Financial Market Efficiency and the Governance Role of Government

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Abstract

Government monitoring serves as a governance mechanism to mitigate agency issues within state-owned enterprises (SOEs). We theoretically demonstrate that the evolution of financial markets, as an alternative external governance mechanism, reduces the necessity for government intervention. Using a difference-in-difference approach, we find that participation in a short-selling program significantly enhances the internal governance of SOEs, while concurrently reducing government control significantly. This effect is more pronounced for SOEs with stronger internal governance or those experiencing more severe agency problems. Our findings reveal a substitution effect between government monitoring and market discipline.

JEL Classification: G32; G14; G18
Keywords: Government Control, Internal Governance, External Governance, Short-Selling, SOEs

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1. Introduction

Coase (1960) proposed that government functions as a special type of "super-firm" that influences the allocation of production factors through administrative decision. In this framework, government control and internal corporate governance can serve as substitutes for state-owned enterprises (SOEs) (Qian, 2001; Tian and Estrin, 2008; He et al., 2016), with the government acting as a governance block shareholder. Existing research indicates that developed financial markets function as an external mechanism for corporate governance. However, the impact of improvements in financial market efficiency on the governance role of the government remains underexplored (Datta-Chaudhuri, 1990; Tanzi, 2011; Kollintzas et al., 2018). This paper examines the allocation of administrative control over firm operations between government monitoring and internal governance in Chinese state-owned firms as the financial markets become more efficient. Specifically, we theoretically demonstrate and provide empirical evidence that the development of financial markets, as an external governance mechanism, promotes more effective internal governance while reducing the demand for government control and monitoring, as reflected by the proportion of government ownership in state-owned enterprises.

Government monitoring over firms is costly primarily because the government may prioritize social objectives or broader responsibilities over profit maximization, potentially undermining the efficiency of SOEs (Shleifer and Vishny, 1994; Shleifer,

1998; Bai et al., 2000; Qian, 1996, 2001). However, in an imperfect institutional environment, characterized by inadequate property rights protection, underdeveloped capital markets, or insufficient taxation and legal protections, government ownership and control become necessary (Qian, 2001).[1] Qian (2001) posits that government ownership and control can function as a corporate governance mechanism. During economic development, government oversight of firms acts as a transitional institution providing a substitute for other corporate governance structures. In contrast, as financial markets become more efficient and well-developed, they promote improved corporate governance practices within firms (Massimo, et al., 2013). Consequently, a reduction in government control can be anticipated due to a diminished agency problem.

We first construct a theoretical model and propose a framework where the government actively monitors firm operations and enforces penalties on management upon detecting tunneling activities. Concurrently, firms implement governance mechanisms designed to mitigate the likelihood of tunneling.[2] When the stock market is more efficient, tunneling is more likely to be reflected in the stock price. This enhances shareholders' incentives to strengthen internal governance, thereby reducing the need for government oversight. In our model, the removal of a short-sell constraint functions as an external governance mechanism that enhances internal governance, and crowds out government monitoring. We further demonstrate that government control

[1] On the other hand, the government needs SOEs to provide a social safety net and burden other social responsibility (Bai et al., 2000) when institutions are not perfect, and needs SOEs to get more revenue in avoidance of efficiency losses from tax distortions (Gordon et al., 1999).

[2] Following Johnson et al. (2000), "tunneling" in our paper refers to the illicit or unethical transfer of resources out of a company by its controllers to the detriment of shareholders or other stakeholders.

weakens more for firms with stronger internal governance in restraining tunneling activities.

We then empirically examine the impact of a short-selling program on government control. The short-selling program, introduced by the Shanghai and Shenzhen Stock Exchanges on March 31, 2010, permitted short-selling and margin-trading for a selected group of stocks in China. This program removes short-sale restrictions on a group of stocks selected randomly by government each year. Initially, 86 firms participated in the pilot phase. By 2019, this number had grown to 1,650 firms, excluding those that had been delisted. This program offers an ideal setting to examine the impact of short-selling and margin-trading on the governance role of government for state-owned enterprises (SOEs).

Government ownership of firms play a crucial role in enabling government intervention in China. Politicians may leverage this ownership to influence SOEs, aiming to support the economy in a broader manner (Fan et al, 2011; Deng et al., 2020). Government maintains control over listed SOEs by appointing top executives, many of whom possess political connections as current or former government officials or bureaucrats (Chen et al., 2011; Li et al., 2020). In the empirical work of this paper, we use state ownership as a proxy for government control. Specifically, we used four proxies to measure the degree of government control over SOEs: the proportion of the largest state shareholders, the proportion of state shareholders among the top ten shareholders, the control rights of the ultimate controlling shareholder, and the cash

flow rights of the ultimate controlling shareholder (Fan, et al. 2013; Wang and Xiao; 2009).

We employ a difference-in-differences (DID) regression model, and we define the time period after the year in which each firm participated in the short-selling program as the post-treatment year. Our findings reveal a significant decline in all proxies for government control following firms' entry into the short-selling program, supporting the prediction that the improved stock market efficiency reduces government control, thus weakening the governance role of government. We then examine the dynamics of the short-selling program's impact on government control to ensure that our results are not driven by potential parallel trends. We conduct several robustness tests, including incorporating the firms that later withdrew from the short-selling program, using the Propensity Score Matching (PSM) method to identify control firms, performing placebo tests, and expanding the sample to include non-main board listed stocks. Our results consistently hold across these tests.

