	5.588	8.008	9.145				
Dgdp	12,034	0.103	0.043	0.003	0.092	0.196				
Pgdp	12,034	10.802	0.481	9.493	10.875	11.576				

Panel B: Descriptive statistics for official rotation and corporate innovation from 2007 to 2015												
year	Corporate Innovation			Eastern Region			Non-Eastern Region			Official Rotation		
	LnRD	Patent	Patenti	Central	EastProvinces	NonEastProvinces	Total	Central	EastProvinces	NonEastProvinces	Total	
2007	7.621	2.143	1.325	1	1	0	2	3	1	1	5	7
2008	8.290	2.271	1.433	1	0	1	2	3	4	1	8	10
2009	10.12	2.414	1.586	1	0	1	2	3	4	1	8	10
2010	13.63	2.320	1.533	0	0	2	2	2	4	2	8	10
2011	14.50	2.569	1.703	2	0	2	4	1	4	3	8	12
2012	16.61	2.559	1.760	4	0	1	5	2	3	4	9	14
2013	16.86	2.618	1.838	5	0	0	5	4	3	4	11	16
2014	16.93	2.697	1.925	5	1	0	6	4	3	4	11	17
2015	17.07	2.776	1.979	5	0	1	6	5	2	5	12	18
Total	-	-	-	24	2	8	34	27	28	25	80	114

Table 2

Effects of Official Rotation on Corporate Innovation. This table reports the effects of official rotation on corporate innovation, including innovation investment, innovation quantity, and innovation quality (H1). Column (1) reports the results on the effect of official rotation on innovation investment (LnRD), column (2) reports the results on the effect of official rotation on innovation quantity (Patent), and column (3) reports the results on the effect of official rotation on innovation quality (Patenti). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

	(1) LnRD _{t+1}	(2) Patent _{t+1}	(3) Patenti _{t+1}
Rotation_t	0.272** (2.013)	0.079* (1.762)	0.101** (2.459)
Size _t	0.437*** (4.389)	0.561*** (18.094)	0.527*** (18.173)
Lev _t	-0.118 (-0.235)	0.157 (0.996)	0.048 (0.336)
Growth _t	0.841*** (3.957)	0.165** (2.419)	0.175*** (2.821)
Roa _t	3.750*** (2.590)	2.525*** (5.046)	2.106*** (4.555)
CFO _t	1.191 (1.272)	0.175 (0.663)	0.350 (1.443)
PPE _t	-1.450** (-2.475)	-1.506*** (-7.409)	-1.191*** (-6.481)
Age _t	-0.096*** (-6.593)	-0.016*** (-3.247)	-0.011** (-2.519)
Board _t	0.105** (2.109)	-0.018 (-1.005)	0.009 (0.544)
Indep _t	0.921 (0.663)	0.466 (0.939)	0.785* (1.673)
Fin _t	0.157 (1.068)	0.355*** (6.794)	0.286*** (5.990)
Dgdp _t	-1.451 (-0.549)	2.504*** (2.660)	3.095*** (3.673)
Pgdp _t	-0.052 (-0.207)	-0.017 (-0.197)	0.118 (1.415)
Intercept	-4.825* (-1.653)	-13.060*** (-12.762)	-14.298*** (-14.669)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	12,034	12,034	12,034
Adj.R ²	0.302	0.274	0.266

4.2.2. Official heterogeneity and corporate innovation

The findings in Table 2 suggest that official rotation promotes corporate innovation. Does the effect of official rotation on corporate innovation vary with different types of official rotation due to official heterogeneity? To examine whether the effect of official rotation on corporate innovation is affected by official heterogeneity (hypothesis H2), we examine the effect of horizontal official rotation (Province) and vertical official rotation (Central) on corporate innovation. Table 3 reports the regression results for official heterogeneity and the effect of official rotation on corporate innovation. The regression coefficients on Province are all significantly positive and within the range of 0.128–0.516, while the regression coefficients on Central are positive but insignificant. These findings are consistent with hypothesis 2 that the effect of official rotation on corporate innovation varies due to official heterogeneity, and that officials rotating from other provinces have a greater effect on corporate innovation. An explanation points to the differences in individuals' initial endowments. Officials rotating from other provinces perform multiple tasks, have more experience in economic and social

Table 3

Effects of Official Rotation on Corporate Innovation, Province vs. Central. This table reports the results for hypothesis H2, that the effect of official rotation on corporate innovation varies with the source of officials due to the heterogeneity of sources. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

	(1) LnRD _{t+1}	(2) Patent _{t+1}	(3) Patenti _{t+1}
Province_t	0.516** (2.572)	0.128** (2.116)	0.173*** (3.130)
Central_t	0.089 (0.650)	0.043 (0.822)	0.047 (0.985)
Size _t	0.432*** (4.345)	0.560*** (18.098)	0.525*** (18.186)
Lev _t	-0.088 (-0.175)	0.163 (1.036)	0.057 (0.401)
Growth _t	0.826*** (3.888)	0.162** (2.377)	0.170*** (2.756)
Roa _t	3.772*** (2.605)	2.529*** (5.057)	2.112*** (4.576)
CFO _t	1.196 (1.277)	0.177 (0.668)	0.351 (1.452)
PPE _t	-1.423** (-2.427)	-1.500*** (-7.378)	-1.183*** (-6.441)
Age _t	-0.096*** (-6.616)	-0.016*** (-3.262)	-0.011** (-2.545)
Board _t	0.102** (2.050)	-0.019 (-1.039)	0.008 (0.491)
Indep _t	0.838 (0.603)	0.449 (0.908)	0.760 (1.626)
Fin _t	0.200 (1.330)	0.364*** (6.938)	0.299*** (6.252)
Dgdp _t	-1.563 (-0.591)	2.482*** (2.641)	3.062*** (3.641)
Pgdp _t	-0.054 (-0.215)	-0.018 (-0.202)	0.118 (1.412)
Intercept	-4.936* (-1.687)	-13.083*** (-12.789)	-14.331*** (-14.729)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
N	12,034	12,034	12,034
Adj.R ²	0.303	0.275	0.266

management, and can take effective measures to encourage firms to increase R&D investment. However, officials rotating from the central government perform single tasks and need more time to adapt to managing more comprehensive local affairs. Such officials may also be rotated to solve specific problems or to increase professional experience rather than improve economic factors, so vertical official rotation has a smaller impact on corporate innovation.

4.2.3. Regional heterogeneity and corporate innovation

The development of regional economies in China is radically uneven. Does the effect of official rotation on corporate innovation vary between eastern and non-eastern regions? Samples from eastern and non-eastern regions are used to examine the role of regional heterogeneity in the effect of official rotation on corporate innovation (hypothesis H3). In Table 4, we run Eq. (1) to test innovation performance for firms in eastern and non-eastern regions separately, and find a significant difference between the two samples. For the non-eastern region sample, official rotation improves corporate innovation, as the coefficients for Rotation are

Table 4

Effects of Official Rotation on Corporate Innovation, Eastern Region vs. Non-Eastern Region. This table reports the results for hypothesis H3, that the effect of official rotation on corporate innovation varies between eastern and non-eastern region due to heterogeneity across regions. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

	Non-Eastern Region			Eastern Region		
	(1) LnRD _{t+1}	(2) Patent _{t+1}	(3) Patenti _{t+1}	(4) LnRD _{t+1}	(5) Patent _{t+1}	(6) Patenti _{t+1}
Rotation_t	0.831*** (3.412)	0.232*** (2.831)	0.160** (2.164)	-0.070 (-0.450)	-0.029 (-0.541)	0.052 (1.056)
Size _t	0.695*** (4.428)	0.519*** (9.749)	0.459*** (9.698)	0.327*** (2.634)	0.575*** (15.383)	0.555*** (15.726)
Lev _t	-0.553 (-0.566)	0.151 (0.541)	0.089 (0.389)	0.020 (0.036)	0.227 (1.207)	0.063 (0.362)
Growth _t	0.648* (1.724)	0.160 (1.379)	0.237** (2.311)	0.872*** (3.461)	0.165** (1.985)	0.145* (1.896)
Roa _t	0.887 (0.356)	2.229*** (2.693)	0.631 (0.895)	5.111*** (2.915)	2.812*** (4.586)	3.004*** (5.248)
CFO _t	2.579* (1.747)	-0.772* (-1.776)	-0.275 (-0.770)	0.372 (0.319)	0.571* (1.765)	0.566* (1.838)
PPE _t	-3.009*** (-3.376)	-1.652*** (-5.298)	-1.417*** (-5.218)	-0.325 (-0.435)	-1.395*** (-5.326)	-1.026*** (-4.216)
Age _t	-0.100*** (-4.205)	-0.026*** (-2.971)	-0.021*** (-2.770)	-0.087*** (-4.804)	-0.012** (-2.041)	-0.008 (-1.363)
Board _t	0.142** (2.138)	0.009 (0.296)	0.030 (1.173)	0.087 (1.252)	-0.031 (-1.366)	-0.002 (-0.069)
Indep _t	0.083 (0.040)	0.513 (0.603)	0.733 (0.925)	1.242 (0.678)	0.390 (0.634)	0.778 (1.334)
Fin _t	0.588** (2.207)	0.431*** (4.432)	0.326*** (3.821)	-0.105 (-0.529)	0.304*** (4.554)	0.288*** (4.623)
Dgdp _t	-2.312 (-0.520)	4.844*** (2.983)	5.495*** (3.778)	-2.553 (-0.544)	1.184 (0.823)	1.918 (1.461)
Pgdp _t	-0.847 (-1.285)	-0.600*** (-2.823)	-0.448** (-2.322)	0.535 (1.310)	0.147 (1.098)	0.359*** (2.845)
Intercept	-3.473 (-0.513)	-7.739*** (-3.376)	-8.244*** (-3.914)	-7.729 (-1.579)	-14.362*** (-8.970)	-17.150*** (-11.372)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	3856	3856	3856	8178	8178	8178
Adj.R ²	0.282	0.256	0.245	0.321	0.290	0.282

all positive and significant; however, for the eastern region sample, there is no evidence that official rotation promotes corporate innovation. This significant difference is consistent with hypothesis 3 that the effect of official rotation on corporate innovation varies between eastern and non-eastern regions, and that official rotation contributes to corporate innovation in non-eastern regions. These findings reflect the regional differences in match of officials and districts. Eastern regions tend to have superior natural conditions and more mature economic development. Accordingly, native officials are more familiar with these conditions and have more experience, which makes it relatively easier for them to promote corporate innovation. However, rotating officials do not have unique experience and information, and may even exert negative effects when they restart local integrated affairs management or implement new economic development strategies. Thus, for eastern regions, official rotation does not necessarily lead to more corporate innovation. For non-eastern regions that have imperfect market economic systems and are relatively underdeveloped economically, official rotation can promote corporate innovation through the exchange of experience, information, and resources between eastern and non-eastern regions.

4.2.4. Robustness test

Our paper assumes that the rotation of governors is exogenous, or that we ignore the endogeneity problems in the rotation. Governor rotation depends on the central government's decision-making; provinces and individuals do not make these decisions. The central government makes rotation decisions after comprehensively considering various factors, not just economic one. We carry out a series of robustness tests to corroborate our empirical results.

- (1) Officials with a tenure of less than 3 years or who violated the rules are excluded from this study. It is difficult for officials who have served less than 3 years to significantly affect their region's economic and social development. In addition, if officials violate rules or regulations and have been removed by the central government, official rotation may be an endogenous variable. The results are similar to our primary results, as the coefficients on Rotation are still significantly positive in Table 5, Panel A.
- (2) This paper mainly investigates the effect of the rotation of governors. However, provincial secretaries are also responsible for local political, economic, and social affairs. Therefore, we further investigate the impact of official rotation on corporate innovation from the perspective of provincial secretaries, and obtain similar results.
- (3) Technological innovation entails long development cycles, large amounts of capital demand, and high risk, and enterprises' innovation activities require huge long-term R&D investments to achieve results. Therefore, the corporate innovation variables are delayed for 2 periods to further study the long-term effect of official rotation on corporate innovation. As shown in Table 5, Panel A, there is little variation within the sample.
- (4) The above findings show that official rotation can improve corporate innovation at the firm level. Consistent with prior research, we further adopt innovation-related indicators at the provincial level and for enterprises above a designated size as dependent variables to examine the effect of official rotation. The provincial results are also similar to our primary results, except that in column (3) of Table 5, Panel B, the coefficient on Rotation is not significant.

5. Analysis of the driving mechanism

5.1. Official experience effect

The results in Tables 3 and 4 show that the effect of official rotation on corporate innovation varies due to official and regional heterogeneity. We suspect that the driving mechanism behind these heterogeneities may be primarily official experience. As discussed, central officials perform single and relatively homogenous tasks, often within a well-defined sphere of responsibilities, and have information communication advantages that can promote and guarantee information transmission and policy coordination between the central and local governments. However, provincial secretaries and governors perform multiple and more comprehensive tasks that involve all aspects of economic and social life. They must comprehensively manage all of the region's economic and social development problems, and they thus accumulate comprehensive economic and social management experience. Thus, local officials can more quickly adapt to new working environments and positions, discharging their duties in an effective and efficient manner. The effect of horizontally rotating officials is therefore stronger than that of vertically rotating officials.

The essence of official rotation is the re-match between regions and officials. The cross-regional rotation of officials includes rotation within eastern regions, within non-eastern regions, and between eastern and non-eastern regions. Compared with non-eastern regional officials, officials rotating from eastern regions have better economic development experience and are more effective in economic management. If the effect of official experience plays a leading role, then officials rotating from an eastern region to a non-eastern region can promote corporate innovation in the non-eastern region, while officials rotating from non-eastern region to eastern region might have an insignificant impact on corporate innovation in the eastern region. We further examine the effect of different types of cross-regional official rotation to confirm whether the official experience effect leads to official rotation promoting corporate innovation. Table 6, Panel A provides the results for the

Table 5

Robustness Test. Panel A reports the results of the robustness test for the firm level, which includes the solution to the endogeneity problem, the definition of official rotation with provincial secretaries, and innovation variables lagged two periods. Panel B reports the results of the robustness test for the provincial level and enterprises above the designated size. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

Panel A: Robustness Test, Firm Level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Endogeneity			Redefinition			Lag		
	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}	LnRD _{t+2}	Patent _{t+2}	Patenti _{t+2}
Rotation _t	0.277** (1.965)	0.081* (1.744)	0.130*** (3.057)	0.185* (1.803)	0.088*** (2.882)	0.088*** (3.147)	0.256* (1.904)	0.102** (2.069)	0.123*** (2.685)
Size _t	0.430*** (4.211)	0.561*** (17.578)	0.527*** (17.701)	0.436*** (7.779)	0.560*** (37.628)	0.526*** (38.663)	0.468*** (4.718)	0.567*** (16.931)	0.535*** (17.000)
Lev _t	0.059 (0.112)	0.207 (1.267)	0.093 (0.635)	-0.119 (-0.390)	0.158* (1.835)	0.048 (0.629)	-0.181 (-0.350)	0.168 (0.951)	0.068 (0.417)
Growth _t	0.777*** (3.537)	0.166** (2.319)	0.164** (2.517)	0.848*** (4.340)	0.168*** (2.725)	0.178*** (3.285)	1.184*** (4.535)	0.245*** (3.146)	0.289*** (4.005)
Roat _t	4.362*** (2.882)	2.688*** (5.180)	2.128*** (4.474)	3.700*** (3.038)	2.506*** (7.356)	2.085*** (6.829)	4.301*** (2.784)	2.545*** (4.356)	2.138*** (3.909)
CFO _t	0.918 (0.954)	0.190 (0.695)	0.367 (1.478)	1.194 (1.553)	0.179 (0.833)	0.352* (1.821)	0.618 (0.674)	0.214 (0.726)	0.359 (1.340)
PPE _t	-1.513** (-2.464)	-1.596*** (-7.631)	-1.259*** (-6.659)	-1.427*** (-3.940)	-1.499*** (-14.381)	-1.182*** (-12.656)	-0.811 (-1.350)	-1.559*** (-7.023)	-1.286*** (-6.312)
Age _t	-0.101*** (-6.849)	-0.016*** (-3.178)	-0.012** (-2.547)	-0.096*** (-11.670)	-0.016*** (-6.379)	-0.012*** (-5.107)	-0.077*** (-5.133)	-0.017*** (-3.226)	-0.013** (-2.519)
Board _t	0.105** (2.057)	-0.012 (-0.665)	0.012 (0.713)	0.104*** (3.302)	-0.019** (-2.089)	0.009 (1.077)	0.098** (2.011)	-0.022 (-1.127)	0.003 (0.137)
Indept _t	1.425 (1.045)	0.530 (1.030)	0.846* (1.745)	0.844 (0.925)	0.433 (1.582)	0.750*** (2.962)	1.389 (1.002)	0.585 (1.075)	0.778 (1.501)
Fin _t	0.163 (1.023)	0.372*** (6.806)	0.284*** (5.703)	0.124 (1.459)	0.345*** (13.467)	0.273*** (11.788)	0.076 (0.504)	0.363*** (6.310)	0.310*** (5.801)
Dgdpt _t	-1.122 (-0.410)	1.742* (1.799)	2.766*** (3.178)	-0.468 (-0.223)	2.895*** (4.323)	3.521*** (5.896)	-1.783 (-0.620)	1.897* (1.651)	2.935*** (2.802)
Pgdpt _t	-0.087 (-0.312)	-0.061 (-0.650)	0.124 (1.406)	-0.037 (-0.244)	-0.002 (-0.051)	0.130*** (3.230)	0.013 (0.051)	-0.027 (-0.279)	0.097 (1.057)
Intercept	-4.703 (-1.526)	-12.671*** (-11.747)	-14.299*** (-13.967)	-4.961*** (-2.660)	-13.237*** (-25.252)	-14.427*** (-29.729)	-3.329 (-1.116)	-12.793*** (-11.228)	-14.104*** (-13.036)
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,163	11,163	11,163	12,034	12,034	12,034	9694	9694	9694
Adj.R ²	0.304	0.281	0.271	0.302	0.274	0.265	0.234	0.262	0.254

Panel B: Robustness Test, Provincial Level and Enterprises above the Designated Size

	(1)	(2)	(3)	(4)	(5)
	Provincial Level		Enterprises Above the Designated Size		
	R&D Expenditure	R&D Expenses	Total Patent	Invention Patent	Full-time Equivalent of R&D Personnel
Rotation _t	0.245** (2.481)	0.263* (1.842)	0.213 (1.329)	0.253* (1.756)	0.337** (2.200)
Dgdpt _t	0.565 (0.402)	0.856 (0.582)	2.373 (1.488)	2.337 (1.493)	0.767 (0.521)
Pgdpt _t	0.373* (2.003)	0.147 (0.460)	0.033 (0.107)	0.177 (0.699)	-0.101 (-0.312)
Fin _t	1.370*** (17.953)	1.559*** (10.192)	1.662*** (12.743)	1.561*** (13.109)	1.639*** (9.548)
Intercept	1.069 (0.656)	1.566 (0.579)	-3.655 (-1.394)	-5.534** (-2.581)	0.325 (0.118)
Year	Yes	Yes	Yes	Yes	Yes
N	279	279	279	279	279
Adj.R ²	0.934	0.907	0.890	0.901	0.888

test of the official experience effect. Consistent with our expectations, the regression coefficients on EastProvince are all significantly positive in non-eastern regions but are not significant and may even have a negative effect in eastern regions, whereas the coefficients on NonEastProvince are not significant in eastern or non-eastern regions. Thus, official rotation from an eastern region to a non-eastern region has a positive impact on corporate innovation, suggesting that the effect of official rotation on corporate innovation may be driven by official experience.