Next, we investigate the mechanism through which the short-selling program affects government control, employing the mediating effect method (Becker and Woessmann, 2009; Dippel et al., 2019; and Frolich et al.,2017). Our analysis shows that market discipline, driven by short-selling, enhances internal governance, which subsequently acts as a substitute for government control over SOEs. Further, we explore cross-sectional variations in the impact of the program on government control and find that the program has a more pronounced effect on firms with stronger internal governance or those facing more severe agency problems.

Our study contributes to at least three distinct areas of literature. First, while there is an extensive body of research on government control, the majority of these studies primarily focus on the consequences of government control or ownership. In contrast, our study explores the impact of short-selling programs on government decisions regarding the ownership of SOEs. It is noteworthy that the literature has extensively discussed the trade-offs between government control and market discipline (e.g. Boubakri et al., 2018). To maximize overall societal welfare, the government must carefully balance its influence with market forces, and continuously optimize its strategies, as emphasized by Tanzi (2011). Therefore, understanding the factors that influence the optimal level of government control is both crucial and academically valuable. Our findings provide empirical evidence that the optimal level of government control declines as financial markets develop.

Second, our paper emphasizes how short-selling can influence not only market activities but also institutional structures. There is a substantial body of evidence highlighting the positive role of short-selling in improving pricing efficiency, detecting financial misconduct, enhancing liquidity, and improving corporate governance (Karpoff and Lou, 2010; Saffi and Sigurdsson, 2011; Beber and Pagano, 2013; Massimo et al., 2013; Massimo et al., 2015; Fang et al., 2016). Focusing on the Chinese context, we provide new insights into how financial market developments can alter the balance between state control and market discipline in transitional economies.

Third, our findings also contribute to the literature on the relationship between financial markets and large shareholders in disciplining managers (Cyert et al., 2002;

Faure-Grimaud, 2002; Ferreira et al., 2011; Roosenboom et al., 2014; Gorton et al., 2017). He et al. (2019) finds that as the efficiency of the initial public offering (IPO) pricing improves, Chinese firms opt for stronger corporate governance structures upon IPO. We extend their research by showing that, as the largest shareholder of SOEs, the government reduces ownership and control over these firms in response to the stronger governance structures resulting from financial market development.

The remainder of this paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the theoretical analysis and the development of the empirical hypothesis. Section 4 provides an overview of the institutional background of the short-selling and margin-trading in China. Section 5 details the data and the construction of variables. The empirical model and results are presented and discussed in Section 6. Section 7 concludes the paper.

2. Related Literature

2.1 Government Control

The existing literature explores the various dimensions of government ownership in SOEs and its implications for efficiency and performance. From a broader economic perspective, government control is often viewed as costly. Critics argue that it leads to inefficiencies and higher agency costs, as governments tend to prioritize social objectives over profit maximization (Shleifer and Vishny, 1994; Shleifer, 1998; Bai et al.,2000; Qian, 1996, 2001). Government's inability to commit to long-term strategies, combined with its extensive responsibilities, exacerbates these issues (Qian 2001). Moreover, government ownership is also associated with adverse effects on corporate

governance, such as increased information asymmetry (Borisova and Yadav, 2015), larger cash holdings, heightened agency problems (Chen et al., 2018), and greater private benefits (D'Souza and Nash, 2017).

Consistent with the negative effects of government control, several studies suggest that privatization leads to better performance, strengthened internal corporate governance and improvs investor protection (Aivazian et al., 2005; Boubakri et al., 2005; Nash, 2017; Rousseau and Xiao, 2008; Huang et al., 2020). Specifically, privatization has been linked to increased sales, higher labor productivity and improved profitability, primarily due to reduced managerial expenses relative to sales (Bai et al., 2009).

In contrast, other studies indicate that government control can positively influence firm performance by fostering innovation, strengthening corporate governance, mitigating excessive risk-taking, and promoting environmental sustainability, particularly in markets with weak institutional frameworks (Chen et al. 2009; Li et al. 2008; Qian et al. 2006). For example, Qian et al. (2006) argue that government control in China serves a corporate governance role by alleviating agency problems and enhancing monitoring mechanisms. Jiang et al. (2010) find that government control and regulation protect minority shareholders by preventing the misappropriation of corporate resources by controlling shareholders.

The impact of government control on firm value, as outlined in the existing literature, is influenced by various external factors. In more efficient financial markets in pricing,

where external governance mechanisms play a greater role, the positive effects of government control may diminish, potentially leading to a reduction in the level of government control. In other words, the degree of government control over firms is not entirely exogenous but is influenced by various factors. Some studies have identified the impact of macroeconomic fiscal conditions, market transaction costs, and institutional development on the extent of government control. For example, studies have shown that fiscal revenue considerations can increase government control (Che and Qian, 1998; Jin and Qian, 1998; Brandt and Zhu, 2001). Market transaction costs in the market mechanism and institutional enhancements, such as the rule of law, property rights, capital markets, social safety nets, adequate taxation, and fiscal institutions, also affect government's decision to reduce ownership in SOEs (Gordon et al., 1999; Qian, 2001). Additionally, product competition has been linked to privatization (Hu et al., 2024).