Table 6, Panel A also provides evidence that the regression coefficients on Central are significantly positive in non-eastern regions, which shows that vertically rotating officials can effectively promote corporate innovation in non-eastern areas. A possible reason is that compared with eastern regions, the political and economic environment in non-eastern regions is relatively poor and government efficiency is low. Officials rotating from the central government to a local government can strengthen communication between the central government and the local government, and can supervise and restrain local government actions, thus improving the business environment and government quality in non-eastern regions. In addition, vertically rotating officials have a close relationship with the central government and can obtain more resources for the local government. Thus, given official and regional heterogeneity, central rotating officials can promote corporate innovation in non-eastern regions.

5.2. Charitable donations and innovation subsidies

In China, the relationship between the government and businesses plays an important role in the allocation of government resources. Seeking political connections and improving innovation ability are key factors for obtaining a competitive advantage (Yang, 2011). Constrained by limited resources, firms must balance building capacity and political connections. That is, building political connections and strengthening innovation ability are the two substitutive ways for enterprises to develop themselves. Charitable donations can generate advertising, reputation, and tax deduction effects and assist the local government in achieving political goals, and can thus be a quick and effective way to establish political connections. Corporate charitable donations are generally regarded as “political contributions” paid by companies to establish political relationships, rather than as the fulfillment of social responsibilities (Dai et al., 2014). Considering that official rotation can significantly curb corruption (Chen and Li, 2012) and improve the business environment, we think that official rotation might enhance the innovation incentive by increasing the relative cost of establishing political connections. Therefore, our paper further explores the relationship between official rotation and corporate charitable donations, and examines the mechanism by which official rotation influences corporate innovation. The results shown in columns (1) and (2) of Table 6, Panel B suggest that horizontal official rotation can reduce corporate charitable donations and restrict the establishment of political connections, leading to the promotion of corporate innovation.

The local government plays a critical role in China’s science and technology investment system. Vast and long-term R&D spending increase a corporation’s financial risk. Companies engaged in R&D activities may lack capital due to the exclusive characteristics of R&D information and the external characteristics of technological innovation, and may be confronted with market failures during the process of scientific and technological innovation. Market failures of technological innovation provide the theoretical basement of government’s intervention and support to enterprises’ innovation activities. The local government can affect corporate R&D investment behaviors through a “visible hand” by establishing a series of science and technology projects supported by financial expenditure on science and technology. In addition, government funds can be used to support R&D activities in particular innovation areas. The local government can also help firms overcome the problem of insufficient R&D investment through innovation subsidies, which can significantly promote R&D investment and substantive innovation output (Guo, 2018). We therefore further examine whether official rotation can increase innovation subsidies to identify the effect of official rotation on corporate innovation from the perspective of resource allocation. The results shown in columns (3) and (4) of Table 6, Panel B suggest that vertical official rotation can increase corporate innovation subsidies that directly supplement enterprises’ R&D investment.

Table 6

Channels through Which Official Rotation Promotes Corporate Innovation. Panel A reports the results for the test of the driving mechanism, which examines the relationship between the effect of official rotation on corporate innovation and the effect of official experience. Panel B, columns (1) and (2) report the results for charitable donations, which indicate the relationship between official rotation and charitable donations. Panel B, columns (3) and (4) report the results for innovation subsidies, which indicate the relationship between official rotation and innovation subsidies. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

Panel A: Effects of Official Rotation on Corporate Innovation, Official Experience Effect

	(1) Non-Eastern Region		(3)	(5) Eastern Region		(6)
	LnRD _{t+1}	Patent _{t+1}	Patent _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patent _{t+1}
EastProvince _t	0.874*** (2.693)	0.253** (2.352)	0.191* (1.916)	0.163 (0.238)	-0.429*** (-2.604)	-0.168 (-1.109)
NonEastProvince _t	0.859*** (3.187)	0.147 (1.321)	0.087 (0.891)	0.387 (1.094)	0.026 (0.258)	0.175* (1.802)
Central _t	0.759*** (2.750)	0.274*** (2.893)	0.181** (2.129)	-0.234 (-1.498)	-0.027 (-0.434)	0.022 (0.385)
Size _t	0.696*** (4.411)	0.517*** (9.730)	0.458*** (9.672)	0.315** (2.541)	0.574*** (15.398)	0.553*** (15.696)
Lev _t	-0.548 (-0.559)	0.150 (0.539)	0.089 (0.393)	0.051 (0.089)	0.230 (1.227)	0.071 (0.408)
Growth _t	0.644* (1.707)	0.158 (1.357)	0.234** (2.285)	0.856*** (3.399)	0.160* (1.924)	0.138* (1.815)
Roa _t	0.865 (0.348)	2.223*** (2.683)	0.620 (0.878)	5.197*** (2.970)	2.825*** (4.595)	3.029*** (5.292)
CFO _t	2.592* (1.747)	-0.768* (-1.757)	-0.267 (-0.746)	0.363 (0.312)	0.556* (1.719)	0.554* (1.801)
PPE _t	-3.009*** (-3.372)	-1.659*** (-5.324)	-1.423*** (-5.233)	-0.290 (-0.386)	-1.394*** (-5.310)	-1.019*** (-4.180)
Age _t	-0.100*** (-4.199)	-0.026*** (-2.981)	-0.021*** (-2.796)	-0.086*** (-4.748)	-0.012** (-2.028)	-0.007 (-1.300)
Board _t	0.142** (2.134)	0.009 (0.320)	0.031 (1.197)	0.081 (1.180)	-0.031 (-1.376)	-0.003 (-0.118)
Indep _t	0.086 (0.041)	0.511 (0.599)	0.732 (0.921)	1.098 (0.601)	0.386 (0.631)	0.748 (1.289)
Fin _t	0.592** (2.176)	0.417*** (4.274)	0.313*** (3.641)	-0.058 (-0.286)	0.303*** (4.515)	0.297*** (4.718)
Dgdp _t	-2.633 (-0.616)	4.877*** (3.123)	5.442*** (3.931)	-0.907 (-0.190)	1.174 (0.815)	2.223* (1.689)
Pgdp _t	-0.845 (-1.279)	-0.611*** (-2.875)	-0.457** (-2.367)	0.365 (0.890)	0.147 (1.082)	0.326** (2.558)
Intercept	-3.470 (-0.508)	-7.505*** (-3.289)	-8.024*** (-3.797)	-6.224 (-1.286)	-14.282*** (-8.978)	-16.813*** (-11.226)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	3856	3856	3856	8178	8178	8178
Adj.R ²	0.282	0.257	0.245	0.322	0.291	0.282

Panel A: Official Rotation, Charitable Donations, and Innovation Subsidies

	(1) Donation _{t+1}	(2) Donation _{t+1}	(3) RD&Subsidy _{t+1}	(4) RD&Subsidy _{t+1}
Rotation _t	-0.256*** (-3.500)		0.280* (1.738)	
Province _t		-0.409*** (-4.067)		0.186 (0.825)
Central _t		-0.115 (-1.425)		0.362** (2.056)

(continued on next page)

Table 6 (continued)

	(1) Donation _{t+1}	(2) Donation _{t+1}	(3) RD&Subsidy _{t+1}	(4) RD&Subsidy _{t+1}
Size _t	0.941*** (23.050)	0.943*** (23.039)	0.151 (1.422)	0.152 (1.438)
Lev _t	0.205 (0.838)	0.193 (0.790)	-0.162 (-0.293)	-0.171 (-0.310)
Growth _t	0.109 (1.090)	0.111 (1.119)	1.085*** (5.490)	1.087*** (5.505)
Roa _t	8.461*** (11.449)	8.480*** (11.494)	3.329** (2.034)	3.334** (2.038)
CFO _t	1.324*** (3.372)	1.326*** (3.383)	-2.486*** (-2.706)	-2.483*** (-2.704)
PPE _t	-0.205 (-0.775)	-0.208 (-0.786)	-0.659 (-1.078)	-0.665 (-1.088)
Age _t	-0.052*** (-7.370)	-0.052*** (-7.316)	-0.092*** (-5.230)	-0.091*** (-5.218)
Board _t	-0.008 (-0.342)	-0.006 (-0.257)	-0.008 (-0.127)	-0.007 (-0.107)
Indep _t	-0.615 (-0.887)	-0.576 (-0.831)	-1.682 (-0.996)	-1.658 (-0.982)
Fin _t	0.085 (1.224)	0.063 (0.906)	0.452*** (2.721)	0.439*** (2.632)
Dgdp _t	3.732** (2.405)	3.727** (2.400)	0.047 (0.014)	0.066 (0.020)
Pgdp _t	-0.033 (-0.273)	-0.028 (-0.231)	-0.397 (-1.354)	-0.395 (-1.350)
Intercept	-6.927*** (-5.209)	-6.904*** (-5.187)	6.230* (1.829)	6.252* (1.833)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	13,421	13,421	15,830	15,830
Adj.R ²	0.202	0.203	0.243	0.243

6. Supplementary analysis: performance appraisal pressure and economic growth

6.1. Performance appraisal pressure

Since the third plenary session of the 11th Central Committee of the Communist Party of China (CPC) put forward the concept of “economic development as the central task” in 1978, the National People’s Congress (NPC) has made the GDP growth rate the primary indicator of China’s economic development. In China, officials’ measure for promotion has changed from political performance to economic performance. However, under centralized political governance, local officials are mainly supervised by central authorities. Given the incentive of promotion, local officials engage in a “promotion tournament” based on GDP growth (Zhou, 2007). The promotion likelihood of Chinese provincial officials has a significant positive correlation with the growth rate of provincial GDP (Li and Zhou, 2005). In addition, the central government appraises the performance of local officials using relative performance evaluation methods to reduce appraisal error. This strengthens the political tournament and incentivizes local government officials to focus on short-term goals that highlight achievements made during their term. Local officials are assumed to face two investment choices: production investment, which is characterized by short-term cycles, quick effects, and low risk, and innovation investment, which is characterized by long-term cycles, slow effects, and high risk. To maximize their economic and political interests during their time in office, local officials tend to encourage productive investment and ignore innovative investment—that is, they show a self-interested investment preference of “emphasizing production and neglecting innovation” (Wu, 2017). Therefore, if the GDP growth rate is a deci-

sive factor for political promotion, economic development should directly affect the behavioral preferences of local officials. To gain an advantage in the political promotion tournament, local officials will actively attract investment and promote infrastructure construction to promote rapid economic growth within their jurisdiction (Bu et al., 2018). Especially in regions with low GDP growth rates, officials experience greater pressure regarding their political performance evaluation. To pursue economic growth, officials' self-interested investment preference—to invest more in production than in innovation—will be more severe. Thus, we examine the effect of official rotation under different levels of assessment pressure to test whether the effect of official rotation on corporate innovation varies with different levels of performance appraisal pressure.

We divide the sample into four groups according to the GDP growth rate of each province. Regions with the lowest GDP growth rate are designated as the High Pressure group, and regions with the highest GDP growth rate are classified as the Low Pressure group. Table 7, Panel A shows how the different levels of performance appraisal pressure affect the relationship between official rotation and corporate innovation. The coefficient on Rotation is significantly positive in the Low Pressure group but fails the significance test for the High Pressure group, suggesting that appraisal pressure does affect the relationship between official rotation and corporate innovation. Only when rotating officials are faced with low appraisal pressure do they have positive effects on corporate innovation. This is consistent with the reality that local officials rely heavily on investment in fixed assets rather than intangible assets.

6.2. Official rotation, corporate innovation, and economic growth

Development is the key to solving economic problems, and long-term economic growth is the core of development. The central government attaches great importance to the quality of economic growth and to sustainable development. In five-year plans and important conferences, the central government has continuously emphasized the transformation of the economic growth mode and the key roles of science, technology, and innovation in economic development and transformation. Science, technology, and innovation are the primary productive forces and engines of economic growth. Through the development of high-tech industries, China can seek an “opportunity window” to leap ahead technologically and accelerate its economic development (Liu et al., 2017). China is in a critical period of economic transition that requires more active recognition of the crucial roles of knowledge and technological innovation in the modern economy to lay the foundation for innovation-driven development. However, during the process of economic transformation, can official rotation promote regional economic development by improving corporate innovation?

To answer this question, our paper further examines the relationship between official rotation, corporate innovation, and economic growth to verify the positive effect of corporate innovation resulting from official rotation on regional economic development. Table 7, Panel B presents the results for economic growth. Consistent with our speculation, using the next period of GDP and the GDP growth rate as explained variables, the coefficients on Rotation*LnRD and Rotation*Patent are both significantly positive, indicating that R&D expenditure and patent applications caused by official rotation can increase regional GDP and the GDP growth rate. In other words, official rotation can promote economic growth by increasing corporate innovation, which supports the economic growth effect of official rotation at the micro level (Zhang and Gao, 2007; Xu et al., 2007).

7. Conclusion

As China's economy has entered a “new normal” period with slower economic growth, major changes are taking place in terms of the growth rate and development model, implying that economic growth is in a critical period of transition from being factor and investment driven to being innovation driven. From 2006 to 2020, China's science and technology development goal is to build an innovation-oriented country and to make scientific and technological innovation the backbone of economic development. Therefore, it is of great practical significance to foster and stimulate innovation, which is a challenge for both the government and firms.

By considering governor rotation, this paper empirically examines the effect of official rotation on corporate innovation and explores the driving mechanism of this effect. Using a sample of Chinese A-share listed companies from 2007 to 2015, we find that official rotation has a positive effect on corporate innovation. Offi-

Table 7

Supplementary Analysis: Performance Appraisal Pressure and Economic Growth. Panel A reports the results for the test of performance appraisal pressure, which examines the relationship between the effect of official rotation on corporate innovation and performance appraisal pressure. Panel B reports the results for economic growth, which indicates the relationship between the effect of official rotation on corporate innovation and economic growth. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. T-statistics computed with robust standard errors clustered at the firm level are reported in parentheses.

Panel A: Effects of Official Rotation on Corporate Innovation, High Pressure vs. Low Pressure

	(1)	(2)	(3)	(4)	(5)	(6)
	High Pressure			Low Pressure		
	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}	LnRD _{t+1}	Patent _{t+1}	Patenti _{t+1}
Rotation_t	0.076 (0.469)	-0.050 (-0.679)	0.017 (0.264)	0.576** (2.172)	0.171** (2.481)	0.169*** (2.682)
Size _t	0.612*** (4.993)	0.530*** (13.579)	0.506*** (14.303)	-0.010 (-0.056)	0.515*** (11.884)	0.476*** (12.157)
Lev _t	-0.146 (-0.257)	0.385* (1.915)	0.182 (1.009)	0.631 (0.628)	0.035 (0.153)	-0.073 (-0.354)
Growth _t	1.025*** (3.525)	0.131 (1.175)	0.180* (1.842)	1.392** (2.048)	0.162 (1.033)	0.135 (1.023)
Roa _t	0.757 (0.438)	2.926*** (4.008)	2.426*** (3.718)	4.871 (1.375)	1.799** (2.316)	1.246* (1.739)
CFO _t	1.284 (0.939)	0.460 (1.039)	0.451 (1.135)	2.706 (1.298)	-0.089 (-0.203)	0.322 (0.800)
PPE _t	-0.366 (-0.544)	-1.216*** (-4.602)	-0.927*** (-3.929)	-2.130** (-1.969)	-1.738*** (-6.457)	-1.276*** (-5.303)
Age _t	-0.053*** (-3.300)	-0.013** (-2.217)	-0.008 (-1.486)	-0.227*** (-6.722)	-0.013* (-1.681)	-0.013* (-1.939)
Board _t	0.099 (1.545)	-0.013 (-0.489)	0.019 (0.811)	0.157* (1.832)	-0.040 (-1.639)	-0.001 (-0.048)
Indep _t	1.232 (0.883)	-0.048 (-0.072)	0.512 (0.821)	0.354 (0.115)	0.910 (1.244)	1.004 (1.410)
Fin _t	0.205 (0.854)	0.314*** (4.099)	0.286*** (4.273)	0.224 (0.675)	0.346*** (4.672)	0.315*** (4.667)
Dgdp _t	2.536 (0.408)	5.074** (2.339)	5.595*** (2.908)	-6.973 (-0.874)	-0.005 (-0.003)	2.104 (1.265)
Pgdp _t	0.033 (0.093)	-0.193 (-1.592)	-0.203* (-1.796)	-0.732 (-1.610)	-0.091 (-0.767)	0.040 (0.360)
Intercept	-3.948 (-0.996)	-10.300*** (-7.472)	-10.490*** (-8.238)	10.900* (1.957)	-10.541*** (-7.630)	-12.042*** (-9.255)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
N	3196	3196	3196	2942	2942	2942
Adj.R ²	0.197	0.272	0.261	0.297	0.227	0.215

Panel B: Official Rotation, Corporate Innovation, and Economic Growth

	(1)	(2)
	GDP _{t+1}	Dgdp _{t+1}
Rotation _t	0.014 (0.502)	-0.002** (-2.104)
Rotation*LnRD _t	0.006*** (3.836)	
Rotation*Patent _t		0.001** (2.239)
LnRD _t	-0.002** (-2.432)	
Patent _t		0.000** (1.992)

(continued on next page)

Table 7 (continued)

	(1) GDP _{t+1}	(2) Dgdp _{t+1}
Size _t	−0.013** (−2.005)	−0.001** (−2.044)
Lev _t	0.124*** (3.569)	0.000 (0.032)
Growth _t	−0.031* (−1.868)	0.005*** (4.818)
Roa _t	0.316*** (3.017)	−0.003 (−0.433)
CFO _t	0.031 (0.506)	0.001 (0.300)
PPE _t	0.146*** (3.893)	−0.002 (−0.813)
Age _t	−0.005*** (−4.279)	−0.000*** (−2.582)
Board _t	−0.006 (−1.340)	−0.000 (−0.725)
Indep _t	−0.278*** (−2.735)	0.013** (2.323)
Fin _t	1.060*** (61.742)	−0.000 (−0.024)
Dgdp _t	0.115 (0.557)	
Pgdp _t	−0.398*** (−13.984)	−0.014*** (−12.889)
Intercept	6.575*** (27.518)	0.297*** (28.037)
Industry	Yes	Yes
Year	Yes	Yes
N	12,034	12,034
Adj.R ²	0.864	0.721

cial rotation significantly improves R&D investment and increase the quantities of total patent applications and innovation patent applications. We also find that the effect of official rotation on corporate innovation varies due to official and region heterogeneity. Officials rotating from other provinces significantly promote corporate innovation, but officials rotating from the central government have a negligible effect on corporate innovation. Officials rotating to non-eastern regions significantly improve corporate innovation, while officials rotating to eastern regions do not. These results reflect the need to further improve the role of technological innovation in non-eastern regions for economic development. Compared with eastern regions, in non-eastern regions, the market environment is relatively poor, and the economy develops slowly. Officials rotating from eastern regions to non-eastern regions provide superior economic development experience and improve the economic and political environment, thus promoting corporate innovation and coordinating regional economic development. In other words, if eastern region officials are rotated to non-eastern regions, the market environment of non-eastern region will become more transparent, standardized, convenient, and vigorous due to the effect of officials' experience, which is conducive to corporate innovation and quickly improves corporate innovation. In addition, we find that central officials and local officials have different channels through which to influence corporate innovation. Officials rotating from the central government promote corporate innovation in non-eastern regions through increasing innovation subsidies, while officials rotating from local governments mainly improve corporate innovation through the experience effect and by decreasing corporate charitable donations. We also find that performance appraisal pressure significantly inhibits the effect of official rotation on corporate innovation. Only when officials have less pressure to increase their achievements do they have a positive impact on corporate innovation. We also confirm that official rotation promotes the regional growth of GDP through promoting corporate innovation.