Jiang and Kim (2015) discuss the role of financial market development in providing transparency, access to capital, enhanced shareholder rights, market discipline, and attraction of foreign investment, all of which contribute to improving corporate governance practices. With development of financial market, the question of whether governments will reduce their control over SOEs remains open.

2.2 Short-Selling and Financial Market Efficiency

The role of short-selling on financial markets and the economy has been a subject of extensive debate. Critics contend that short-selling can facilitate the spread of misleading information and enable stock price manipulation, particularly in firms

characterized by limited transparency (Zhao, 2016). As a result, short sellers are frequently criticized for exerting immense downward pressure on stock prices, with some arguing that their actions may contribute to market crashes (Hong and Stein, 2003; Mitchell et al., 2004; Bris et al., 2007; Ni et al., 2020). In contrast, proponents of short-selling argue that it enhances market liquidity, enables informative trading, and speeds up price adjustment to new information, thereby promoting greater price efficiency (Diamond and Verrecchia, 1987; Chang et al., 2014; Beber and Pagano, 2013; Chen and Rhee, 2010). Short sellers are thought to play a corrective role by addressing overpricing, mitigating the risk of future stock price crashes, and enhancing the probability of government punishing when warranted (Deng and Gao, 2018). Consequently, they act as an additional monitoring mechanism within financial markets.

The literature further examines the impact of short-selling on financial decision-making. Small firms facing lower stock prices due to short-selling often respond by reducing equity issuance, investments, debt ratios, capital expenditures, and R&D expenses (Gilchrist et al., 2005; Grullon et al., 2015; Ni et al., 2020). Short-selling incentivizes traders to acquire private information that may be unknown to managers, thereby enhancing the role of stock prices as informative signals for investment decisions (Schiller, 2017). Moreover, short-selling has been associated with improved performance in product markets (Chu, 2015) and fosters innovation by disciplining managers through active trading and reducing information asymmetry (He and Tian, 2016). However, some studies suggest that firms exposed to short-selling may face

heightened worsened financial constraints, higher external financing costs, and an increase in cash holdings as a response (Meng et al., 2020; Wang, 2014).

Short-selling is regarded as an effective external governance mechanism that enhances stock price information efficiency, with short sellers acting as a significant disciplinary force in corporate settings (Karpoff and Lou, 2010). Firstly, allowing short-selling leverages the threat of investor exit in response to negative which acts as a governance mechanism. This mechanism enhances managerial oversight and alleviates agency problems (Edmans, 2009; Edmans et al., 2013; Admati and Pfleiderer, 2009; Gallagher et al., 2013). Secondly, research indicates that short sales mitigate agency costs associated with controlling shareholders, resulting in a reduction in tunneling following the introduction of short-selling mechanisms (Chen et al., 2018). Thirdly, short-selling imposes significant consequences for managerial misconduct, as unethical behavior can precipitate declines in stock prices, thereby reducing managerial compensation and potentially leading to managerial turnover. Empirical evidence suggests that short-selling effectively curtails firms' earnings manipulation (Massimo et al., 2015; Fang et al., 2016), uncovers accrual anomalies, and effectively mitigates overvaluation (Hirshleifer et al., 2011). It also incentivizes firms to improve corporate governance practices (Massimo, et al., 2013) and to design more incentive compensation contracts (Angelis et al., 2017).

In summary, short-selling functions as an effective external governance mechanism, with short sellers acting as corporate disciplinarians. It serves as a powerful force in bolstering governance and improving market efficiency, thereby strengthens the

disciplinary effects of exit threats from significant shareholders (Edmans, 2009; Edmans et al., 2013; Admati and Pfleiderer, 2009; Gallagher et al., 2013). This reduces tunneling behavior and enhances monitoring effectiveness. Following this stream of studies, we explore the role of short-selling in government control, a topic that has received limited attention in the literature. This underscores the novelty of our study in this context.

3. Theoretical Model and Hypotheses Development

We develop a model to analyze the substitution effects among government monitoring, corporate governance, and market discipline. In particular, our analysis focuses on how government monitoring and corporate governance adjust in response to increased transparency in financial markets.

In this model, there is a SOE that consist of a manager and a government, with the government being the controlling shareholder[3]. The government plays two roles in SOEs: first, the government, representing all shareholders, chooses the corporate governance structure and maximizes the firm value; Second, as the administrator of social affairs, the government can monitor and intervene in the firm using its administrative power for sake of the whole society. The manager can spend effort e to conduct tunneling activities, while the shareholders can discipline the manager's behavior and establish corporate governance g to prevent tunneling activities. The probability that tunneling succeeds is $p(g,e)$ as an exogenous function of manager

[3] To be brief in the theoretical model, we do not explicitly include other shareholders, and we assume the government cares about all shareholders' utility even though it does not own 100% of the shares.

effort, e, and corporate governance, g, satisfying $p_g(.) < 0$, $p_{gg}(.) > 0$, $p_e(.) > 0$ and $p_{ee}(.) < 0$.

At the same time, given the corporate governance, the government can also use its administrative power to mitigate the manager's moral hazard. Specifically, once tunneling occurs and is detected, the government imposes non-pecuniary punishment on the manager, such as demotion. In our model, the intensity of government monitoring is measured as the disutility of the manager if tunneling is successful. We use u for the monitoring intensity chosen by the government as a function g. The cost of government monitoring intensity is λu with $\lambda > 0$.

In the absence of the manager's tunneling and the cost of corporate governance, the stand-alone value of the firm is V. Let T denote the value loss associated with tunneling, so that the firm value will decrease to $V - g - T$ once tunneling occurs and the firm spends g for corporate governance. So, the actual value of the firm with no information asymmetries is:

$$V_0 = \begin{cases} V - g & w.p. \quad 1 - p \\ V - g - T & w.p. \quad p \end{cases} \tag{1}$$

The expected firm value is $EV_0 = V - g - pT$. Let V_m denote the market value of the firm. We assume there are some frictions in the stock market, and the market value decreases by δT when tunneling occurs, where δ measures the market efficiency in trading or market transparency and satisfies $0 \leq \delta \leq 1$. A higher value of δ indicates greater market transparency. The market value of the firm with frictions is:

$$V_m = \begin{cases} V - g & w.p. \ 1 - p \\ V - g - \delta T & w.p. \quad p \end{cases} \tag{2}$$

So, the expected market value of the firm is $EV_m = V - g - p\delta T$. When short-selling and margin-trading is allowed, market efficiency improves and the value of δ increases.

The timeline of the sequential game is as follows:

Step 1: The shareholders select the optimal level of corporate governance to maximize the weighted average of the firm's market value and actual value with k[4] representing the weight assigned to market value and $1-k$ to actual value, that is $U = kEV_m + (1-k)EV_0$. The optimization problem of the shareholders is as follows:

$$\max_g U = V - g - p(g,e)[k\delta T + (1-k)T] \tag{3}$$

Step 2: Observing g, the government chooses the optimal monitoring level, u, to maximize its expected utility, defined as the sum of shareholder utility and the cost of monitoring. The optimization problem of the government is as follows:

$$\max_u \Pi = -\lambda u + U \tag{4}$$

Step 3: Observing g and u, the manager chooses the optimal level of effort e for tunneling to maximize his utility. The manager's optimization problem is as follows:

$$\max_e W = -pu + pT - e. \tag{5}$$

Before we proceed, we assume that $p_{eg} < 0$, that is, the benefit of manager's effort decreases as corporate governance improves.

[4] The weight parameter *k* changes from zero (excluding zero) and one, and its value does not affect our major results as long as it is zero.

Theorem 1: *With effective corporate governance, enhanced market efficiency leads to improved corporate governance while weakened government monitoring.*

Proof: The first order condition for the manager's optimization problem (5) with respect to *e* gives:

$$1 = p_e(T - u) \tag{6}$$

Using the Implicit Function Theorem, we have (the manager takes g and u as exogenous):

$$(p_{eg} + p_{ee}e_g)(T - u) = 0 \tag{7}$$

$$p_{ee}e_u(T - u) - p_e = 0 \tag{8}$$

Then we have

$$e_g = -\frac{p_{eg}}{p_{ee}} \tag{9}$$

$$e_u = \frac{1}{(T-u)^2 p_{ee}} \tag{10}$$

With $p_{eg} < 0$ and $p_{ee} < 0$, we have $e_g < 0$ and $e_u < 0$.

For the government's choice on monitoring, the first order condition for the government's optimization problem in (4) with respect to u gives:

$$-\lambda + U_u = -\lambda - p_e e_u[k\delta T + (1 - k)T] = 0 \tag{11}$$

The second order condition for the government's optimization problem with respect to u is:

$$-[p_{ee}(e_u)^2 + p_e e_{uu}] < 0 \tag{12}$$

Applying the Implicit Function Theorem to (11) with respect to g, we have

$$p_{ee}(e_g + e_u u_g)e_u + p_{eg}e_u + p_e(e_{ug} + e_{uu}u_g) = 0 \tag{13}$$

Or equivalently

$$u_g = -\frac{p_{ee}e_g e_u + p_{eg}e_u + p_e e_{ug}}{p_{ee}(e_u)^2 + p_e e_{uu}} \tag{14}$$

From equation (12) we know the denominator of equation (14), $p_{ee}(e_u)^2 + p_e e_{uu}$, is positive. We have $p_{ee}e_g e_u < 0$ in the numerator because $p_{ee} < 0$, $e_g < 0$, and $e_u < 0$. We also know $p_{eg}e_u > 0$ because $p_{eg} < 0$ and $e_u < 0$. Therefore, when $|p_{eg}|$ is large, which means the effect of corporate governance on marginal tunneling behavior is large, we have the numerator is positive and then $u_g < 0$ no matter the term $p_e e_{ug}$ is positive or negative.