This paper has policy implications for government administrators. First, in the context of fiscal decentralization and political centralization, China has accomplished great achievements in economic development. To maximize economic and political interests during their terms, local officials have incentives to pay more attention to production investment than to innovation investment. However, an economic growth model that relies heavily on extensive investment in fixed assets cannot be sustainable. Our paper finds that official rotation does have significant and positive effects on innovation-production investment, thus laying theoretical foundation for transforming economic growth from an extensive to an innovation-driven form. Second, our paper finds that the effect of official rotation on corporate innovation varies due to official and regional heterogeneity, which has important reference significance for properly modifying the official governance system to promote economic development. Third, our paper finds that GDP-oriented pressure to perform weakens the corporate innovation effect of official rotation. Therefore, we should gradually reduce the weight of economic assessment in official performance evaluations and increase the weight of assessment of public services and social management.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Variable definitions

Variables	Definitions
LnRD	Innovation investment, the natural logarithm of R&D expense after adding 1. $\text{LnRD} = \text{Ln}(1 + \text{R\&D expense})$
Patent	Innovation quantity, the natural logarithm of total patent applications after adding 1. $\text{Patent} = \text{Ln}(1 + \text{total patent applications})$
Patenti	Innovation quality, the natural logarithm of invention patent applications after adding 1. $\text{Patenti} = \text{Ln}(1 + \text{invention patent applications})$
Rotation	Dummy variable, which is equal to 1 if the new governors are selected from cross-regional rotation and 0 otherwise (Zhang and Gao, 2007)
Central	Dummy variable, which is equal to 1 if the cross-regional rotation governors are selected from the central government and 0 otherwise
Province	Dummy variable, which is equal to 1 if the cross-regional rotation governors are selected from other foreign provinces and 0 otherwise
Eastern Region	Eastern regions include Liaoning, Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Hainan. The other provinces are classified as non-eastern regions
EastProvinces	Dummy variable, which is equal to 1 for cross-regional rotation governors coming from eastern regions and 0 otherwise

NonEastProvinces	Dummy variable, which is equal to 1 for cross-regional rotation governors coming from non-eastern regions and 0 otherwise
Size	Natural logarithm of end-of-year total assets
Lev	End-of-year total liabilities divided by end-of-year total assets
Growth	Percentage change in sales
Roa	Net income divided by end-of-year total assets
CFO	Annual net cash flow from operating activities divided by end-of-year total assets
PPE	Current year level of property, plant, and equipment, scaled by end-of-year total assets
Age	Number of years the firm has been listed on the stock exchange
Board	Number of directors on the board
Indep	Proportion of independent directors on the board
Fin	Natural logarithm of the annual general budget revenue of each province
GDP	Natural logarithm of the GDP of each province
Dgdp	Percentage change in GDP
Pgdp	Natural logarithm of GDP per capita
Donation	Charitable donations, the natural logarithm of charitable donations after adding 1. Donation = $\text{Ln}(1 + \text{charitable donations})$
RD&Subsidy	Innovation Subsidies, the natural logarithm of innovation subsidies after adding 1. RD&Subsidy = $\text{Ln}(1 + \text{innovation subsidies})$

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Multiple large shareholders and corporate environmental protection investment: Evidence from the Chinese listed companies

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ABSTRACT

Agencies can reduce problems by adopting a governance structure of multiple large shareholders. However, multiple large shareholders may collude, thereby reducing the behavior that can create long-term value for the company. This paper uses a sample of companies listed on the Shenzhen and Shanghai stock exchanges between 2008 and 2017 to investigate the relationship between multiple large shareholders and corporate environmental protection investment (CEPI). We find that multiple large shareholders will significantly reduce CEPI. Specifically, external supervision and a company's ownership structure affect the relationship between multiple large shareholders and CEPI. In addition, after participating in SOEs, non-state-owned shareholders will significantly improve CEPI of SOEs.

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1. Introduction

Since the reform and opening up, the Chinese economy has achieved remarkable results, while ecological and environmental issues have become increasingly serious. According to the *2018 Global Environmental Performance Index* jointly issued by Yale University, Columbia University, and the World Economic Forum, China's environmental performance ranks 120th out of 180 economies. In terms of air quality, China ranks fourth to last based on PM2.5 comprehensive evaluations. Environmental pollution causes a loss of 3.5–8% to GDP each year (Chiu and Wu, 2010). According to the Chinese Environmental Protection Department, more than 80% of pollution is caused by the production and operation of enterprises (Wei et al., 2017). Enterprises

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should actively fulfill their social responsibility to pollution prevention and control and carry out environmental governance because they continuously request and benefit from environmental resources and benefits that allow them to increase production and operation activities, which inevitably causes more pollution. To this end, Shenzhen and Shanghai stock exchanges issued *Guidelines for Social Responsibility of Listed Companies* (2006) and *Guidelines for Environmental Information Disclosure of Listed Companies* (2008), stating that listed companies should disclose their fulfillment of social and environmental responsibilities.

As a financial disclosure in a corporate social responsibility (CSR) report, corporate environmental protection investment (CEPI) pertains to enterprises that use part of an investment fund for pollution prevention and control, which belongs to both corporate governance and capital investment. By actively undertaking CEPI and fulfilling CSR, a firm may reap many benefits, including a good reputation (Aguilera-Caracuel and Guerrero-Villegas, 2017), an increase in market value (Kong et al., 2012), and improve investment efficiency (Benlemlih and Bitar, 2016). The benefits enhance the firm's long-term value. However, CEPI is a special investment that combines social, economic, and environmental benefits. It has the characteristics of a long investment cycle and low economic benefits, which restrict investment in other productive and economic projects. Most firms often do not actively carry out environmental governance and CEPI because CEPI has a high opportunity cost. A firm's main motivation to adopt a positive environmental protection investment strategy is to cope with institutional pressure (Verbeke and Rugman, 1998). Due to weak insufficient incentives, listed companies generally have insufficient environment governance, making CEPI a "passive" behavior (Maxwell and Decker, 2006).

An increasing number of scholars have investigated the external and internal factors affecting CEPI, finding that external factors include environmental regulation (Taylor et al., 2005; Maxwell and Decker, 2006; Olson, 1999), external pressure (Testa et al., 2015; Sarkar, 2008), and market competition (Ducassy and Montandrou, 2015; Sengupta, 2015; Luken et al., 2008), and that internal factors include corporate culture (Sugita and Takahashi, 2013) and board structure (Jiang and Akbar, 2018; Uwugbe and Ajibolade, 2013; Wei et al., 2017). However, there is limited evidence on the influence of ownership structure on CEPI.

Based on these findings, we select companies listed on the Shenzhen and Shanghai stock exchanges between 2008 and 2017 as the samples to examine the influence of multiple large shareholders on CEPI. We find that the CEPI of enterprises with multiple large shareholders is lower than enterprises with a single large shareholder. However, our conclusion may encounter endogeneity problems regarding missing variables and sample selection bias because the research on the relationship between ownership structure and CEPI is vulnerable to unobservable factors. Therefore, this paper adopts a fixed effect model, PSM model, DID model, and Heckman two-stage model to address potential endogeneity problems. The results show that the above conclusion is still valid after controlling potential endogeneity problems.

In addition, this paper investigates the influence of external supervision on the relationship between multiple large shareholders and CEPI. We apply marketization and examine whether a firm is audited by a Big Four accounting firm to measure the influence of external supervision on firms. We find that in regions with weak marketization and in firms not audited by a Big Four firm, the negative influence of multiple large shareholders on CEPI is more significant.

Finally, we examine the impact of heterogeneous ownership participation on CEPI. We find that the participation of non-state-owned shareholders significantly increases CEPI of SOEs. However, the participation of state-owned shareholders has no significant influence on the CEPI of non-SOEs.

The main contributions of this paper are as follows. First, this paper provides new evidence for the relationship between ownership structure and CEPI, enriching the academic literature in the field of corporate environmental management. So far, most research on corporate governance and corporate environment has focused on environmental information disclosure (Lewis et al., 2014). Research on factors affecting CEPI has focused on the institutional level (Maxwell and Decker, 2006; Verbeke and Rugman, 1998). Although there have been studies focusing on the influence of ownership structure on CSR (Faller and Zu, 2018; Félix and Óscar, 2011), the literature has not discussed the influence of ownership structure on CEPI. Therefore, this paper studies the influence of multiple large shareholders on CEPI from the perspective of corporate governance. Second, this paper enriches the research on the reform of China's mixed ownership structure. Since the Third Plenary Session of the 18th CPC Central Committee, mixed ownership reform has quickly become one of the central issues in the field of corporate governance in China. Many scholars believe that

a mixed ownership structure can improve corporate governance mechanisms to enhance corporate performance (Megginson et al., 1994; Bortolotti et al., 2002). However, the existing literature has mainly focused on its economic benefits and ignored its social benefits. Therefore, from the perspective of cross-shareholding between state-owned and non-state-owned shareholders, we discuss the influence of heterogeneous shareholding on CEPI. We find that the CEPI of SOEs will be significantly improved after non-state-owned shareholders participate in SOEs, which provides evidence to support the mixed ownership reform of SOEs in China.

Finally, this paper enriches the literature on the relevant fields of ownership structure. From the perspective of equity checks and balances, previous studies have found that multiple large shareholders can effectively monitor the behavior of the controlling shareholders to obtain private benefits (Pagano and Röell, 1998; Shleifer and Vishny, 1997). However, there is no straightforward equivalence between multiple large shareholders and equity checks and balances. Multiple large shareholder structures are highly complex. Large shareholders may have a supervisory or collusion effect on CEPI. After accounting for persons acting in concert to reorganize data on the ownership structure, as well as China's institutional background, we define large shareholders as shareholders with a shareholding ratio of no less than 10%. We then investigate the influence of multiple large shareholders on CEPI.

The structure of the rest of this paper is as follows. The second part presents the theoretical analysis and research hypothesis, the third part presents the research design, the fourth part describes the empirical test, the fifth part presents further analysis, and the sixth part offers research conclusions and policy suggestions.

2. Theoretical analysis and hypothesis

Principal-agent theory states that the separation of ownership and management is an important feature of modern firms. Such separation will improve firm efficiency but exacerbate conflict between shareholders and management (Jensen and Meckling, 1976). When a firm has many and widely dispersed shareholders, corporate resources may be used to meet the interests of managers rather than to maximize shareholder value. However, in countries with emerging capital markets, such as China, the ownership structure of listed companies tends to have a high concentration of ownership due to the country's economic transformation. Large shareholders have sufficient motivation and ability to supervise management (La Porta et al., 1999). Issues with corporate governance are more likely to manifest when controlling shareholders infringe on the interests of creditors and minority shareholders (Shleifer and Vishny, 1997). The conflict of interest between controlling and minority shareholders may affect a firm's investment decisions because the controlling shareholders can forgo profitable projects to preserve private benefits (Jiang et al., 2018).

CEPI is unlike other economic projects. It is not only more difficult to create direct economic inflows, but it also requires firms to spend a great deal of money on environmental protection facilities and innovative environmentally friendly technology. As corporate funds are limited, when investing a portion of funds in environmental protection, other production-oriented investments will inevitably be affected (Gray and Shadbeian, 2003), which will lead to a decline in corporate profitability. If a company only has one controlling shareholder, the controlling shareholder has a strong incentive to encroach on the interests of minority shareholders due to a lack of supervision and checks and balances from other large shareholders (Shleifer and Vishny, 1997). A controlling shareholder is more willing to invest funds in capital and physical investments that can increase their control power or change the direction of environmental protection investment toward private benefits not shared with minority shareholders (Tang and Li, 2013). For example, Tang and Li (2013) find that the shareholding ratio of the firm's largest shareholder has a negative correlation with CEPI. Therefore, if a company only has a single large shareholder, this shareholder may not have sufficient incentive to invest in CEPI.

To resolve the conflict of interest between the large shareholder and minority shareholders, many scholars have suggested that the governance structure of multiple large shareholders can reduce the behavior of controlling shareholders that infringes on the interests of minority shareholders (Cronqvist and Nilsson, 2003). Studies have shown that other large shareholders can effectively reduce the chance that controlling shareholders will attempt to obtain private income. Shareholders can reduce the behavior by reducing related transactions and capital occupation (Attig et al., 2009; Maury and Pajuste, 2005), enhancing earnings informativeness

(Boubaker and Sami, 2011), increasing the value of cash holdings (Attig et al. 2013), and improving investment efficiency (Jiang et al., 2018). Therefore, under the ownership structure of multiple large shareholders, large non-controlling shareholders can effectively monitor controlling shareholders and alleviate agency problems. Multiple large shareholders will then restrain controlling shareholders from reducing corporate environmental investment.

However, the governance structure of multiple large shareholders may also have high costs. It may be more profitable for large shareholders to collude and extract private rents that maximize their personal wealth at the expense of other shareholders. When a firm's large shareholders collude, its value decreases (Cai et al., 2015). Previous studies have shown that multiple large shareholders are more likely to collude to reduce company value (Laeven and Levine, 2008). Kahn and Winton (1998) argue that large shareholders are more inclined to collude to use private information to conduct transactions for profit rather than supervision. Cheng et al. (2013) show that it is easier for large shareholders to collude to infringe on the interests of minority shareholders when there is a relationship between multiple large shareholders. We argue that multiple large shareholders will collude to reduce CEPI. Based on theoretical predictions and mixed empirical evidence on the governance role of multiple large shareholders, the impact of multiple large shareholders on CEPI remains an empirical question. Hence, we develop the following competing hypotheses:

Monitoring Hypothesis: Compared with firms with a single large shareholder, firms with multiple large shareholders have higher CEPI.

Collusion Hypothesis: Compared with firms with a single large shareholder, firms with multiple large shareholders have lower CEPI.

3. Data and sample statistics

3.1. Data sources and sample selection

A certain percentage of shareholders of listed companies in China hold joint shares through property association, kinship association, position association, or an “agreement of persons acting in concert.” (Hao and Gong, 2017). They act in concert when voting to protect their rights and interests. In this paper, we consider shareholders that act in concert through kinship or holding associations as single shareholders. We use data from China Securities Market and Accounting Research (CSMAR) and the CCER economic and financial database to determine joint shareholders. Take Tianjian Group Co., Ltd as an example (Fig. 1). At the end of 2014, Tianjian Group Co., Ltd had two large shareholders with shareholding ratios of more than 10%: Shenzhen Yuanzhi Investment Company (16.10%) and Shenzhen State-owned Assets Management Committee (23.47%). In theory, Tianjian Group Co., Ltd has multiple large shareholders. However, Shenzhen Yuanzhi Investment Company is controlled by the Shenzhen State-owned Assets Management Commission,

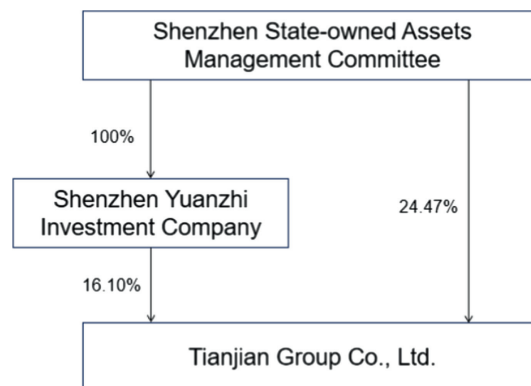


Fig. 1. The ownership control chart of Tianjian Group Co., Ltd.

so we merged the shares of these two shareholders and treated them as one shareholder. Therefore, Tianjian Group Co., Ltd does not have multiple large shareholders.

This paper's data sources are as follows. First, financial data and board structure data are from China Securities Market and Accounting Research (CSMAR) and the CCER economic and financial database. Some missing data are obtained from the annual reports of listed companies. Second, CEPI data are manually collected from independent social responsibility reports, sustainable development reports, and environmental reports disclosed by listed companies on the official website of the CSRC, CNINFO. Third, regional economic development level, regional pollution discharge level, and regional environmental regulation intensity are derived from the 2009–2018 *China Statistical Yearbooks*.

This paper takes listed companies in Shenzhen and Shanghai stock exchanges between 2008 and 2017 as the sample and selects them according to the following criteria. First, we exclude financial, insurance, and securities listed companies that have special industry attributes and operating characteristics. Second, we exclude samples with special treatment, such as ST (the company has suffered losses for two consecutive years), SST (the company has suffered losses for two consecutive years and has not completed the share reform), and * ST (the company has suffered losses for three consecutive years) firms. Third, we exclude samples without disclosed CEPI data and samples with missing financial data and board data. Fourth, we exclude samples with every shareholder having <10% of shares. In the end, we obtain 1140 observations from 216 sample companies in 2008–2017. After Shenzhen and Shanghai stock exchanges issued *Guidelines for Environmental Information Disclosure of Listed Companies* in 2008, listed companies gradually started to disclose relevant environmental information, so we select 2008 as the starting point.

3.2. Variable design and definition

3.2.1. Dependent variable: Corporate environmental protection investment

Referring to Jiang and Akbar (2018) and Wei et al. (2017), and considering the actual CSR report disclosure, we divide CEPI into the following six categories: (1) expenditure on environmental technology R&D and renovation, (2) expenditure on environmental protection facilities and system investment and transformation, (3) expenditure on pollution abatement, (4) expenditure on clean production, (5) expenditure on ecological protection, and (6) other corporate environment protection investment. We collect corporate environment protection investment data in strict accordance with these categories. We divide environmental protection investment by operating income to measure CEPI.

3.2.2. Independent variable: Multiple large shareholders

Laeven and Levine (2008) and Maury and Pajuste (2005) define large shareholders as shareholders with a shareholding ratio of more than 10%. According to *The Companies Act of the People's Republic of China*, shareholders with a shareholding ratio of more than 10% have the right to ask the board to hold or to hold an ad hoc meeting by themselves. Moreover, they can generally send at least one director or manager to listed companies to participate in business management. This paper identifies defines large shareholders as shareholders with a shareholding ratio of more than 10%. If the firm has two or more large shareholders with shareholding ratios of more than 10%, Multi equals 1. Otherwise, Multi equals 0.

3.2.3. Control variables

Drawing on the existing research (Hollindale et al., 2007; Laeven and Levine, 2008; Uwugbe and Ajibolade, 2013), we select variables that have an important influence on CEPI as controlled variables. They are divided into three categories: (1) Corporate financial variables, including company size, financial leverage, corporate performance, and cash holding level; (2) Corporate governance variables, including company age, property right, board independence, shareholding ratio of the management, equity checks and balances, and agency cost; and (3) External influence factors, including regional environmental regulation intensity, regional sewage discharge level, and regional economic development level. The dependent variables, independent variables, and control variables are described in Table 1.

Table 1
Variable selection and definition.

Variable symbol	Variable name	Variable description
Dependent Variable		
Epil	Corporate environmental protection investment	Environmental protection investment/Operating incomes
Independent Variable		
Multi	Multiple large shareholders	If the firm has two or more large shareholders with a shareholding ratio of more than 10%, Multi equals 1, and 0 otherwise
Control variable		
Reg	Regional environmental regulation intensity	Total investment in regional industrial pollution abatement/total investment in national industrial pollution abatement
Led	Regional economic development	The natural logarithm of real per-capita GDP in the headquarter area where the firm is located
Sdl	Regional pollution emission	Regional sewage discharge/national sewage discharge
Cash	Cash holding level	Monetary fund balance/total assets
Size	Company size	The natural logarithm of total assets
Roe	Corporate performance	Net profit/total assets
Lev	Financial leverage	Total liabilities/total assets
Age	Company age	The natural logarithm of the corporate age of listing
Soe	Property right	Takes a value of 1 when state-owned, and 0 otherwise
Cost	Agency cost	Administration expense/Operating income
Manage	Shareholding ratio of the management	Number of management shares/Total number of shares of the company
Balance	Equity checks and balances	The sum of the shares held by the second to fifth largest shareholders
Si	Board independence	The proportion of independent directors

3.3. Descriptive statistics and analysis

The descriptive statistics of CEPI are shown in Table 2. The mean and median of the full-sample CEPI are 0.013 and 0.0031, respectively, indicating that the mean of the ratio of CEPI to operating income is 1.3%. However, the median is much lower than the mean, suggesting that the CEPI of most sample companies has not reached the average level, which further indicates that the CEPI is generally insufficient in Chinese companies. The standard deviation of CEPI is large. The maximum and minimum are very different, indicating that there are prominent individual differences in CEPI behavior.

Descriptive statistics of the explanatory variables are shown in Table 3. The average value of multiple large shareholders, Multi, is about 0.287, indicating that 28% of the firms in our sample have multiple large shareholders. This reflects the existence of ownership concentration. The average value of property right, Soe, is about 0.768, suggesting that most of the samples belong to SOEs. The mean of regional environmental regulation intensity, Reg, and regional pollution level, Sdl, are 0.481 and 0.0404, respectively, and the maximum

Table 2
Corporate environmental protection investment basic statistics.

Year	Obs	Mean	Median	St. Dev	Min	Max
2008	33	0.0238	0.0051	0.0431	0.00000315	0.1923
2009	40	0.0226	0.0087	0.0381	0.00000397	0.2044
2010	78	0.0119	0.0037	0.0305	0.00000152	0.1998
2011	112	0.0100	0.0029	0.0241	0.00000301	0.1902
2012	136	0.0122	0.0031	0.0388	0.000000934	0.3795
2013	148	0.0093	0.0024	0.0162	0.00000184	0.0899
2014	156	0.0135	0.0034	0.0411	0.000000277	0.3767
2015	184	0.0154	0.0026	0.0580	0.000000963	0.6907
2016	131	0.0131	0.0039	0.0238	0.0000254	0.1500
2017	122	0.0109	0.0038	0.0187	0.0000375	0.1233
Total	1140	0.0130	0.0031	0.0363	0.00000277	0.6907

Table 3
Basic statistics for the explanatory variables.

Variable	Obs	Mean	St. Dev	Median	Min	Max
Multi	1140	0.2877	0.4529	0	0.0000	1.0000
Soe	1140	0.7675	0.4226	1	0.0000	1.0000
Reg	1140	0.0404	0.0314	0.0323	0.0001	0.1659
Led	1140	10.9378	0.4842	10.9895	9.0852	11.7361
Sdl	1140	0.0481	0.0348	0.0353	0.0007	0.1319
Roa	1140	4.0138	6.4488	3.1578	−69.0677	38.9703
Age	1140	2.3418	0.6962	2.5649	0.0000	3.2189
Cost	1140	0.0715	0.0467	0.0654	0.0057	0.6124
Lev	1140	0.5170	0.1867	0.535	0.0565	1.3447
Size	1140	23.4831	1.3969	23.3428	19.8646	27.4688
Cash	1140	0.1462	0.1058	0.1221	0.0036	0.6855
Manage	1140	0.0437	0.2040	0.0000229	0.0000	2.3164
Balance	1140	0.1312	0.1092	0.0892	0.0005	0.4755
Si	1140	0.6254	0.2654	0.5454	0.0000	2.5000

and minimum values differ greatly. This shows that the environmental regulation intensity and regional pollution level of different provinces in China are very different.

3.4. Model building

To investigate the relationship between large shareholders of listed companies and CEPI, the model to be tested is set as follows:

$$\text{Model 1: } EpiI_{i,t} = \beta_0 + \beta_1 Multi_{i,t} + \beta_2 Reg_{i,t} + \beta_3 Led_{i,t} + \beta_4 Sdl_{i,t} + \beta_5 Cash_{i,t} + \beta_6 Size_{i,t} + \beta_7 Roa_{i,t} + \beta_8 Lev_{i,t} + \beta_9 Age_{i,t} + \beta_{10} Soe_{i,t} + \beta_{11} Cost_{i,t} + \beta_{12} Manage_{i,t} + \beta_{13} Balance_{i,t} + \beta_{14} Si_{i,t} + \varepsilon$$

4. Empirical analysis

4.1. Multiple regression and analysis

4.1.1. Regression results

We conduct the OLS regression on all of the samples and compare the influence of multiple large shareholders with a single large shareholder on CEPI. The results are shown in Table 5. Column (1) shows that the coefficient of multiple large shareholders, Multi, is significantly negative at the 1% level, indicating that multiple large shareholders reduce CEPI, which verifies the collusion hypothesis. Jiang et al. (2018) show that multiple large shareholders can improve corporate investment efficiency. However, our research shows that multiple large shareholders will significantly reduce CEPI, perhaps because corporate environmental investment has certain characteristics. Unlike investment in economic projects, it is difficult for corporate environmental investment to provide a company with direct economic benefits. Moreover, corporate environmental investment has the characteristics of long investment cycle and low investment income, which discourages large shareholders from CEPI.

In addition, the regression results show that the coefficient of property right, Soe, is significantly negative, suggesting that SOEs invest less in CEPI. First, as the backbone of China's national economy, SOEs' business activities are subject to government intervention. To achieve economic growth goals, the government is more inclined to invest in activities that generate economic benefits. CEPI offers limited economic benefits, so the government is less interested in intervening in CEPI. Second, compared with non-SOEs, SOEs are more likely to obtain advantages such as financing convenience, tax incentives (Adhikari et al., 2006), property rights protection, and financial subsidies (Chaney et al., 2011). In contrast, non-SOEs need to assume more social responsibility for political connection to obtain advantages, such as CEPI. Finally, SOEs have political connections. The Chinese government has great control over commercial activities. Political connection allows SOEs to face looser regulatory restrictions (Kusnadi et al., 2015). In the same institutional system, SOEs

Table 5
Multiple large shareholders and CEPI regression results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variable	Epi1	Epi1	Epi1	Epi1	Epi2	Epi3	Epi4
Multi	-0.0131*** (0.0043)		-0.0119*** (0.0043)	-0.00672* (0.00406)	-0.005** (0.0021)	-0.636*** (0.216)	-0.0180** (0.0078)
Multi2		-0.0152*** (0.0041)					
Soe	-0.0143*** (0.0049)	-0.0132*** (0.0047)	-0.0145*** (0.0051)	-0.0128** (0.00511)	-0.0053** (0.0021)	-0.600*** (0.148)	0.0074 (0.0046)
Reg	0.0181 (0.0263)	0.0194 (0.0264)	0.0320 (0.0276)	-0.00464 (0.0276)	0.0142 (0.0120)	4.722*** (1.700)	0.0471 (0.0653)
Led	-0.0096*** (0.0023)	-0.0083*** (0.0021)	-0.0086*** (0.0022)	-0.0106*** (0.00232)	-0.0048*** (0.0013)	-0.690*** (0.124)	-0.0034 (0.0033)
Sdl	-0.102*** (0.0269)	-0.106*** (0.0273)	-0.0992*** (0.0273)	-0.0900*** (0.0237)	-0.0449*** (0.0108)	-11.37*** (2.001)	0.0414 (0.0563)
Roa	-0.0009 (0.0006)	-0.0009 (0.0006)	-0.0009 (0.0007)	-0.0001 (0.0001)	-0.0005 (0.0004)	-0.0293** (0.0115)	-0.0001 (0.0003)
Age	-0.0029 (0.00189)	-0.0032* (0.00189)	-0.0019 (0.00166)	-0.0040* (0.0023)	-0.0022* (0.00118)	-0.245** (0.0980)	-0.0012 (0.0022)
Cost	0.0179 (0.0216)	0.0096 (0.0209)	0.0157 (0.0218)	-0.0086 (0.0190)	-0.0099 (0.0094)	-3.811*** (1.422)	0.0081 (0.0245)
Lev	-0.0161 (0.0113)	-0.0089 (0.0102)	-0.0149 (0.0122)	-0.0009 (0.0072)	-0.0093 (0.007)	-1.897*** (0.438)	0.0021 (0.0132)
Size	0.001 (0.00109)	0.0003 (0.00107)	0.0008 (0.00118)	0.0011* (0.0007)	0.0004 (0.000504)	0.984*** (0.0517)	0.0021* (0.0011)
Cash	-0.0230* (0.0120)	-0.0149 (0.0125)	-0.0181 (0.0122)	-0.0324*** (0.0081)	-0.0083 (0.0072)	-4.994*** (0.652)	-0.0331*** (0.0124)
Manage	-0.0097** (0.0047)	-0.0114** (0.0048)	-0.0054 (0.0048)	-0.0032 (0.0065)	-0.0072*** (0.0020)	-0.948*** (0.280)	-0.0064 (0.0070)
Balance	0.0006*** (0.0002)	0.0004*** (0.0002)	0.0006*** (0.0002)	0.0003 (0.0002)	0.0002** (0.0001)	0.0235** (0.0094)	-0.0001 (0.0004)
Si	0.0009 (0.0033)	0.0007 (0.0033)	0.0015 (0.0037)	0.0025 (0.0036)	0.002 (0.002)	-0.0233 (0.193)	-0.0065 (0.0049)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
_cons	0.119*** (0.0258)	0.117*** (0.0263)	0.0927*** (0.0228)	0.135*** (0.0309)	0.0661*** (0.0138)	8.672*** (1.688)	-0.0033 (0.0409)
N	1140	1140	1067	814	1140	1140	1,140
R ²	0.178	0.179	0.171	0.205	0.119	0.450	0.1181

Note: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively. Clustered robust standard errors are shown in parentheses. Epi1 is corporate environmental protection investment divided by operating income. Epi2 is corporate environmental protection investment divided by total assets. Epi3 is the natural logarithm of corporate environmental protection investment. Epi4 is corporate environmental protection investment (under construction related to environmental issues) divided by operating income.

are less willing to invest in environmental protection than non-SOEs because they are less likely to be punished due to lack of environmental protection.

The coefficient of regional pollution discharge level, Sdl, is significantly negative, suggesting that the government may not strictly supervise environmental pollution in regions with serious pollution, which weakens firms' awareness of environmental protection. The shareholding ratio of management is negatively correlated with CEPI. Larger Shareholders have stronger control over companies when the shareholding ratio of management is higher. They may tunnel investment funds (Chen et al., 2017) or allocate CEPI funds into other economic projects for personal benefits. Both lead to a reduction in CEPI.

4.1.2. Robustness test

To achieve a more reliable conclusion, this paper carries out the following robustness tests. First, we change the measurement method of multiple large shareholders. In Table 5, column (2), we define shareholders with more than a 20% shareholding ratio as large shareholders. The regression results show that the coefficient of

Multi2 is significantly negative at the 1% level. Second, we exclude some samples. The samples in 2008–2009 are far fewer than those in other years due to the 2008–2009 global financial crisis and the fact that listed companies in China began to publish CSR reports in 2008. Therefore, we retest the model after excluding the samples in 2008–2009. As shown in column (3), the coefficient of Multi is significantly negative at the 1% level. Third, we lag Multi by one period for regression because the investment behavior has a lag effect. As shown in column (4), the coefficient of Multi is significantly negative at the 10% level. Finally, we change the measurement method of CEPI. In column (5), we divide CEPI by total assets. In column (6), we take the logarithm of CEPI. Moreover, we chose the current progress on construction related to environmental issues in the notes of the financial report as the dependent variable. In column (7), we measure corporate environmental protection investment by dividing CEPI (under construction related to environmental issues) by operating income. All of the results support H1a, that multiple large shareholders will reduce CEPI.

4.2. *Endogeneity test*

The relationship between ownership structure and CEPI may have endogeneity problems. First, according to Edmans (2014), the causal relationship between ownership structure and corporate characteristics is difficult to identify, so the investigation of the relationship between ownership structure and CEPI is susceptible to missing variables. For example, due to the Type II agency problems, large shareholders may be more inclined to collude to infringe on the interests of minority shareholders (Kahn and Winton, 1998), which may reduce corporate value (Maury and Pajuste, 2005; Laeven and Levine, 2008). Therefore, companies with multiple large shareholders may have weak performance. Shareholders often reduce CEPI to pursue investments with economic benefits. As a result, the relationship between multiple large shareholders and CEPI is affected by missing variables. Second, many companies have invested in environmental protection but have not announced specific funds. These companies cannot be included in the sample, leading to endogeneity problems regarding sample selection bias.

To consider possible endogeneity problems, we refer to Slaughter (2001) and Chen (2017). We use the fixed effect model, propensity score matching, and difference-in-differences model to solve potential endogeneity problems regarding missing variables. We use the Heckman two-stage model to solve potential endogeneity problems regarding sample selection bias.

4.2.1. *Fixed effect model*

We use the fixed effect model to regress all of the samples to alleviate endogeneity problems caused by unobservable variables that do not change over time. The regression results are shown in Table 6, column (1). The coefficient of Multi is significantly negative at the 10% level. This indicates that this paper's conclusion is valid when controlling for possible endogeneity problems.

4.2.2. *Propensity score matching*

We use the propensity score matching method for sample matching to address the endogeneity problems of missing variables. The matched samples obtained by this method include all of the matchable companies with multiple large shareholders and matched companies with a single large shareholder. There is no significant difference in corporate characteristics (Rosenbaum and Rubin, 1983). Referring to the method of Ben-Nasr et al. (2015), we match samples by using the nearest matching method according to a 1:1 ratio. In the probability calculation of the first stage, all of the control variables in this paper are used as independent variables. Whether companies have multiple large shareholders is considered as a dependent variable. The samples are then re-examined, and the regression results are shown in Table 6, column (2). When controlling for endogeneity problems, the coefficient of Multi is still significantly negative at the 5% level.

4.2.3. *Difference-in-differences model*

We draw on previous research and use the difference-in-differences model to estimate the difference in CEPI before and after the change in ownership structure (Slaughter, 2001). We conduct the difference-in-differences model test by using the samples with changes in ownership structure during the sample period and the samples with unchanged ownership structure during the sample period. When the samples in the treatment group

Table 6
Endogeneity test.

	(1)	(2)	(3)	(4)	(5)
	Fixed effects	PSM	single to multiple DID	multiple to single DID	Heckman
Variable	Epi1	Epi1	Epi1	Epi1	Epi1
Multi	-0.0113* (0.00599)	-0.0148** (0.00612)			-0.0125*** (0.00430)
Change			-0.0228*** (0.0068)	0.0005 (0.0051)	
Treated			-0.0018 (0.003)	-0.0029 (0.005)	
Soe	-0.0126* (0.0067)	-0.0099** (0.0045)	-0.0130** (0.0065)	-0.0277*** (0.0063)	-0.0110** (0.0050)
Reg	0.0523* (0.0297)	-0.0214 (0.0462)	0.0437 (0.0457)	-0.0028 (0.0401)	0.0447 (0.0274)
Led	-0.0093*** (0.0033)	-0.0090** (0.0040)	-0.0091*** (0.0025)	-0.0081** (0.0036)	-0.0089*** (0.0022)
Sdl	-0.130*** (0.0435)	-0.0829** (0.0367)	-0.198*** (0.0618)	-0.0631 (0.0495)	-0.104*** (0.0270)
Roa	-0.0008 (0.0007)	-0.0027** (0.0011)	-0.0001 (0.0002)	-0.0017 (0.0011)	-0.0009 (0.0006)
Age	-0.0025 (0.0032)	-0.0083** (0.0035)	-0.0055* (0.0031)	-0.0017 (0.0022)	-0.0031 (0.0019)
Cost	0.0337 (0.0237)	0.0103 (0.0322)	0.0045 (0.0432)	0.144** (0.0612)	0.0190 (0.0216)
Lev	-0.0182 (0.0113)	-0.0411** (0.0178)	0.0020 (0.0081)	0.00565 (0.0156)	-0.0165 (0.0112)
Size	0.0004 (0.0014)	0.0026** (0.0013)	-0.0007 (0.0017)	0.0027* (0.0016)	0.0014 (0.0011)
Cash	-0.0142 (0.0147)	-0.0156 (0.0246)	-0.0343*** (0.0102)	0.0046 (0.0204)	-0.0230* (0.0119)
Manage	-0.0107* (0.0060)	-0.0153** (0.0072)	-0.0397*** (0.0108)	-0.0153** (0.0061)	-0.0096** (0.0047)
Balance	0.0007** (0.0003)	0.0008 (0.0005)	0.0015*** (0.0004)	-0.0000 (0.0002)	0.0006*** (0.0002)
Si	-0.0004 (0.0037)	0.0135* (0.0078)	-0.0066 (0.0043)	0.0152** (0.0068)	0.0009 (0.0033)
Lambda					0.0096** (0.0047)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
_cons	0.125*** (0.0457)	0.211*** (0.0493)	0.157*** (0.0448)	0.139*** (0.0423)	0.0892*** (0.0265)
N	1140	352	768	320	1140
R ²	0.0300	0.545	0.158	0.494	0.178

Note: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively. Clustered robust standard errors are shown in parentheses.

change from companies with a single large shareholder into companies with multiple large shareholders, we select companies with a single large shareholder during the sample period as the control group and exclude companies with continuous changes during the sample period (i.e., we exclude those companies that changed from a single large shareholder to multiple large shareholders and then from multiple large shareholders to a single large shareholder during the sample period). Conversely, when the samples in the treatment group change from companies with multiple large shareholders into companies with a single large shareholder, we select companies with multiple large shareholders during the sample period as the control group and excluded companies with continuous changes during the sample period (i.e., we exclude those companies that changed from a single large shareholder to multiple large shareholders and then from multiple large shareholders to a single large shareholder during the sample period). The model is as follows:

$$\text{Model 2: } Epi_{i,t} = \beta_0 + \beta_1 \text{change}_{i,t} + \beta_2 \text{Treated}_{i,t} + \beta_3 \text{Control}_{i,t} + \varepsilon$$

Change is the dummy variable before and after the change in ownership structure. When companies with a single large shareholder change to multiple large shareholders, it equals 1. Before the change, it equals 0. Treat signifies whether it is the dummy variable of the treatment group. Treat equals 1 when the sample firm belongs to the treatment group and 0 when the sample firm belongs to the control group. Control is the control variable described above. In addition, we add the year and industry dummy variables to control for the influence of macro policies, such as time trend factors and industry factors. β_1 measures the difference in CEPI before and after the change in ownership structure. The regression results are shown in column (3) and column (4) of Table 6. Column (3) shows the change in CEPI after ownership structure changes from the single large shareholder to multiple large shareholders. Column (4) displays the change in CEPI after the ownership structure changes from multiple large shareholders to a single large shareholder. The coefficient of change in column (3) is significantly negative at the 1% level, which indicates that CEPI will decrease when the ownership structure changes from a single large shareholder to multiple large shareholders. The coefficient of change in column (4) is positive, but not significant. The reason may be that ownership structure changes from multiple large shareholders to a single large shareholder in a short time, and it takes a certain amount of time for large shareholders to change their CEPI decisions.