The first order condition for the shareholders' optimization problem in (3) with respect to g gives:

$$-1 - [p_g + p_e(e_g + e_u u_g)][k\delta T + (1-k)T] = 0 \tag{15}$$

Applying the Implicit Function Theorem to (15) with respect to δ, we have

$$\begin{aligned}
&[p_g + p_e(e_g + e_u u_g)]kT \\
&\quad + [k\delta T + (1-k)T]\{p_{gg} + p_{ge}(e_g + e_u u_g) + p_{eg}(e_g + e_u u_g) \\
&\quad + p_{ee}(e_g + e_u u_g)^2 \\
&\quad + p_e(e_{gg} + e_{gu}u_g + e_{ug}u_g + e_{uu}{u_g}^2 + e_u u_{gg})\}\frac{dg}{d\delta} = 0
\end{aligned} \tag{16}$$

The second order condition for the shareholders' optimization problem in (3) implies:

$$p_{gg} + p_{ge}(e_g + e_u u_g) + p_{eg}(e_g + e_u u_g) + p_{ee}(e_g + e_u u_g)^2 + p_e(e_{gg} + e_{gu} u_g + e_{ug} u_g + e_{uu} {u_g}^2 + e_u u_{gg}) > 0$$

(17)

And as $p_g < 0, p_e > 0, e_g < 0, e_u < 0, u_g < 0$, when $|p_g|$ is large, that is, the corporate governance is effective, we have $p_g + p_e(e_g + e_u u_g) < 0$, and then we have $\frac{dg}{d\delta} > 0$, that is, when the market becomes more transparent, the corporate governance will improve

Taking the first derivative of equation (11) with respective to δ given g, we can get:

$$-[p_{ee}(e_u)^2 + p_e e_{uu}] \frac{\partial u}{\partial \delta} - p_e e_u kT = 0$$

Or equivalently

$$\frac{\partial u}{\partial \delta} = \frac{-p_e e_u kT}{p_{ee}(e_u)^2 + p_e e_{uu}}$$

(18)

Taking full differential of equation (11) with respective to δ, we have

$$-(p_{eg} e_u + p_{ee} e_g e_u + p_e e_{ug}) \frac{dg}{d\delta} - [p_{ee}(e_u)^2 + p_e e_{uu}] \frac{du}{d\delta} - p_e e_u kT = 0$$

(19)

And then we can get

$$\frac{du}{d\delta} = \underbrace{\frac{-p_e e_u kT}{p_{ee}(e_u)^2 + p_e e_{uu}}}_{\frac{\partial u}{\partial \delta}} \underbrace{- \frac{p_{ee} e_g e_u + p_{eg} e_u + p_e e_{ug}}{p_{ee}(e_u)^2 + p_e e_{uu}}}_{\frac{\partial u}{\partial g}} \frac{dg}{d\delta}$$

(20)

Since $p_e > 0, e_u < 0$, so we have $p_e e_u kT < 0$. We also know $p_{ee}(e_u)^2 + p_e e_{uu}$ is positive from the second order condition, so we know $\frac{\partial u}{\partial \delta} > 0$ from equation (18). This means when the market transparency improves, the government control will increase with the corporate governance level being fixed. However, as $p_{eg} e_u > 0$, $p_{ee} e_g e_u < 0$, so when $|p_{eg}|$ is large enough, we have the term $-(p_{eg} e_u + p_{ee} e_g e_u + p_e e_{ug}) \frac{dg}{d\delta}$ is negative with $\frac{dg}{d\delta} > 0$, and $-(p_{eg} e_u + p_{ee} e_g e_u + p_e e_{ug}) \frac{\partial g}{\partial \delta} - p_e e_u kT$ is negative, which implies $\frac{du}{d\delta} < 0$. Therefore, although when the market becomes more transparent, the government would have an incentive to increase monitoring ($\frac{\partial u}{\partial \delta} > 0$), just as other stakeholders, however, the improvement of corporate governance ($\frac{dg}{d\delta} > 0$) crowds out the government monitoring ($\frac{\partial u}{\partial g} < 0$), and overall, the government monitoring weakens. ■

Intuitively, on the one hand, when market transparency increases, the government would have incentive to increase control to improve the value of shareholder, and we call this direct effect; on the other hand, market transparency improves corporate governance, and when corporate governance is effective, the substitution effect is greater than the direct effect, and the government control decreases.

In summary, when the corporate governance is effective, the gain from improving corporate governance is large, there is a substitution effect between corporate governance and government monitoring to balance the overall efficiency of the system.

Corollary 1: *Firms with more serious moral hazard problem or with corporate*

governance that is more effective in controlling moral hazard will experience a greater reduction in government monitoring as the market becomes more efficient.

Proof: Plugging (9) and (10) into the first order condition for the shareholders' optimization problem with respect to g in (15), we have:

$$-1-\left[p_g+p_e\left(-\frac{p_{eg}}{p_{ee}}+\frac{u_g}{(T-u)^2 p_{ee}}\right)\right][k\delta T+(1-k)T]=0 \tag{21}$$

Or equivalently:

$$-\left[\frac{1}{k\delta T+(1-k)T}+p_g\right]\frac{p_{ee}}{p_e}+p_{eg}=\frac{u_g}{(T-u)^2} \tag{22}$$

With $\frac{-1}{k\delta T+(1-k)T}-p_g>0$, we can see that the greater is T or $|p_g|$ or $|p_{eg}|$, the greater is $|u_g|$. ■

Based on our theoretical analysis, we aim to test the following empirical hypotheses:

Hypothesis 1: When market transparency improves, government control weakens due to improvements in corporate governance.