4.2.4. Heckman two-stage model

Finally, we use the Heckman two-stage model to solve the sample self-selection problem. In the first phase, we select whether or not a firm is audited by a Big Four accounting firm, regional marketization, regional pollution regulation level, corporate property right, asset-liability ratio, and profitability as independent variables, and whether or not the firm discloses CEPI as the dependent variable, to predict the probability of the firms disclosing environmental protection investment. In Table 6, column (5), we add the inverse Mills ratio, Lambda, for the second-stage regression. The regression results are shown in column (5). The inverse Mills ratio, Lambda, is significant at the 5% level, indicating that this paper has a sample self-selection problem. The coefficient of Multi is significantly negative at the 1% level, suggesting that when controlling for possible endogenous sample selection bias, multiple large shareholders reduce CEPI, significant at the 1% level.

4.3. Mechanism analysis

The results in Table 6 show that multiple large shareholders have significantly reduced CEPI, but we have not verified the impact of controlling shareholders on CEPI. Consequently, we use whether the company has a controlling shareholder as an independent variable for regression. In Table 7, column (1), Cont is a dummy variable. If the company has a controlling shareholder, Cont equals 1, and 0 otherwise. The regression results show that the coefficient of Cont is significantly negative at the 5% level, which indicates that the controlling shareholder will reduce CEPI. This result is consistent with the findings of Tang and Li (2013). We divided the sample into two groups, with and without controlling shareholders, to further analyze the impact of multiple large shareholders on CEPI. Column (2) shows that in the sample with controlling shareholders, multiple large shareholders have no significant impact on CEPI. This shows that the existence of other large shareholders cannot alleviate the controlling shareholder's behavior of reducing CEPI, which does not support our supervision hypothesis. Column (3) shows that the coefficient of Multi is significantly negative at the 1% level in the sample without controlling shareholders. This shows that in non-economic investment projects such as CEPI, non-controlling large shareholders are more likely to show interest synergy and collusion tendencies.

5. Heterogeneity analysis

5.1. The role of external supervision

According to stakeholder theory, the development of an enterprise is inseparable from the input or participation of various stakeholders. Firms need to create profits for shareholders and assume responsibility for investors. At the same time, firms are required to satisfy the needs of all stakeholders to maximize their value (Harjoto et al., 2015). Therefore, enterprises should actively assume social responsibilities and establish

Table 7
Mechanism analysis.

Variable	(1) Epi1	(2) Epi1	(3) Epi1
Cont	−0.0057** (0.0023)		
Multi		0.0031 (0.0039)	−0.0141** (0.0055)
Soe	−0.0144*** (0.0049)	−0.0025 (0.0026)	−0.0175*** (0.0065)
Reg	0.0186 (0.0263)	0.0875*** (0.0338)	0.0164 (0.0345)
Led	−0.0086*** (0.0022)	−0.0043* (0.0024)	−0.0071** (0.0028)
Sdl	−0.1038*** (0.0273)	−0.0480* (0.0289)	−0.1260*** (0.0369)
Roa	−0.0009 (0.0006)	−0.0001 (0.0001)	−0.0016* (0.0009)
Age	−0.0036* (0.0019)	−0.0031*** (0.0011)	−0.0045 (0.0035)
Cost	0.0122 (0.0217)	0.0063 (0.0128)	0.0088 (0.0346)
Lev	−0.0141 (0.0107)	−0.0062 (0.0070)	−0.0260* (0.0154)
Size	0.0012 (0.0010)	0.0003 (0.0005)	0.0022 (0.0019)
Cash	−0.0175 (0.0122)	−0.0225*** (0.0080)	−0.0225* (0.0117)
Manage	−0.0097** (0.0047)	−0.0201** (0.0101)	−0.0130* (0.0068)
Balance	0.0000 (0.0001)	−0.0002 (0.0002)	0.0006** (0.0003)
Si	0.0007 (0.0033)	0.0006 (0.0020)	0.0013 (0.0064)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
_cons	0.1117*** (0.0230)	0.0662** (0.0282)	0.0880** (0.0345)
N	1,140	447	693
R ²	0.1749	0.1256	0.2114

Note: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively. Clustered robust standard errors are shown in parentheses.

friendly relations with various stakeholders. However, firms are profit-seeking and cannot meet the needs of all stakeholders. For that reason, stakeholders have sufficient motivation to supervise the fulfillment of CSR, which affects decision-making on CEPI. However, different firms face different levels of external supervision. If external supervision is weak, large shareholders may reduce CEPI to pursue economic benefits. If external supervision is strong, it will be difficult for large shareholders to reduce CEPI due to external pressure from stakeholders. To test how external supervision affects the influence of a large shareholder on CEPI, this paper uses marketization and whether the firm is audited by a Big Four accounting firm to measure the level of external supervision on firms.

5.1.1. Marketization

With China's marketization accelerating, market-oriented reform not only accelerates China's economic development but also makes resource allocation more empirical and justifiable. However, marketization occurs unevenly in different regions. Regions with higher marketization have greater economic development and stronger regional legal environments. In these regions, companies are highly concerned with public opin-

ion and are strongly subject to external supervision. Under the dual pressures of market competition and external supervision, companies must change their original behaviors and actively assume social responsibility. Fernández-Kranz and Santaló (2010) find that companies facing higher market competition tend to actively assume social responsibility. However, companies are more likely to make opportunistic choices and neglect CSR when they face unfair competition and market disorder. In regions with lower marketization, considering fiscal revenue, the government tends to favor local companies (Besley and Prat, 2006), thus weakening local corporate CSR awareness. Based on the above analysis, this paper assumes that multiple large shareholders have a greater negative influence on CEPI because of weak external supervision and CSR awareness in regions with lower marketization.

This paper uses the general marketization index from “China’s Provincial Marketization Index Report” (2018) by Wang et al. (2018) to measure marketization in regions where firms are located. Marketization in a region is high when the marketization index of listed companies is higher than the national average, and low when it is below the average. We divide the samples into groups for study. The regression results are shown in Table 8. Columns (1) and (2) show the influence of multiple large shareholders on CEPI in regions with high marketization and low marketization. As shown in column (1), the coefficient of Multi is negative

Table 8
External supervision test.

Variable	(1)	(2)	(3)	(4)
	Higher marketization Epil	Lower marketization Epil	Audit by a Big Four accounting firm Epil	Audit by a non-Big Four accounting firm Epil
Multi	−0.0049 (0.0037)	−0.0296** (0.0116)	−0.0050 (0.0044)	−0.0155*** (0.0053)
Soe	−0.0077** (0.0036)	−0.0668** (0.0277)	−0.0035 (0.0031)	−0.0154*** (0.0056)
Reg	0.0408 (0.0257)	−0.175 (0.107)	0.0858* (0.0478)	0.0230 (0.0406)
Led	−0.0120*** (0.0031)	0.0316* (0.0173)	−0.0058*** (0.0022)	−0.0076*** (0.0025)
Sdl	−0.0994*** (0.0304)	−0.411*** (0.143)	−0.0597** (0.0300)	−0.138*** (0.0362)
Roa	−0.0009 (0.0007)	−0.0010** (0.00046)	−0.0004 (0.0003)	−0.0009 (0.0006)
Age	−0.0021 (0.0014)	−0.0162* (0.0098)	−0.0005 (0.0010)	−0.0036 (0.0026)
Cost	0.0476* (0.0267)	−0.0446 (0.0701)	0.0791*** (0.0279)	0.0104 (0.0246)
Lev	−0.0134 (0.0119)	−0.0108 (0.0222)	−0.0202** (0.0083)	−0.0115 (0.0121)
Size	−0.0001 (0.0013)	0.0059** (0.0025)	0.0028*** (0.0008)	0.0010 (0.0015)
Cash	−0.0012 (0.0128)	−0.0747** (0.0327)	−0.0135* (0.0076)	−0.0249* (0.0142)
Manage	−0.0075* (0.0044)	−0.265*** (0.0970)	0.0136 (0.0095)	−0.0165*** (0.0060)
Balance	0.0003 (0.0002)	0.0027*** (0.0008)	0.0001 (0.0002)	0.0009*** (0.0003)
Si	−0.0011 (0.0033)	−0.0016 (0.0084)	0.0039** (0.0015)	0.0023 (0.0051)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
_cons	0.165*** (0.0412)	−0.426** (0.200)	0.0137 (0.0269)	0.0921*** (0.0318)
N	888	252	265	875
R ²	0.202	0.422	0.327	0.186

Note: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively. Clustered robust standard errors are shown in parentheses.

but not significant in regions with high marketization, indicating multiple large shareholders have no significant influence on CEPI in regions with high marketization. Column (2) shows that the coefficient of Multi is significantly negative at the 1% level in regions with low marketization, suggesting that multiple large shareholders have a significant negative influence on CEPI in regions with low marketization. This is consistent with our previous analysis.

5.1.2. External audit

External audits play a key role in CSR and corporate governance. They require business managers to fulfill CSR and present a CSR report to their stakeholders. This requirement strengthens the relationship between firms and stakeholders (Kurihama, 2007). However, CSR reports are weakly supervised and constrained. Large shareholders may selectively disclose CSR information strategically or out of private motivation (Kim et al., 2012). As a result, many companies will partly disclose the specific environmental investment amount or not disclose at all. Compared with the other accounting firms, audit reports issued by the Big Four accounting firms have strong levels of independence, quality, and market recognition (Deangelo, 1981). High-quality audit reports pay more attention to the disclosure of non-financial information such as CSR, thereby improving their reliability. Disclosing CSR information is essential for companies. First, it is one of the guiding directions for investors on how to make decisions (Anderson and Frankle, 1980). Milne and Patten (2002) find that most investors make more long-term investments in companies with poor recent performance but a high level of information disclosure. Second, it can improve the transparency of corporate information and alleviate information asymmetry, thereby reducing capital costs (Dhaliwal et al., 2009) and transaction costs and improving the financing environment (Goss and Roberts, 2011). Finally, it can raise CSR awareness. Once companies disclose a high-quality CSR report, stakeholders put forward specific corresponding CSR requirements and supervise the corresponding CSR activities. External supervision is stronger after firms are audited by a Big Four. Consequently, it is difficult for multiple large shareholders to reduce CEPI. Therefore, this paper argues that compared with firms audited by a Big Four accounting firm, the large shareholders of firms audited by a non-Big Four accounting firm have a stronger negative influence on CEPI.

We divide the samples into groups for further study according to whether they are audited by a Big Four accounting firm. The regression results are shown in Table 8. Columns (3) and (4) show that multiple large shareholders have a significant negative influence on CEPI in firms audited by non-Big Four accounting firms. In contrast, multiple large shareholders have no significant influence on CEPI in firms audited by a Big Four accounting firm. This is consistent with the above analysis.

5.2. The role of heterogeneous ownership participation

Since the Third Plenary Session of the 18th CPC Central Committee, mixed-ownership structural reform has become a hot issue in the field of corporate governance. Megginson et al. (1994) believe that mixed-ownership structure can improve corporate performance because the participation of non-state-owned shareholders in SOEs will help ease the rigid internal management system of SOEs, thus pressuring management to improve the operating performance of SOEs. In contrast, if state-owned shareholders participate in non-SOEs, it can effectively reduce the tax burden and loosen the financing constraints of non-SOEs (Adhikari et al., 2006; Wu et al., 2002), thereby improving the operating performance of non-SOEs. However, there is currently no study on the influence of heterogeneous ownership participation on CEPI.

Non-state-owned shareholders' participation in SOEs privatizes such firms, and the government hopes that privatization benefits them (Megginson and Netter, 2001). To maintain a good image after privatization, the government often requires privatized SOEs to assume more social responsibilities. Boubakri et al. (2019) find that privatization would lead SOEs to increase their investment in socially responsible activities, as governments need to increase their corporate social responsibilities to mitigate concerns about social welfare following reform. Therefore, this paper argues that if non-state-owned shareholders participate in SOEs, it will increase the CEPI of SOEs. However, state-owned shareholders' participation in non-SOEs is based on resource control, which is often the result of political interests. The government and officials intervene in the business decisions of non-SOEs to achieve their political goals. However, in the past, the assessment of officials was based on economic performance. Environmental investment did not contribute substantially to

Table 9
Heterogeneity participation test.

Variable	(1) Non-state ownership participates in SOEs Epi1	(2) Non-state ownership participates in SOEs Epi1	(3) State ownership participates in non-SOEs Epi1	(4) State ownership participates in non-SOEs Epi1
Private	0.0218** (0.0096)			
Private1		0.0082** (0.0036)		
State			0.0112 (0.0084)	
State1				0.0112 (0.0083)
Reg	0.0443* (0.0267)	0.0406 (0.0268)	0.137* (0.0701)	0.132* (0.0704)
Led	-0.0057*** (0.0018)	-0.0063*** (0.0019)	-0.0171** (0.0066)	-0.0173*** (0.0066)
Sdl	-0.0915*** (0.0275)	-0.0915*** (0.0277)	-0.171*** (0.0566)	-0.170*** (0.0563)
Roa	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0019** (0.0009)	-0.0020** (0.0009)
Age	-0.0071*** (0.0022)	-0.0069*** (0.0022)	-0.0091*** (0.0031)	-0.0088*** (0.0031)
Cost	0.0243 (0.0223)	0.0227 (0.0223)	0.0372 (0.0519)	0.0378 (0.0518)
Lev	-0.0073 (0.0061)	-0.0077 (0.0063)	0.0062 (0.0198)	0.0045 (0.0203)
Size	-0.0001 (0.0011)	-0.0003 (0.0011)	0.0032 (0.0023)	0.0037 (0.0024)
Cash	-0.0185*** (0.0061)	-0.0182*** (0.0060)	0.0021 (0.0232)	0.0022 (0.0235)
Manage	-0.239** (0.107)	-0.210*** (0.0774)	-0.0166*** (0.0060)	-0.0171*** (0.0058)
Balance	-0.0001** (0.0001)	-0.0001 (0.0001)	0.0008*** (0.0002)	0.0008*** (0.0002)
Si	-0.0020 (0.0034)	-0.0020 (0.0034)	0.0059 (0.0082)	0.0061 (0.0079)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
_cons	0.0941*** (0.0241)	0.107*** (0.0261)	0.142* (0.0806)	0.134* (0.0801)
N	875	875	265	265
R ²	0.143	0.138	0.566	0.564

Note: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively. Clustered robust standard errors are shown in parentheses.

officials' political goals. State-owned shareholders are not motivated to intervene in CEPI decisions. Therefore, this paper concludes that state-owned shareholders' participation in non-SOEs does not have a significant influence on CEPI.

We use the sum of the shareholding ratio of the top 10 state-owned shareholders and the sum of the shareholding ratio of non-state-owned shareholders to measure the size of heterogeneous ownership participation to test the influence of heterogeneous ownership participation on CEPI. *Private* represents the sum of the shareholding ratios of the non-state-owned shareholders among the top 10 shareholders of SOEs. If it exceeds 10%, *Private1* equals 1, and 0 otherwise. Similarly, *State* indicates non-SOEs. If it exceeds 10%, *State1* equals 1, and 0 otherwise. We report the regression results in Table 9. Columns (1) and (2) show the influence of non-state-owned shareholders' participation in the CEPI of SOEs. The coefficients of *Private* and *Private1* are both significantly positive at the 5% level, indicating that the participation of non-state-owned shareholders significantly increases the CEPI of SOEs. Columns (3) and (4) show the influence of the participation of state-owned shareholders on the CEPI of non-SOEs. The coefficients of *State* and *State1* are positive but not significant, suggesting that the participation of state-owned shareholders does not have a significant influence on the CEPI of non-SOEs, which is consistent with the above speculation.

6. Conclusion

Previous research has shown that environmental governance can increase corporate value (Klassen et al., 1996; Berrone and Gomez-Mejia, 2009). Based on this concept, this paper combines the characteristics of listed Chinese companies with high concentration ownership structures using data on Chinese listed companies from 2008 to 2017 to investigate the relationship between multiple large shareholders and CEPI. The results show that the governance structure of multiple large shareholders is costly. It may be more profitable for large shareholders to collude to reduce CEPI. Further research shows that the negative influence of multiple large shareholders on CEPI depends on the firm's location. Multiple large shareholders have a significant negative influence on CEPI in the firms with weak external supervision. In addition, we find that heterogeneous ownership participation influences CEPI in different ways. Non-state-owned shareholders participating in SOEs will promote the CEPI of SOEs significantly. However, the CEPI of non-SOEs does not change after state-owned shareholders participate in non-SOEs.

The policy implications of this paper are as follows. First, companies should fully consider the interests of various stakeholders, raise CSR awareness, and actively fulfill their environmental responsibility. Second, to better ensure that firms fulfill their environmental responsibility, the government should establish and improve laws and regulations for corporate environmental governance, such as enacting laws on corporate environmental protection, standardizing reporting systems on corporate environmental disclosure, and effectively implementing punishment mechanisms. Third, the Chinese government should speed up the formation of an effective supervision mechanism for supervising the fulfillment of corporate environmental responsibility, especially SOEs. In the supervision mechanism and punishment mechanism, SOEs should be treated equally with non-SOEs to improve the awareness of the environmental governance of SOEs. Finally, when shareholders of SOEs participate in non-SOEs, they should not focus solely on economic performance. Mixed-ownership structural reform should be based on economic performance *and* environmental performance.

While we provide strong evidence for the effect of multiple large shareholders on CEPI, this study is limited by the nature of the data. In short, only a small number of Chinese companies publish their annual specific environmental investment amount, which resulted in a relatively smaller sample in this paper. In addition, our findings may have some limitations due to the unique legal and market environment in which Chinese companies operate. We encourage future research to conduct cross-country studies and to discuss the link between multiple large shareholders and corporate environmental investments.

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Executive compensation and conflict between shareholders and creditors: Evidence from creditor litigation



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ABSTRACT

Using creditor litigation data from China, we investigate whether creditors can participate in corporate governance when agency conflict between shareholders and creditors is severe. By comparing firms that have experienced creditor lawsuits (litigation firms) with those that have not (non-litigation firms), we find that litigation firms have lower pay-performance sensitivity before lawsuits, suggesting that these firms have weaker corporate governance. This result is consistent with our expectation that creditors participate in corporate governance by introducing external monitoring when internal monitoring, dominated by shareholders, is insufficient. We also find that the association is stronger for firms with more severe shareholder-creditor agency conflict. Moreover, creditor litigation is strongly related to low pay-performance sensitivity when the external legal environment is strong. Our results remain robust to different model specifications and after addressing endogeneity problems.

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1. Introduction

Shareholders and creditors are key financing providers. They invest in corporations to obtain future returns on investment. As they wish to obtain the expected rate of return, shareholders and creditors are concerned about agency problems and corporate governance in the firms in which they invest (Shleifer and Vishny, 1997; Williamson, 1988; Jensen and Murphy, 1990; La Porta et al., 2000; Kroszner and Strahan, 2001; Martynova and Renneboog, 2008; Nini et al., 2012). Regulators have called for the protection of the rights of shareholders

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and creditors to overcome financing frictions and help firms access external capital (Armour et al., 2015). Therefore, previous studies in economics and finance focus on how to protect the rights of shareholders and creditors through country-level and firm-level monitoring, i.e., legal protection and corporate governance. These two monitoring mechanisms interact; they are either substitutive or complementary (Kim et al., 2007; Gungoraydinoglu and Öztekin, 2011; Abdi and Aulakh, 2012; Ernstberger and Grüning, 2013; El Ghoual et al., 2018; El Ghoual et al., 2017). A lack of country-level legal monitoring increases the likelihood of weak corporate governance, while weak corporate governance requires the intervention of a strong legal environment. Therefore, interaction between the legal system and corporate governance is essential to protect the rights of stakeholders.

However, creditors and shareholders play different roles in corporate governance. It is difficult for creditors to participate in corporate governance, which is dominated by shareholders and management. The literature identifies two types of agency problem in corporations. The first type (Type I) is the standard agent-principal problem between management and shareholders. The second type (Type II) is related to conflicts between shareholders and creditors. In the first type, shareholders use a compensation mechanism to align the interests of management with their own interests. In the second type, creditors participate less directly than shareholders in corporate governance (Nini et al., 2012), because shareholders have residual control rights. The managerial decision-making process is mainly influenced by shareholders, through compensation, shareholder meetings, the voting process, the election of directors, etc. Except in the event of violation of debt covenants, or if the firm defaults or declares bankruptcy, creditors are less directly involved in corporate governance (Townsend, 1979; Gale and Hellwig, 1985; Hart and Moore, 1998; Armour et al., 2015). However, shareholder participation in corporate governance may be insufficient, especially when agency problems are serious. Despite the high agency cost for debtholders, previous studies pay limited attention to how creditors affect corporate governance when shareholders cannot properly reduce moral hazard in the company. Studies suggest that litigation in the form of lawsuits is a critical stopgap measure in corporate governance and stakeholder protection, and is the most frequently used external legal intervention in response to internal management misconduct (Appel, 2019). Therefore, creditor litigation represents the participation of creditors in corporate governance through lawsuits. In this study, we empirically examine the question of whether creditor litigation (external monitoring intervention) is related to low pay-performance sensitivity (PPS), an important indicator of weak corporate governance.

We choose PPS as our indicator of weak corporate governance for two reasons. First, compensation schemes are a dominant method by which shareholders aim to restrict management behavior. The effect of compensation schemes on management behavior has long been studied in the accounting and finance literature (Johnson et al., 1993; Jensen and Murphy, 1990; John and John, 1993; Sung, 2005; Brockman et al., 2010). Compensation schemes are the outcome of the Type I agency problem between managers and shareholders. Information asymmetry between management and shareholders creates incentives and opportunities for management to exploit the interests of the company for their own benefits, instead of maximizing shareholder value. Therefore, compensation contracts are designed to align management interests with the objective of maximizing shareholder value (Jensen and Murphy, 1990). Second, by its nature, compensation is designed by the board of directors and shareholders, without the involvement of creditors. For this reason, compensation schemes provide an appropriate setting to test the conflicts between shareholders and creditors, as creditors have no control over these schemes.

Common practices in compensation contracts include performance-based bonuses, salary revisions, stock options, and performance-based dismissal decisions. Among them, PPS is the most important. PPS indicates how a one-dollar change in compensation is related to a one-dollar change in shareholder wealth (Jensen and Murphy, 1990). Previous studies find that PPS is a strong indicator of corporate governance (Harford and Li, 2007; Kumar and Sivaramakrishnan, 2008; Dhole et al., 2015). As return on assets (ROA) is the measure of firm profitability, low PPS suggests that management compensation is not directly related to the maximization of shareholder wealth. Corporate governance is weak in such circumstances because management incentives cannot be reinforced by compensation schemes.

Corporate governance studies generally conclude that internal governance interacts with external governance to protect the rights of stakeholders, in a substitutive or complementary manner. McKinsey's (2000) surveys find that in countries with weak legal systems, firms with good corporate governance receive premi-

ums. Similarly, Chen et al. (2009) find that in emerging markets, country-level shareholder protection plays a substitutive role with firm-level corporate governance. Using auditors' governance functions, Choi and Wong (2007) show that corporate governance is more important when the legal environment of a country is weak. However, other studies find a substitutive rather than complementary relationship between the two governance mechanisms. El Ghouli et al. (2018) find that auditors' governance role is essential for firm debt maturity, but only in countries with a strong legal environment. In other words, previous studies provide mixed evidence of how corporate governance interacts with the legal environment to reduce the two types of moral hazard problem. In particular, limited attention is paid to how internal corporate governance, dominated by shareholders, interacts with external creditor lawsuits when the agency problem between shareholders and creditors is severe. To fill this research gap, we empirically examine this question in this study.

Using creditor litigation data from China, we find that firms that have experienced creditor lawsuits have low PPS before lawsuits, indicating that these firms have weak corporate governance. This result is consistent with the argument that creditors participate in corporate governance by introducing external monitoring, i.e., lawsuits, when the internal monitoring mechanism dominated by shareholders is insufficient. Our results remain robust to different model specifications and after addressing endogeneity problems. We also find that the relationship is stronger for firms with weak internal control, firms in which management holds a higher percentage of shares, and firms that are not audited by a Big 4 audit firm. Moreover, creditor litigation is strongly related to low PPS when external legal enforcement is stronger and in non-state-owned enterprises (non-SOEs). The results of our additional analyses show that firms with weak corporate governance are more likely to experience creditor litigation in the future, which is consistent with the main results.

We use the Chinese context to examine our research question because creditor lawsuits are an important form of external monitoring in China. China is the world's largest emerging market and its capital market has grown rapidly recently. However, the agency problem is severe in Chinese firms, because strong political intervention and a relatively poor information environment increase moral hazard problems. The Chinese legal system is also different from that of other countries. The Chinese government has stressed the importance of the rule of law since the beginning of the 21st century. However, the legal environment in China still needs to be improved. Allen et al. (2005) demonstrate that the degree of protection of the rights of creditors in China lies between that in countries of English origin (high protection) and that in countries of French origin (weak protection). They also find a low level of law enforcement in China, accompanied by a very high level of corruption. La Porta et al. (2004) show that the protection of property rights in China is weak by global standards, as is political and economic freedom. Therefore, the effect of the legal environment on China's rapidly growing economic and financial systems is worth exploring.

Another important aspect of China's capital market is the dominant role of creditors in providing financing. In China, the main source of firm financing is debt from financial institutions. However, creditors need to monitor firms to protect their rights. Creditors, as corporate outsiders, can participate little in corporate governance, which is dominated by shareholders; instead, they have to monitor firms through litigation (external monitoring). However, creditors face obstacles. The effectiveness of creditor monitoring relies heavily on the legal and bankruptcy systems. If the legal system does not efficiently identify contract violations and does not provide the means to declare bankruptcy and reorganize firms, creditors lose a crucial mechanism of corporate governance (Levine, 2004). Traditionally, bankruptcy regulations have sought to protect the rights of creditors by preventing shareholders from shifting risk to them. The bankruptcy system in China is not properly regulated and enforced, and even provides shelter for firms to avoid paying creditors. In such circumstances, creditors must rely on external monitoring, the legal system, to protect their rights. The negative signal sent by a lawsuit increases the financing constraints of firms. As debt financing is the main source of financing for Chinese firms, creditor lawsuits are devastating. Once a lawsuit is initiated, the negative signal prevents other creditors from providing financing to a firm. Therefore, creditor litigation is of great importance to Chinese firms. We use this setting to examine how external monitoring introduced by creditors interacts with internal monitoring, which is dominated by shareholders.

Our study makes several contributions to the literature. First, it explains how external monitoring based on the legal environment interacts with internal corporate governance. Previous studies mainly focus on the question of whether country-level legal protection and firm-level corporate governance play substitutive or complementary roles. Unlike previous studies that examine whether firm-level monitoring works and take

country-level monitoring as a given, our study examines whether the legal system intervenes when corporate governance is weak. This question is rarely studied in the literature.

Second, our study contributes to the literature on the agency problem, especially the conflicts between shareholders and creditors. Conflicts between shareholders and creditors are common in companies, particularly for Chinese firms that use debt capital to form an optimal capital structure. Unlike previous studies focusing on a single type of agency problem, we study the conflicts between creditors and shareholders when the agency problem between the shareholders and managers is severe. On the one hand, because creditors receive a fixed interest rate on their investment, they are risk-averse and prefer not to invest in risky projects once their earnings are sufficient to pay back their investment. However, shareholders invest in the company to maximize their market prices, so they prefer risky projects for higher returns. On the other hand, management acts as the agent of shareholders, not creditors. In addition, directors decide on executive compensation schemes on behalf of the shareholders. Therefore, managers are unlikely to be motivated to make decisions in the interest of creditors, and it is difficult for creditors to participate in the managerial decision-making process. When corporate governance, dominated by shareholders, is inefficient, as suggested by low PPS, creditors need to introduce external monitoring to protect their rights. Therefore, we contribute to the literature by examining the conflicts between shareholders and creditors and their different roles in corporate governance.

Third, we contribute to the literature on corporate governance in China. The legal environment and corporate governance in China, as the world's largest emerging market, are very different from those in other countries. Previous studies in law and economics generally exclude China from their cross-country analysis due to data limitations and China's unique economic and political environment. We extend the literature by providing evidence that the monitoring mechanism of the legal system in China plays a substitutive role and is introduced by creditors when corporate governance is weak.

The rest of the study is organized as follows. Section 2 provides a literature review and presents the hypotheses. Section 3 describes the sample and the variables. Section 4 presents the main results and the robustness tests. Section 5 discusses the results of the cross-sectional analysis. Finally, Section 6 concludes the study.

2. Literature review and hypothesis development

2.1. Literature review

2.1.1. Legal environment and creditor litigation

The law and economics literature generally concludes that investor protection varies between countries (La Porta et al., 1998; La Porta et al., 2000; Djankov et al., 2008). It shows that legal protection is influenced by institutional factors, such as economic development, culture, and firm political connections. Most of these studies consider a country's legal system as exogenous and examine its effect on corporate governance (Pagano and Volpin, 2005). However, laws and regulations are products of the political process, which is essentially the product of economic development. Economic development also influences corporate governance. Therefore, how the legal system and corporate governance interact is an empirical question.

La Porta et al. (2000) find that external protection through the legal system is important because corporate insiders, especially controlling shareholders and managers, are likely to expropriate the interests of creditors and small shareholders. Therefore, small shareholders protect themselves from expropriation by participating in corporate governance. Klapper and Love (2004) find that the country-level legal environment varies across countries and that corporate governance is weaker in countries with a weaker legal environment. Hoskisson et al. (2009) show that stricter monitoring leads to higher CEO compensation. In addition, Acharya et al. (2011) find that external governance and internal governance complement each other. Using survey data, Misangyi and Acharya (2014) show that firms perform better when CEO incentive alignment and monitoring mechanisms work together, complementing rather than substituting for each other. They also show an increase in profit when both internal and external monitoring mechanisms are present. However, monitoring mechanisms obviously combine in complex ways, such that there may be simultaneous substitution and complementarity between and within the various monitoring and control mechanisms. Overall, previous studies

find that institutional factors, such as the legal environment, affect corporate governance and can serve as external monitoring when internal monitoring is insufficient.

Creditor lawsuits are the most common type of stakeholder litigation in China. Creditor litigation increases firm risks and affects external financing. The prosecution of a company by creditors means that the stable creditor-borrower relationship has broken down, which will greatly increase the risks of the business and harm the interests of shareholders. After creditor litigation, creditors that are more sensitive to credit will inevitably adjust a firm's credit conditions and may even be reluctant to make loans. This will worsen the firm's financial conditions, resulting in a shortage of funds, which will affect internal cash flow and asset liquidity. In addition, according to legal procedures, once a lawsuit is filed, the corresponding claims will be kept and some of the assets of the company will be frozen, unable to be traded or used normally. Therefore, creditor litigation is a powerful tool for creditors to intervene in corporate governance.

2.1.2. *The two types of agency problem*

There are two types of agency problem. Type I exists when there is a divergence of interests between managers (the agent) and firm owners (the principal) (Jensen and Meckling, 1976; Jensen and Murphy, 1990). Type II exists between shareholders and creditors (John and John, 1993; John et al., 2010). In the first type, shareholders expect management to invest in value maximization projects. However, managers may prioritize their own benefits and costs when making decisions. In this case, they may expropriate the value of the owners for their own interests. To align the interests of management with those of shareholders, compensation schemes are often used (Jensen and Meckling, 1976; Jensen and Murphy, 1990).

However, it is understood that shareholder value maximization does not necessarily lead to welfare maximization. Decisions that increase shareholder value may result in costs for creditors. In the second type of agency problem, the roles of creditors and shareholders are different in terms of business activities. Creditors expect their investment and interest to be repaid. Shareholders expect their market prices to be maximized. Therefore, creditors get fixed interest from their investment by using debt contracts. They also have priority of repayment in the event of bankruptcy. However, increased leverage imposes additional risks on firms, and in particular on shareholders. In contrast, shareholders do not get a fixed interest rate on their capital investment, so they prefer high dividends and increased share prices. Accordingly, shareholders may choose riskier, high-return projects. In contrast, creditors do not benefit from these premiums, so investing in risky projects is less attractive. In short, creditors are more interested in value preservation, while shareholders are more interested in value maximization. This conflict can induce agency costs, such as excessive dividend payments, claim dilution, asset substitution, underinvestment or overinvestment, and excessive covenants in loan contracts (Jensen and Meckling, 1976; Smith and Warner, 1979; Macey, 1991; Becht et al., 2003; Chu, 2017). Therefore, the prevailing view in the accounting and finance literature is that shareholder maximization is the second best solution to the problem of corporate governance.

Most studies focus on the first type of agency problem. Among the various compensation mechanisms, performance-based bonuses and dismissal decisions are the most used. By linking CEO incentives with financial performance, CEOs are motivated to boost accounting numbers, which is at the heart of shareholder value maximization. PPS is therefore an indicator of corporate governance. Previous studies generally conclude that higher PPS indicates better corporate governance (Morck et al., 1988; McConnell and Servaes, 1990; Jensen and Murphy, 1990). For instance, Conyon and He (2011) find that in China, compensation is positively related to firm performance and that PPS is higher in Chinese firms with independent directors and in non-SOEs. Minnick et al. (2011) show that in bank holding companies with high PPS, managers make better acquisition decisions. Similarly, Chahine and Goergen (2014) reveal that higher PPS improves IPO performance. They also find that the positive effect of social ties on IPOs is more pronounced when PPS is higher and that the negative effect of family ties on IPOs is mediated by high PPS. Dai et al. (2014) show that in the event of litigation, PPS decreases, and that after litigation, PPS increases. They attribute these results to a negative relationship between CEO incentives and firm risks.

However, the literature rarely discusses how compensation schemes reflect and influence shareholder-creditor conflicts; in other words, how the two types of agency problems interact. When the first type of agency problem, i.e., conflicts between shareholders and managers, becomes severe, due to the weak role of creditors in internal governance, creditors must take legal action. Therefore, lawsuits are an important

tool for creditors to intervene in governance. Jiang et al. (2010) find that a reduction in conflict between shareholders and debtholders reduces loan yield spreads. Liao (2015) argues that monitoring by blockholders exacerbates the conflict between debt and equity, in turn affecting the choice and structure of debt financing. Chu (2017) find that firms with more conflicts between equity holders and debtholders pay more dividends, suggesting a transfer of wealth from creditors to shareholders. The two exceptions in this line of research are John and John (1993) and John et al. (2010). Using a theoretical model, John and John (1993) find that performance-based compensation can mitigate shareholder-creditor conflicts. As the leverage ratio increases, PPS should decrease to stop shareholders from shifting risk to creditors, thereby protecting their rights. Similarly, John et al. (2010) examine the model empirically and find a negative relationship between PPS and the leverage ratio. They also show that PPS increases if there is strict monitoring by outsiders of firms' risky investments.

2.2. Hypothesis development

As corporate governance is dominated by shareholders, and compensation schemes are put in place by shareholders to mitigate the first type of agency problem, it is difficult for creditors to participate directly in corporate governance. Previous studies use debt covenant violations or bankruptcy to examine how creditors intervene in corporate governance in extreme cases. As it is difficult to obtain debt covenant and violation data, we extend the research question by using a unique setting, creditor lawsuits, in which external governance by creditors is clearly anticipated by shareholders and managers.

Creditor lawsuits can reflect corporate governance in two ways. First, in companies with weak corporate governance, both types of agency problem are severe. Indeed, self-interested managers consider their gains and losses first when making investment decisions. The risk of overinvestment or loss of return due to underinvestment reduces shareholder value. Second, creditors are more risk-averse than shareholders, because they only receive a fixed payment regardless of share prices. However, they may not be able to get their payment back in the event of firm bankruptcy. Therefore, creditors are concerned about weak corporate governance.

Based on the literature, shareholders establish performance-based compensation plans to link CEOs' actions with their own interests. With high PPS, CEOs are incentivized to act to increase firm performance, thereby increasing shareholder value. In firms with low PPS, CEOs are less motivated by accounting numbers and more likely to expropriate the interests of shareholders for their own benefit, suggesting a weak corporate governance environment. This weak corporate governance due to the agent-principal problem further aggravates conflict between shareholders and creditors, because creditors are more risk-averse than shareholders. When creditors fear that they will not receive the principal and interest due to uncertainty resulting from the risky actions taken by managers, they need to intervene with external governance, via the legal system.

Based on the above discussion, our first hypothesis is as follows:

H1: Firms with creditor lawsuits have low PPS before lawsuits.