Hypothesis 2: For firms with more severe moral hazard problems and highly effective corporate governance in curbing tunneling, government control weakens more.

4. Institutional Background of Short-selling in China

The short-selling system is a fundamental credit mechanism worldwide and serves as a crucial foundation for the effective functioning of securities markets in many global economies. However, short-selling in the Chinese securities market was prohibited since the establishment of the security exchange in 1990s due to concerns over potential market crash and uncontrolled volatility. The short-selling and margin-trading pilot

scheme was implemented in March 2010. The timeline of this reform is presented in Table 1 of Appendix B. On March 30, 2010, the Shanghai and Shenzhen Stock Exchanges officially notified the six pilot security firms, which began accepting applications for short-selling and margin-trading the following day. The pilot was launched on March 31, 2010, with 90 underlying securities, marking the official introduction of short-selling and margin-trading. By the end of 2010, a total of 92 stocks were eligible for short-selling and margin-trading, excluding delisted firms. 6 of these stocks were delisted that year.

On November 25, 2011, the Shanghai and Shenzhen stock exchanges updated the implementation rules for short-selling and margin-trading, transitioning the pilot into standard practice. In the same year, the list of eligible stocks was substantially expanded by 180, with one stock removed. By 2013, the list was expanded to include 678 stocks. In 2014, 207 additional stocks were added, bringing the total to 868 after removing the delisting stocks and the deleted stock. The pace of expansion slowed from 2015 to 2018, however, in 2019, the number of short-selling target stocks increased to 1,650. Concurrently, the exchange established an evaluation adjustment mechanism to filter out ineligible stocks and bring in the high-quality ones, thereby stabilizing and improving the structure of underlying securities. These expansions enhanced the activity of the short-selling and margin-trading market, and resolved the problem of diversification of investors' investment strategies.

Eligible underlying securities for short-selling and margin-trading include stocks, securities investment funds, bonds and other financial instruments. These stock

securities must meet several criteria according to the *Detailed Rules for the Implementation of Short-selling and Margin-trading Transactions of the Shanghai Stock Exchange*: (1) The firm must have been listed at least for three months; (2) For margin-trading, it must have a minimum of 100 million tradable shares and a market value of the tradable shares of at least RMB 500 million. For short-selling, it must have a minimum of 200 million tradable shares and a public float of at least RMB 800 million (approximately USD 127.3 million); (3) The firm must have at least 4,000 shareholders; (4) On a rolling three-month basis, the daily turnover must be no less than 15% of index turnover, the daily trading value must be at least RMB 50 million, the average return must not deviate by more than 4% from the index return, and the return volatility must be no exceed five times the index volatility; (5) The firm must has completed the Split-Share Structure Reform process; (6) Qualified stocks must not be under investigation by the China Security Regulatory Commission (CSRC), i.e., the firm is not involved in a merger, buyout, reorganization, or under investigation for potential illegal activities. Additionally, eligible short-sellers must have a strong trading record, low bankruptcy risk, a minimum capital of RMB 500,000, no corporate insider status, and must demonstrate basic investment knowledge.

The market responded significantly to the short-selling and margin-trading pilot. For instance, short interest rose, and firms included in the short-selling pilot experienced significant negative returns across various event windows compared to control firms (Chen et al., 2018). Additionally, these pilot firms saw a notable negative price reaction upon the announcement of their inclusion on the short-selling list (Chang et al., 2014).

The pilot also affected other aspects of the capital market and pilot firms, just as we summarized in the introduction.

5. Data and Methodology

To evaluate the impact of short-selling and margin-trading on government control, we gathered data on designated short-selling stocks, firms' financial information, corporate governance, state ownership and government control data from the China Stock Market and Accounting Research (CSMAR) and the WIND databases. We manually collected additional certain part of corporate governance data from annual reports. Our sample period spans from 2003 to 2019. A firm is classified as an SOE when its ultimate controlling shareholder is a central or local government entity. We excluded SOEs that transitioned to non-SOEs three years before participating in the short-selling and margin-trading program, as well as those that became non-SOE firms prior2008 if they were not on the list. Firms that exit from short-selling and margin-trading were also excluded, focusing solely on mainboard firms. The final sample consists of 702 SOEs, totaling11,080 firm-year observations. This section presents the data and variables and describes the econometric methods employed.

5.1 Short-selling Timing sample

We create a dummy variable, $SHORT_{it}$, which equals one if firm i participated in short-selling and margin-trading in year t and zero otherwise. As shown in Table 1 of Appendix B, 1,650 firms were eligible for short-selling and margin-trading in 2019, of which 1,107 were SOEs (67%). Additionally, we require that the firm must have been an SOE for at least three years prior to its eligibility for the short-selling and margin-

trading program just as we mentioned before.