Next, we examine whether the interaction between the external legal environment and internal corporate governance varies for firms with different levels of agency problem. The relationship between creditor lawsuits and PPS is not necessarily the same across firms, and the likelihood of external lawsuits may be directly related to the severity of the agency problem. To the extent that a severe agency problem between shareholders and creditors dampens corporate governance, we expect to find low PPS before lawsuits in firms with a more serious agency problem; that is, more serious conflicts between shareholders and creditors. In line with this argument, Huang (2009) finds that creditors tend to impose a mandatory repayment covenant called an "excess cash flow sweep" in loan contracts to force borrowers to repay their debt ahead of schedule when creditor-shareholder conflicts are severe. Chu (2017) shows that an increase in the difficulty of class action lawsuits reduces loan spreads and that this effect is weaker in countries where creditors have more rights. In addition, Qi et al. (2011) find that firms with stronger shareholder control face an increase in shareholder-creditor conflicts. Therefore, we expect the relationship between creditor lawsuits and PPS to be stronger in firms with more severe creditor-shareholder conflicts. Our second hypothesis is as follows:

H2: The negative relationship between creditor lawsuits and PPS is more pronounced in firms with more severe creditor-shareholder conflicts.

Numerous studies provide evidence that the behavior of creditors and shareholders is shaped by the legal environment, especially legal institutions for the protection of creditors. For example, Brockman and Unlu (2009) find that country-level creditor rights influence dividend policies by balancing power between debt and equity claimants. They also show that compared with the agency cost of equity, the agency cost of debt plays a more decisive role in dividend policies. Consistent with this argument, Qi et al. (2011) find that creditors require fewer covenants in contracts in countries with stronger creditor protection, indicating that creditor protection replaces covenants in reducing the agency cost of debt. Overall, these studies generally suggest that creditors consider the influence of the external legal environment when intervening in external monitoring. We predict that a mature and strong legal environment will enable creditors to use lawsuits to protect themselves. Therefore, creditors are more likely to participate in corporate governance in the form of lawsuits when creditor protection is strong. Our third hypothesis is as follows:

H3: The negative relationship between creditor lawsuits and PPS is more pronounced in stronger legal environments.

3. Research design

3.1. Model specification

3.1.1. Following the literature (Cadman et al., 2010), we test the relationship between creditor lawsuits and corporate governance using the following specification:

$$\begin{aligned} \text{Compensation}_{it} = & \alpha_0 + \alpha_1 \text{LIT}_{it+1} + \alpha_2 \text{ROA}_{it} + \alpha_3 \text{ROA}_{it} * \text{LIT}_{it+1} + \text{Controls} + \text{Industry F.E.} \\ & + \text{Year F.E.} + \varepsilon \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Compensation}_{it} = & \alpha_0 + \alpha_1 \text{LIT}_{it+1} + \alpha_2 \text{ROE}_{it} + \alpha_3 \text{ROE}_{it} * \text{LIT}_{it+1} + \text{Controls} + \text{Industry F.E.} \\ & + \text{Year F.E.} + \varepsilon, \end{aligned} \quad (2)$$

where i and t are the firm and year indicators, respectively. Based on previous studies (Cadman et al., 2010), we measure Compensation_{it} as the natural logarithm of the sum of the cash salaries of the top three highest paid executives. In China, compensation is commonly paid in cash salary. LIT_{it+1} is a dummy variable equal to one if firms have creditor lawsuits in year $t + 1$, and zero otherwise. Firm performance is proxied by ROA_{it} or ROE_{it} (Firth et al., 2006). As we examine how creditors intervene in weak corporate governance, we use the lead time $t + 1$ to investigate how weak corporate governance in the current period results in creditor intervention in the future. Therefore, the interaction term of $\text{ROA}_{it}/\text{ROE}_{it}$ and LIT_{it+1} represents the relationship between corporate governance and the likelihood of creditor lawsuits. We choose financial performance metrics rather than market performance metrics, such as stock prices and returns, for the following reason. In China, there are many more individual investors than institutional investors, which is very different from the situation in developed markets. Retail investors are less rational and less able to collect and process fundamental information than institutional investors (Barber and Odean, 2008; Barber et al., 2009). Thus, stock prices cannot fully reflect the performance of Chinese listed firms. As a result, it is better to use financial performance based compensation measures in the context of China (Fang, 2009; Wang and Zhang, 2012).

We also include a set of control variables used to determine compensation in the literature (Cornett et al., 2008; Fang, 2009). Specifically, we control for Size_{it} , Lev_{it} , Growth_{it} , Fshr_{it} , Mshr_{it} , Bsize_{it} , IndBoard_{it} , ΔSales_{it} , RetVol_{it} , SOE_{it} , and Dual_{it} . Size_{it} is measured as the natural logarithm of a firm's total assets. Lev_{it} is total liabilities scaled by total assets. Growth_{it} is measured as the annual change ratio of the firm's total assets. Fshr_{it} is the percentage of outstanding shares held by the firm's largest shareholder. Mshr_{it} is the percentage of shares

held by the firm's executives. $Bsize_{it}$ is the size of the board, measured by the number of directors on the board. $IndBoard_{it}$ is board independence, which is the percentage of the total number of directors on the board represented by independent directors. $\Delta Sales_{it}$ is the annual change in total revenue. $RetVol_{it}$ is the standard deviation of weekly returns in year t . SOE_i is an indicator variable equal to one if the firm is a state-owned enterprise (SOE), and zero otherwise. Finally, $Dual_{it}$ is an indicator variable equal to one if the chairman and the CEO are the same person in year t . All continuous variables are winsorized at the top and bottom 1%. Year and industry fixed effects are included to control for unobservable factors that are invariant across years and industries. All standard errors are robust to heteroskedasticity and clustered at the firm level.

3.2. Sample construction

Our initial sample is based on all A-share firms listed on the Shenzhen Stock Exchange and the Shanghai Stock Exchange. We manually collect lawsuit data from corporate annual reports and construct a proprietary database of creditor litigation. The sampling period extends from 2003 to 2013. We obtain firm financial data from the China Stock Market & Accounting Research database. All financial firms are excluded because the financial sector is heavily regulated. We also remove all firms with missing financial and stock market data. Our final sample includes 12,321 firm-year observations from 1943 firms. Our main variable of interest is LIT_{it+1} , a dummy variable equal to one for all firm-year observations with creditor lawsuits, and zero otherwise. Therefore, our treatment firms include all firm-year observations with creditor litigation, while our control firms include all firm-year observations with no creditor litigation.

3.3. Descriptive statistics

The distribution of the sample is presented in Table 1. Column (1) presents the annual distribution of firms without litigation (non-litigation firms). Column (2) shows the annual distribution of firms with litigation (litigation firms). We observe an upward trend in the number of lawsuits, from 48 lawsuits in 2003 to 123 lawsuits in 2013. We have 1058 firm-year observations in the treatment group and 11,263 firm-year observations in the control group.

Table 2 presents the summary statistics of the final sample. The mean ratio of LIT_{it+1} is 0.086, suggesting that about 8.6% of the firms in our sample faced litigation during the sampling period. The mean of $Compensation_{it}$ is 13.732, with a standard deviation of 0.852. Therefore, there is a wide variation in the amount of compensation between firms. The mean value of ROA_{it} is 0.034 and the mean value of ROE_{it} is 0.066. The mean ratio of $Size_{it}$ is 21.7, with a median of 21.568. The other statistics are generally comparable to those reported in previous studies.

Table 1
Sample Distribution.

Year	$LIT_{t+1} = 0$	$LIT_{t+1} = 1$	Total
2003	226	48	274
2004	401	68	469
2005	700	91	791
2006	871	94	965
2007	895	117	1012
2008	980	119	1099
2009	1101	101	1202
2010	1195	92	1287
2011	1512	89	1601
2012	1688	116	1804
2013	1694	123	1817
Total	11,263	1058	12,321

Note: In this table shows the distribution of the sample by year.

Table 2
Descriptive Statistics.

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	Min	P25	Median	P75	Max
LIT_{it+1}	12321	0.086	0.280	0.000	0.000	0.000	0.000	1.000
$Compensation_{it}$	12321	13.732	0.852	9.932	13.214	13.780	14.305	16.047
ROA_{it}	12321	0.034	0.077	-0.946	0.010	0.036	0.069	0.255
ROE_{it}	12321	0.066	0.204	-3.023	0.024	0.077	0.140	1.464
$Size_{it}$	12321	21.700	1.253	18.657	20.849	21.568	22.399	25.925
Lev_{it}	12321	0.504	0.271	0.043	0.334	0.498	0.643	3.678
$Growth_{it}$	12321	0.177	0.382	-0.716	0.008	0.101	0.234	3.786
$Fshr_{it}$	12321	0.366	0.156	0.081	0.240	0.346	0.486	0.758
$Mshr_{it}$	12321	0.028	0.089	0.000	0.000	0.000	0.000	0.577
$Bsize_{it}$	12321	9.151	1.855	5.000	9.000	9.000	9.000	15.000
$IndBoard_{it}$	12321	0.363	0.050	0.143	0.333	0.333	0.375	0.571
$\Delta Sales_{it}$	12321	0.224	0.620	-0.885	-0.015	0.130	0.303	7.087
$RetVol_{it}$	12321	0.134	0.057	0.035	0.096	0.121	0.159	0.671
SOE_i	12321	0.554	0.497	0.000	0.000	1.000	1.000	1.000
$Dual_{it}$	12321	0.179	0.383	0.000	0.000	0.000	0.000	1.000

Note: In this table presents the descriptive statistics for the main variables used in the regressions.

4. Pay-Performance sensitivity and creditor lawsuits

4.1. Main analysis

Table 3 presents the results of our main analysis based on Eqs. (1) and (2). In column (1) and column (2), in which firm performance is proxied by ROA , we find significant negative coefficients for the interaction term of ROA_{it} and LIT_{it+1} . Specifically, in column (1), no control variables are included and the coefficient of $ROA_{it} * LIT_{it+1}$ is significantly negative (-1.691, $t = -5.71$). In column (2), all of the control variables are included and the coefficient of $ROA_{it} * LIT_{it+1}$ remains significantly negative (-1.869, $t = -7.11$). In columns (3) and (4), in which firm performance is proxied by ROE , the coefficients of $ROE_{it} * LIT_{it+1}$ remain significantly negative. Specifically, in column (3), no control variable is included and the coefficient of $ROE_{it} * LIT_{it+1}$ is -0.922, with a t -value of -9.79. Similarly, in column (4), the coefficient of $ROE_{it} * LIT_{it+1}$ is -0.538, with a t -value of -6.28. The results are consistent with our expectations. In firms with high PPS, managers are incentivized by high salaries and motivated to improve corporate governance. Therefore, corporate governance is better in firms with high PPS, suggesting fewer conflicts between creditors and shareholders. As a result, creditors are less likely to participate in corporate governance in the form of lawsuits.

The signs of the coefficients of the control variables are generally consistent with those of previous studies (Firth et al., 2006; Chen et al., 2015). We find a positive relationship between compensation and firm size, the percentage of management shareholdings, board size, board independence, whether the firm is an SOE, and whether the CEO of the firm is also the chairman of the board. We find a negative association between compensation and leverage, firm growth, the percentage of shares held by the largest shareholder, annual sales growth, and stock return volatility.

In summary, the results in Table 3 support H1 postulating that firms with creditor lawsuits have low PPS before lawsuits. Indeed, there is a negative relationship between creditor lawsuits and PPS, suggesting that creditors are more likely to participate in corporate governance via an external litigation approach when corporate governance dominated by shareholders is weak.

4.2. Robustness Checks

We check the robustness of our main results using a series of sensitivity analyses. We first examine whether our main results are robust to an alternative litigation measure. Specifically, we originally defined LIT_{it+1} as whether firms have experienced litigation. When collecting the data, we observed that many firms have more than one lawsuit. Therefore, we changed our definition of creditor litigation to $LITnum_{it+1}$, measured by the number of lawsuits in which firms have been involved, i.e., the frequency of lawsuits. The results are presented

Table 3
Main Results.

Variable	(1)	(2)	(3)	(4)
LIT_{it+1}	-0.107*** (-2.99)	0.001 (0.02)	-0.209*** (-5.37)	-0.002 (-0.06)
ROA_{it}	3.481*** (19.79)	2.864*** (15.99)		
$ROA_{it} * LIT_{it+1}$	-1.691*** (-5.71)	-1.869*** (-7.11)		
ROE_{it}			1.118*** (13.11)	0.771*** (10.62)
$ROE_{it} * LIT_{it+1}$			-0.922*** (-9.79)	-0.538*** (-6.28)
$Size_{it}$		0.289*** (23.94)		0.304*** (24.83)
Lev_{it}		-0.066 (-1.26)		-0.330*** (-6.16)
$Growth_{it}$		-0.055*** (-3.12)		-0.034* (-1.94)
$Fshr_{it}$		-0.314*** (-3.66)		-0.291*** (-3.34)
$Mshr_{it}$		0.185 (1.56)		0.247** (2.04)
$Bsize_{it}$		0.028*** (3.73)		0.029*** (3.83)
$IndBoard_{it}$		0.133 (0.60)		0.091 (0.40)
$\Delta Sales_{it}$		-0.040*** (-3.76)		-0.024** (-2.19)
$RetVol_{it}$		-0.185 (-1.22)		-0.248 (-1.58)
SOE_{it}		0.004 (0.13)		-0.007 (-0.23)
$Dual_{it}$		0.097*** (3.01)		0.093*** (2.83)
Constant	12.304*** (110.94)	6.184*** (22.88)	12.332*** (110.43)	6.006*** (21.96)
Ind & Year	YES	YES	YES	YES
Observations	12,321	12,321	12,321	12,321
R^2	0.336	0.479	0.308	0.465

Note: In this table presents the results of the main regression. The figures reported in brackets are t -statistics, based on standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

in Panel A, Table 4. Our main results remain unchanged. In columns (1) and (2), the coefficients of $ROA_{it} * LITnum_{it+1}$ are still negative, and equal to -1.030 , with a t -value of -9.45 , when all controls are included (column 2). The results are similar in columns (3) and (4), with a coefficient of $ROE_{it} * LITnum_{it+1}$ equal to -0.251 and a t -value of -6.43 (column 4). Therefore, our main results are not sensitive to this alternative measure of creditor litigation.

We also examine whether our main results hold with a different sampling period. A number of laws and enforcement measures relating to creditor protection were introduced in around 2006, such as the Bankruptcy Law and the Property Law. Previous studies show that the adoption of these laws has significantly increased legal protection, especially the protection of creditors (Berkowitz et al., 2015). To eliminate the concern that our results are driven by the adoption of these laws, we use a sampling period after 2006 and re-estimate the equations. The results are reported in Panel B of Table 4. Our results remain unchanged. We still find a negative coefficient for the interaction term of ROA/ROE and LIT . Therefore, the negative relationship between PPS and creditor litigation still holds despite the adoption of legal protection laws.

Finally, we examine whether our results are robust to different regression methods. In the main analysis, all coefficients and standard errors are clustered at the firm level. We change the clustering method to both the

Table 4
Robustness Checks.

Panel A: Using the number of lawsuits				
Variable	(1)	(2)	(3)	(4)
LIT_{it+1}	-0.124*** (-4.08)	-0.054* (-1.79)	-0.194*** (-6.41)	-0.029 (-0.96)
ROA_{it}	3.486*** (20.57)	2.799*** (16.03)		
$ROA_{it} * LIT_{it+1}$	-1.144*** (-10.63)	-1.030*** (-9.45)		
ROE_{it}			1.051*** (13.59)	0.717*** (10.98)
$ROE_{it} * LIT_{it+1}$			-0.476*** (-10.26)	-0.251*** (-6.43)
Controls	NO	YES	NO	YES
Constant	12.314*** (111.35)	6.245*** (23.18)	12.337*** (110.99)	6.017*** (22.06)
Ind & Year	YES	YES	YES	YES
Observations	12,321	12,321	12,321	12,321
R^2	0.339	0.480	0.308	0.465
Panel B: Using the sample after 2006				
Variable	(1)	(2)	(3)	(4)
LIT_{it+1}	-0.096** (-2.55)	0.015 (0.46)	-0.167*** (-4.16)	0.013 (0.39)
ROA_{it}	3.479*** (17.39)	2.855*** (13.96)		
$ROA_{it} * LIT_{it+1}$	-1.030*** (-3.10)	-1.326*** (-4.25)		
ROE_{it}			1.417*** (15.62)	0.942*** (11.48)
$ROE_{it} * LIT_{it+1}$			-0.922*** (-8.01)	-0.477*** (-4.48)
Controls	NO	YES	NO	YES
Constant	13.702*** (114.87)	7.492*** (26.26)	13.749*** (117.18)	7.371*** (25.88)
Ind & Year	YES	YES	YES	YES
Observations	9822	9822	9822	9822
R^2	0.229	0.405	0.213	0.394
Panel C: Clustered at the firm and year levels				
Variable	(1)	(2)	(3)	(4)
LIT_{it+1}	-0.107*** (-3.36)	0.001 (0.02)	-0.209*** (-5.00)	-0.002 (-0.06)
ROA_{it}	3.481*** (17.22)	2.864*** (15.72)		
$ROA_{it} * LIT_{it+1}$	-1.691*** (-4.30)	-1.869*** (-5.50)		
ROE_{it}			1.118*** (7.21)	0.771*** (8.12)
$ROE_{it} * LIT_{it+1}$			-0.922*** (-10.45)	-0.538*** (-8.13)
Controls	NO	YES	NO	YES
Constant	13.702*** (114.87)	7.492*** (26.26)	13.749*** (117.18)	7.371*** (25.88)
Ind & Year	YES	YES	YES	YES
Observations	12,321	12,321	12,321	12,321
R^2	0.336	0.479	0.308	0.465

Note: In this table presents the results of the robustness tests. The figures reported in brackets are t -statistics, based on standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

firm level and the year level. The results are reported in Panel C of Table 4. The negative relationship between PPS and creditor litigation remains unchanged. Therefore, our results are robust to different regression methods.

4.3. Endogeneity

Endogeneity may be a concern. There are two potential endogeneity problems in our setting. First, whether creditors initiate litigation is a decision. If there are certain omitted factors that are related to creditors' litigation decisions and these factors affect PPS, endogeneity is a concern. Second, there may be fundamental differences between our treatment sample and control sample. In other words, litigation firms may be fundamentally different in terms of corporate governance or financial reporting from non-litigation firms. We assume that there is no difference between the two groups in our main analysis. If this assumption does not hold, endogeneity is a concern.

To eliminate potential selection bias and omitted variable bias, we use a propensity score matching (PSM) approach (Rosenbaum and Rubin, 1983; Conyon and He, 2016). Specifically, we match litigation firms and non-litigation firms, and re-estimate Eqs. (1) and (2) using the treatment sample and the matched samples.

In the first stage, following the literature (Wang and Jiang, 2016), we include the following variables: $Size_{it}$, Lev_{it} , ROA_{it} , $\Delta sales_{it}$, ST_{it} , PPE_{it} , WC_{it} , Age_{it} , $RetVol_{it}$, and $Zscore_{it}$. ROA_{it} is income before extraordinary items divided by total assets. ST_{it} is an indicator variable equal to one if the share is specially treated in year t .¹ PPE_{it} is net property, plant, and equipment scaled by total assets. WC_{it} is working capital divided by total assets, where working capital is measured as the difference between current assets and current liabilities. Age_{it} is measured by the difference between year t and the firm's listing year. Finally, $Zscore_{it}$ is the bankruptcy index calculated following Altman (1968). The dependent variable is LIT_{it+1} . The other variables are defined in the same way as in the main regression. We use a probit model to estimate the propensity scores and match the treatment firms with the control firms based on the closest propensity score (without replacement) in the same industry and the same year. After identifying matching control firms for each treatment firm, we re-estimate Eqs. (1) and (2) using the matched samples.²

The results are presented in Table 5. In column (1) and column (2), in which performance is proxied by ROA , the coefficients of $ROA_{it} * LIT_{it+1}$ are still significantly negative, suggesting that firms with low PPS are more likely to be sued in the next period. In column (3) and column (4), in which firm performance is proxied by ROE , the results remain unchanged. Overall, our results remain unchanged when using the PSM method and are not driven by endogeneity.

5. Cross-Sectional variation in the relationship between creditor litigation and Pay-Performance sensitivity

5.1. The role of shareholder-creditor agency conflict

Corporate finance theory suggests that agency conflict is the main source of incentive problems. There are various types of agency costs, including the agency cost of equity (conflicts between equity holders) and the agency cost of debt (conflicts between debtholders and shareholders). In firms with a high agency cost of equity, managers may deviate from the initial objective of firm value maximization. The PPS incentive system may work differently in firms with a severe agency problem. Managers may manipulate firm performance to secure higher salaries, which is difficult to detect when corporate governance is weak. As a result, it is even more difficult for creditors to participate in corporate governance. In contrast, in firms in which the agency cost of debt is high, creditors have more incentives to participate in corporate governance and protect their rights. Therefore, we postulate in H2 that the negative relationship between PPS and creditor lawsuits is stronger in firms with a serious agency problem.

¹ On April 22, 1998, the Shanghai and Shenzhen stock exchanges announced that firms with abnormal financial status should trade with "ST" status. Firms that report losses for two consecutive years are classified as having abnormal financial status.

² The results of the first stage regression are presented in Appendix A1. Appendix A2 presents the matching efficiency results for the main variables used in the PSM approach. The results show that the treatment sample is comparable to the control sample.

Table 5
PSM Results.

Variable	(1)	(2)	(3)	(4)
LIT_{it+1}	-0.001 (-0.02)	0.014 (0.38)	-0.052 (-1.19)	0.011 (0.31)
ROA_{it}	2.555*** (8.91)	1.899*** (7.14)		
$ROA_{it} * LIT_{it+1}$	-0.921** (-2.54)	-1.037*** (-3.19)		
ROE_{it}			0.439*** (4.45)	0.369*** (5.15)
$ROE_{it} * LIT_{it+1}$			-0.278** (-2.52)	-0.183** (-2.07)
$Size_{it}$		0.289*** (13.94)		0.302*** (14.73)
Lev_{it}		-0.045 (-0.70)		-0.193*** (-3.12)
$Growth_{it}$		-0.042 (-1.02)		-0.011 (-0.26)
$Fshr_{it}$		-0.377** (-2.45)		-0.398** (-2.57)
$Mshr_{it}$		0.956*** (2.74)		0.962*** (2.76)
$Bsize_{it}$		0.031*** (2.68)		0.033*** (2.88)
$IndBoard_{it}$		0.225 (0.63)		0.238 (0.66)
$\Delta Sales_{it}$		-0.037* (-1.74)		-0.029 (-1.34)
$RetVol_{it}$		-0.481* (-1.77)		-0.442 (-1.57)
SOE_{it}		0.012 (0.24)		0.013 (0.26)
$Dual_{it}$		0.102* (1.73)		0.096 (1.63)
Constant	12.309*** (75.77)	6.135*** (13.29)	12.319*** (72.50)	5.905*** (12.84)
Ind & Year	YES	YES	YES	YES
Observations	2114	2114	2114	2114
R^2	0.337	0.468	0.297	0.462

Note: In this table presents the results of propensity score matching. The figures reported in brackets are t -statistics, based on standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

To test H2, we follow the literature (Kanodia and Lee, 1998; Johnson et al., 2000; Ruland and Zhou, 2005; Rani et al., 2012; Chen et al., 2015) and build proxies for the agency problem between shareholders and creditors. Specifically, we use three proxies. The first measure is internal control weakness (ICW). The weaker the internal control system, the greater the agency problem between shareholders and creditors. The second proxy is the percentage of shares held by management ($Mshr$). Firms with a higher percentage of management shareholdings are perceived as having a more severe agency problem between shareholders and creditors. The third proxy is whether the firm is audited by a Big 4 audit firm ($Big\ 4$). Big 4 auditors strictly control financial information, which reduces the agency problem. Therefore, creditors are less concerned about corporate governance in firms with Big 4 auditors. For each agency problem proxy, we divide the full sample into firms with a high agency problem and firms with a low agency problem based on the sample median.

The results are reported in Table 6. Panel A presents the results using ICW as the agency problem proxy. In the subsample with low ICW , the coefficient of $ROA_{it} * LIT_{it+1}$ is 1.145, with a t -value of 1.12. In the subsample with high ICW , the coefficient of $ROA_{it} * LIT_{it+1}$ is -1.736, with a t -value of -6.75. The results are similar when using ROE as the firm performance proxy in column (3) and column (4). We continue to find more pronounced results in the high agency problem subsample using other proxies (Panel B and Panel C). Overall, the

Table 6
The Role of Shareholder-Creditor Agency Conflict.

Panel A: High versus low ICW				
Variable	(1)	(2)	(3)	(4)
	High	Low	High	Low
LIT_{it+1}	-0.051 (-1.43)	0.001 (0.01)	-0.032 (-0.88)	0.129* (1.72)
ROA_{it}	2.218*** (11.97)	3.523*** (10.79)		
$ROA_{it} * LIT_{it+1}$	-1.736*** (-6.75)	1.145 (1.12)		
ROE_{it}			0.474*** (7.51)	1.571*** (9.91)
$ROE_{it} * LIT_{it+1}$			-0.313*** (-4.13)	-0.638 (-1.25)
Controls	YES	YES	YES	YES
Constant	6.702*** (19.12)	6.218*** (17.80)	6.489*** (18.30)	6.452*** (18.38)
Ind & Year	YES	YES	YES	YES
Observations	6100	093	6100	6093
R^2	0.458	0.432	0.445	0.427
Diff-Test for the coefficients of $ROA_{it} * LIT_{it+1}$		$\chi^2 = 8.31^{***}$		
Diff-Test for the coefficients of $ROE_{it} * LIT_{it+1}$				$\chi^2 = 4.58^{**}$
Panel B: High versus low Mshr				
Variable	(1)	(2)	(3)	
	High	Low	High	Low
LIT_{it+1}	0.076* (1.69)	-0.048 (-1.14)	0.085* (1.92)	-0.051 (-1.21)
ROA_{it}	3.110*** (12.18)	2.423*** (10.34)		
$ROA_{it} * LIT_{it+1}$	-1.926*** (-4.47)	-1.716*** (-5.26)		
ROE_{it}			0.960*** (7.98)	0.616*** (7.53)
$ROE_{it} * LIT_{it+1}$			-0.626*** (-4.42)	-0.450*** (-4.46)
Controls	YES	YES	YES	YES
Constant	5.420*** (13.83)	6.873*** (20.99)	5.300*** (12.98)	6.716*** (20.39)
Ind & Year	YES	YES	YES	YES
Observations	6157	6164	6157	6164
R^2	0.504	0.464	0.490	0.455
Diff-Test for the coefficients of $ROA_{it} * LIT_{it+1}$		$\chi^2 = 2.78^*$		
Diff-Test for the coefficients of $ROE_{it} * LIT_{it+1}$				$\chi^2 = 3.02^*$
Panel C: Big 4 versus non-Big 4				
Variable	(1)	(2)	(3)	(4)
	Big 4	Non-Big 4	Big 4	Non-Big 4
LIT_{it+1}	0.020 (0.16)	0.027 (0.81)	-0.037 (-0.32)	0.024 (0.70)
ROA_{it}	3.297*** (3.62)	3.012*** (13.63)		
$ROA_{it} * LIT_{it+1}$	1.669 (0.73)	-1.818*** (-5.45)		
ROE_{it}			0.641** (2.39)	0.955*** (11.97)
$ROE_{it} * LIT_{it+1}$			0.563 (1.05)	-0.556*** (-5.43)

(continued on next page)

Table 6 (continued)

Variable	(1) Big 4	(2) Non-Big 4	(3) Big 4	(4) Non-Big 4
Controls	YES	YES	YES	YES
Constant	7.998*** (7.17)	6.640*** (20.92)	7.888*** (6.95)	6.771*** (20.93)
Ind & Year	YES	YES	YES	YES
Observations	668	9514	668	9513
R ²	0.530	0.388	0.517	0.380
Diff-Test for the coefficients of $ROA_{it} * LIT_{it+1}$		$\chi^2 = 3.79^*$		
Diff-Test for the coefficients of $ROE_{it} * LIT_{it+1}$				$\chi^2 = 4.63^{**}$

Note: In this table presents the results for the role of shareholder-creditor agency conflict. The figures reported in brackets are *t*-statistics, based on standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

regression results support H2. Creditors have more incentives to participate in corporate governance via external litigation when the agency problem between shareholders and creditors is more severe.

5.2. The role of the external legal environment

Previous studies generally find that the legal environment plays an important role in shaping the behavior of creditors (Clemenz and Gugler, 2000). For example, Brockman and Unlu (2009) find that country-level creditor rights influence firm-level dividend policies by establishing a balance of power between debtholders and shareholders. The interaction between creditors and managers/shareholders changes with external measures to protect creditors. To the extent that the cost of litigation is lower and litigation is more efficient in a stronger legal environment, we expect the negative relationship between creditor litigation and PPS to be more pronounced in a strong legal environment (H3).

We use two proxies for the legal environment. The first is the legal index. Following Fan and Wang (2012), we use the number of lawyers as a percentage of the population, the efficiency of local courts, and the protection of property rights. The sample is divided into firms with a strong legal environment and firms with a weak legal environment based on the sample median. The second proxy is whether the company is an SOE. It is difficult for external creditors to sue SOEs because of their political affiliation. Therefore, the legal protection of creditors is weaker if they lend to SOEs.

The results are presented in Table 7. In Panel A in which the rigor of the legal environment is proxied by the legal index, we find that the coefficients of $ROA_{it}/ROE_{it} * LIT_{it+1}$ are more significantly negative in the subsample with a strong legal environment. The results are the same when we use SOE status as a proxy (Panel B). The legal environment is stronger in non-SOEs, because political interventions are heavier for SOEs. Overall, the results support H3. In a strong legal environment, the low cost and high efficiency of litigation help creditors participate in corporate governance in the form of lawsuits, so the relationship between creditor lawsuits and PPS is more pronounced in a strong legal environment.

5.3. Alternative measure of corporate governance

In this section, we present our results using an alternative measure of corporate governance: earnings opacity. Previous studies show that corporate governance is strongly related to the information environment of firms (Armstrong et al., 2012). Therefore, we use *EarningsOpacity* as an alternative measure of corporate governance. Greater earnings opacity indicates a poorer information environment and weaker corporate governance.

The results are presented in Table 8. We use three measures of earnings opacity. The first measure is the absolute value of discretionary accruals based on the modified Jones model (Dechow et al., 1995). The second measure is the absolute value of discretionary accruals following Dechow and Dichev (2002). The third measure is earnings opacity, calculated as the three-year moving sum of the absolute value of annual discretionary accruals (Hutton et al., 2009). We find a significantly positive association between earnings opacity and creditor litigation in the next period. The results are consistent with the main results, showing that firms with weaker internal corporate governance are more likely to be subject to creditors' intervention through external lawsuits.

Table 7
The Role of the External Legal Environment.

Panel A: High versus low <i>Legal Index</i>				
Variable	(1)	(2)	(3)	(4)
	High	Low	High	Low
LIT_{it+1}	0.025 (0.62)	0.009 (0.22)	0.014 (0.33)	0.014 (0.34)
ROA_{it}	2.619*** (11.15)	3.017*** (12.52)		
$ROA_{it} * LIT_{it+1}$	-2.087*** (-5.72)	-1.745*** (-5.31)		
ROE_{it}			0.779*** (7.24)	0.778*** (9.04)
$ROE_{it} * LIT_{it+1}$			-0.569*** (-4.60)	-0.533*** (-4.79)
Controls	YES	YES	YES	YES
Constant	7.211*** (20.28)	5.934*** (17.19)	7.180*** (20.03)	5.642*** (16.09)
Ind & Year	YES	YES	YES	YES
Observations	5791	6530	5791	6530
R^2	0.429	0.524	0.415	0.511
Diff-Test for the coefficients of $ROA_{it} * LIT_{it+1}$		$\chi^2 = 3.01^*$		
Diff-Test for the coefficients of $ROE_{it} * LIT_{it+1}$				$\chi^2 = 2.89^*$
Panel B: Non-SOE versus SOE				
Variable	(1)	(2)	(3)	
	Non-SOE	SOE	Non-SOE	SOE
LIT_{it+1}	-0.018 (-0.36)	0.003 (0.08)	-0.008 (-0.17)	-0.008 (-0.21)
ROA_{it}	2.763*** (10.87)	2.759*** (11.21)		
$ROA_{it} * LIT_{it+1}$	-2.319*** (-7.07)	-0.654* (-1.89)		
ROE_{it}			0.695*** (6.24)	0.742*** (9.07)
$ROE_{it} * LIT_{it+1}$			-0.605*** (-4.56)	-0.378*** (-3.42)
Controls	YES	YES	YES	YES
Constant	5.155*** (11.27)	6.592*** (19.88)	4.921*** (10.60)	6.402*** (19.14)
Ind & Year	YES	YES	YES	YES
Observations	5499	6822	5499	6822
R^2	0.454	0.527	0.434	0.516
Diff-Test for the coefficients of $ROA_{it} * LIT_{it+1}$		$\chi^2 = 12.01^{***}$		
Diff-Test for the coefficients of $ROE_{it} * LIT_{it+1}$				$\chi^2 = 3.15^*$

Note: In this table presents the results of the role of the external legal environment. The figures reported in brackets are *t*-statistics, based on standard errors clustered at the firm level. *** and * indicate significance at the 1% and 10% levels, respectively.

6. Conclusion

In this study, we investigate whether creditors can participate in corporate governance when agency conflict between shareholders and creditors is severe. We examine our research question using creditor litigation data from China, comparing litigation firms and non-litigation firms. We find that firms that have experienced creditor lawsuits have low PPS before lawsuits, suggesting that these firms have weak corporate governance. This result is consistent with the argument that creditors participate in corporate governance by introducing external monitoring when internal monitoring dominated by shareholders is insufficient. We also find that this relationship is stronger in firms with more severe agency conflict between shareholders and creditors. Moreover, creditor litigation is strongly related to low PPS when the external legal environment is stronger. Our results

Table 8
Alternative Measure of Corporate Governance.

Dep. Var: Lit_{it+1}	(1) Abs_DA_adjust	(2) Abs_DA_DD	(3) Opacity
<i>EarningsOpacity_{it}</i>	0.150*** (3.96)	0.201*** (4.29)	0.072*** (3.06)
<i>Size_{it}</i>	-0.026*** (-6.79)	-0.028*** (-7.10)	-0.033*** (-7.75)
<i>ROA_{it}</i>	-0.408*** (-6.33)	-0.391*** (-5.93)	-0.386*** (-5.33)
<i>Lev_{it}</i>	0.217*** (10.08)	0.221*** (9.94)	0.219*** (9.19)
<i>Growth_{it}</i>	-0.025*** (-2.66)	-0.022** (-2.10)	-0.006 (-0.60)
<i>Fshr_{it}</i>	-0.055** (-2.54)	-0.055** (-2.41)	-0.044* (-1.67)
<i>Mshr_{it}</i>	-0.077*** (-2.68)	-0.090** (-2.57)	-0.115 (-1.55)
<i>Bsize_{it}</i>	0.001 (0.61)	0.002 (0.88)	0.003 (1.42)
<i>ASales_{it}</i>	0.009 (1.52)	0.010 (1.62)	0.009 (1.34)
<i>RetVol_{it}</i>	0.293*** (4.32)	0.292*** (4.11)	0.296*** (3.72)
<i>SOE_{it}</i>	-0.018** (-2.04)	-0.019** (-2.05)	-0.022** (-2.23)
<i>Dual_{it}</i>	0.003 (0.38)	0.003 (0.27)	0.001 (0.10)
Constant	0.642*** (7.66)	0.687*** (7.84)	0.788*** (8.19)
Ind & Year	YES	YES	YES
Observations	12,024	11,164	9396
R^2	0.125	0.126	0.124

Note: In this table presents the results of the alternative measure of corporate governance. The figures reported in brackets are *t*-statistics, based on standard errors clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

remain robust to different model specifications, after addressing endogeneity problems, and to the use of an alternative measure of corporate governance.

Our study contributes to the literature in several ways. First, it expands the literature on the interaction between external monitoring based on the legal environment and internal corporate governance. In particular, our study shows that the legal protection of creditors is effective when corporate governance is weak. Second, our study contributes to the literature on the agency problem, in particular on conflicts between shareholders and creditors in China, where this type of agency problem is common. Finally, we contribute to the literature on accounting and law in China's capital market. The legal environment and corporate governance in China, as the largest emerging market, are very different from those in other countries. We extend the literature by providing evidence that monitoring by the legal system in China plays a key role and is effectively introduced by creditors when corporate governance is weak. Our results also have implications to policymakers in that legal environment not only directly affects firm behaviors, but also influences creditors' role in corporate governance.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A

See Tables A1 and A2

Table A1
The First-Stage Regression Results of PSM.

Variable	(1)
$Size_{it}$	-0.148*** (-8.17)
Lev_{it}	0.682*** (8.21)
ROA_{it}	-1.891*** (-7.67)
$\Delta Sales_{it}$	0.005 (0.21)
ST_{it}	0.517*** (8.08)
PPE_{it}	-0.369*** (-3.05)
WC_{it}	0.000 (0.01)
Age_{it}	0.291*** (8.36)
$RetVol_{it}$	1.645*** (4.42)
$Zscore_{it}$	-0.013*** (-2.63)
Constant	1.503*** (3.59)
Ind & Year	YES
Observations	12,241
R^2	0.178

Note: In this table presents the first-stage regression results of PSM. The figures reported in brackets are *t*-statistics, based on standard errors clustered at the firm level. *** indicates significance at the 1% level.

Table A2
Matching Efficiency for the Variables Used in PSM.

Variable	$LIT = 0$	$LIT = 1$	Diff_Test (<i>p</i> value)
<i>Size</i>	21.325	21.321	0.999
<i>Lev</i>	0.626	0.637	0.103
<i>ROA</i>	0.006	-0.017	0.000***
$\Delta Sales$	0.261	0.210	0.088*
<i>PPE</i>	0.261	0.262	0.579
<i>WC</i>	-0.012	-1.020	0.185
<i>Age</i>	2.371	2.376	0.591
<i>RetVol</i>	0.152	0.153	0.518

Note: In this table presents the mean values and the difference in mean values for the matching variables between the treatment sample and the control sample. *** and * indicate significance at the 1% and 10% levels, respectively.

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