5.2 Government Control

We use several proxy variables that quantify the extent of government control over firms: (1) The *TOP1* variable is the largest shareholding percentage held by state shareholders among top ten shareholders. (2) The *TOP10* variable is the total ownership percentage of state shareholders among the top ten large shareholders; (3) *CONTR_A* is the proportion of control rights held by the state-owned ultimate controlling shareholder; and (4) *CONTR_F* is the proportion of cash flow rights held by the state-owned ultimate controlling shareholder. The control rights and cash flow rights of the state-owned ultimate controlling shareholder are set to zero if the firm's ultimate controlling shareholder is no longer a government or the firm is no longer classified as an SOE.[5]

Table 2 of Appendix B reports descriptive statistics for the government control variables before and after the implementation of the short-selling and margin-trading program. Panel A shows the changes across all the SOEs, while Panel B focuses solely on SOEs that participated in the program. As shown in Panel A of Table 2, all measures of government control improved in observations following the introduction of the short-selling and margin-trading program, compared to observations prior to the program, including those for SOEs that never participated. For example, the mean(median) of the sum proportion of state shareholders in top ten shareholders increased from 43.90%

[5] We also created an index variable for the shareholding proportion of state *INDEX_S* is calculated as the equally-weighted average of all the five proxies, *TOP1, TOP10, CONTR_A and CONTR_F,* normalized with respect to their standard deviations to draw the figures for pretend test and placebo test.

(46.51%) to 46.71% (48.31%). However, among SOEs that participated in the program, all government control variables significantly decreased. For example, the mean (median) of *TOP1* decreased from 40.59% (41.95%) to 38.41% (39.07%), the mean (median) of *CONTR_A* decreased from 44.49% (45.29%) to 43.11% (43.82%), and the mean (median) of *CONTR_F* decreased from 40.37% (39.37%) to 38.45% (37.85%). The t-tests for all the variables before and after reform are highly significant, indicating a substantial difference in government control. These descriptive statistics are consistent with our expectation that firms participated in the short-selling exhibit lower levels of government control.

5.3 Mediating variables: Corporate Governance

To measure corporate governance, we follow prior studies (e.g., Fan et al., 2007), and collected data on board characteristics-specifically in professionalism, capability and independence-from the CSMAR database, supplemented by manual extraction from annual reports. In particular, we include four proxy variables to measure board professionalism, as follows: (i) *FINC*, defined as the proportion of board directors with financial experience (e.g. investment bank); (ii) the *TECH* variable is calculated as the proportion of board directors with prior experience in production, R&D, and design roles. Directors' specialized expertise, derived through relevant work experience, is expected to enhance board efficiency and vigilance (Faleye et al., 2018; Kroll et al., 2008; Wang et al., 2015); (iii) *ACAD*, representing the proportion of directors with academic experience, such as those who have served as professors or researchers. Directors with an academic background are generally expected to possess in-depth,

systematic knowledge of their respective industries, thereby enhancing their capacity to offer effective advisory support.[6] Consistent with prior literature, we assume that directors with professional or academic backgrounds contribute to stronger monitoring and advisory capabilities (Berger et al., 2014; Fan et al., 2007; Wincent et al., 2010). Additionally, we include measure of a board independence as a key governance characteristic. (iv) *INDP*, defined as the proportion of non-executive directors, capturing the board's level of independence. Finally, (v) we construct a composite corporate governance index (*INDEX_CG*), calculated as the equally weighted average of all four governance proxies, each normalized by its standard deviation.

Table 3 presents descriptive statistics for board characteristics before and after the implementation of the short-selling program. As the table shows, most of the measures of corporate governance quality significantly improved after the program. For example, the mean (median) of *ACAD* increased from 0.15 (0.11) to 0.30 (0.29), and the mean (median) of *INDEX_CG* increased from 1.41 (1.38) to 1.61 (1.62). T-tests reveal statistically significant differences across all variables before and after the pilot, indicating a substantial shift in board composition. These findings align with our expectation that firms participated in the short-selling exhibit improved corporate governance.

5.4 Control Variables

[6] Some researchers found that academic directors were more likely to be independent and that firms with such directors had a better overall performance (Francis et al., 2015; Jiang and Murphy, 2007) or a better CRS performance (Cho et al., 2017). These studies attributed their findings to professors having higher moral standard. In our setting, we mainly focus on directors' professional backgrounds; however, we do not eliminate the alternative explanation in terms of having higher moral standards.

Following prior research (e.g. Hu et al., 2024; Dinc and Gupta, 2011; Huang et al., 2017), we included the following control variables: firm size (*SIZE*), calculated annually as the natural logarithm of total assets plus one. This measure accounts for the tendency of larger companies to exhibit stronger corporate governance relative to small firms; financial leverage (*LEV*), calculated annually as the total liabilities divided by the total assets; return on assets (*ROA*), defined as the ratio of operating profit to total assets; return on sales (*ROS)*, calculated as operating profit divided by sales; return on investment (*ROI)*, calculated as investment return divided by total investments; firm age (*AGE)*, measured as the natural logarithm of the firm's age; market to-book ratio (*MB*), measures the growth opportunity and the external financing demand, both of which influence corporate governance; *CAP*, the capital raised in the IPO as deflated by the total assets; *HERF*, the Herfindahl index of industry concentration, calculated by total assets in each industry; free cash-flow (*FCF*), defined as the ratio of cash-flow from operation to total assets; cumulative abnormal return (*CAC*), measured as the cumulative holding period return for firm i in each year; board shareholding (*BSHA*), the percentage of common stock owned by all company directors; management shareholding (*MSHA*), the percentage of common stock owned by officers and inside directors of firm i; and *REG*, a dummy variable equals one for post-2012 observations and zero otherwise, controlling for the impact of the mixed-ownership reform on government control.

Table 4 reports descriptive statistics for the control variables included in our DID analyses. The mean (median) of financial leverage (*LEV*) is 52% (53%), with a standard

deviation of 20%. The average return on assets (*ROA*) is 3%, while the average return on sales (*ROS*) is 8%. The mean (median) of the industry concentration (*HEFD*) is 8% (2%) with a standard deviation of 11%.

5.5 Methodology

We use a difference-in-difference (DID) specification to examine the relationship between the short-selling and margin-trading program and government control, based on the following regression set-up:

$$GC_{it} = \beta_0 + \beta_1 SHORT_{it} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it} \quad (23)$$

In this specification, GC_{it} represents the degree of government control for firm i in year t, measured using four previously mentioned proxies. $\boldsymbol{A_i}$ and $\boldsymbol{B}_t$ are vectors of firm and year dummies that capture firm and year fixed effects, respectively. X_{it} is a set of time-varying control variables influencing the level of government control while ε_{it} is the error term. $SHORT_{it}$ is an indicator variable equal to one if firm i initiated short-selling and margin-trading by year t and zero otherwise. The coefficient of interest, β_1, therefore indicates the program's impact on government control. A negative and statistically significant β_1 would indicate that the program reduces government control. We use robust standard errors and cluster all standard errors at the firm level to control for potential serial correlation within firms over time. The DID estimation enables us to control for omitted variables. Firm fixed effects dummies capture time-invariant, firm-specific characteristics that can affect government control, while year dummies control for calendar-year-specific influences, such as common shocks and trends, that shape the government control over time.

6. Empirical Evidence

6.1 Effects of Deregulation on Governance Structure

Table 5 reports the results of the regression model based on equation (23). The DID coefficient β_1 is negative and statistically significant, indicating that following the implementation of the program, the government control of A-share companies significantly improved. For instance, the coefficient of *SHORT* in column (1) is -1.8142, suggesting an average reduction in the largest state-owned shareholding proportion due to the program. Similarly, the coefficient of *SHORT* in column (3) is -2.0352, indicating a roughly 2% decrease in the proportion of control rights held by the state-owned ultimate controlling shareholder after the program. These findings highlight the effect's statistical and economic significance. Additionally, the coefficients for other control variables exhibit expected signs, supporting the model's robustness.

6.2 Dynamics of Deregulation on Governance Structure

Although the results in Table 5 demonstrate that the government control decreased after the program of short-selling, the validity of our DID approach relies on the assumption of parallel trends. This assumption posits that the degree of government control among treatment and control firms was comparable prior to the program's initiation and that there was no observable trend in the governance control before the program's implementation (Finkelstein, 2007; Focke et al., 2017; Tanaka, 2015). We confirm the validity of our strategy by examining the dynamics of the relation between this program and government control over time, specifically investigating the presence of any pre-existing trend. We do this by including a series of dummy variables in the

standard regression to trace out the year-by-year effects of short-selling reform.

$$GC_{it} = \beta_0 + \beta_1 {D_{it}}^{-5} + \beta_2 {D_{it}}^{-4} + \cdots \beta_6 {D^0}_{it} + \cdots \beta_{11} {D_{it}}^{+5} + \beta_{12} {D_{it}}^{+6} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it} \quad (24)$$

Here the year dummy variables, the "$D's$" equal zero, except as follows: D^{-j} equals one for a firm in the jth year prior to the program, while D^{+j} equals one for a firm in the jth year after the program. We exclude the dummies for the first two-years (2003 and 2004) to focus on the dynamic effect of short-selling and margin-trading on government control relative to prior years. For instance, ${D_{it}}^{-2}$ equals one for the years two years before the eligibility of short-selling and margin-trading for firm i, while ${D_{it}}^{+6}$ equals one for all years that are six or more years after eligibility. The vectors $\boldsymbol{A_i}$ and $\boldsymbol{B}_t$ are vectors of firm and year dummies to control the firm fixed effect and year fixed effect, respectively. X_{it} denotes a set of time-varying control variables that influence government control levels and ε_{it} is the error term. If the pre-trend assumption holds, the parameter β_t for periods before the program should be statistically insignificant, and the parameter β_t for periods during and after the program should be negative and statistically significant.

Table 6 shows the results of this test using four government control proxies as the dependent variable. The coefficients for pre-program period dummies are all statistically insignificant, indicating no significant difference in pre-program trends across firms. In contrast, most e coefficients for the post-program period dummies are

negative and statistically significant, suggesting that the observed reduction in government control began only after the reform. These results imply that the short-selling program rapidly reduced government control.

Figure 1 in Appendix B displays the results using the government control *INDEX_S* along with the 95% confidence intervals, adjusted for firm-level clustering. The solid line represents the coefficients for the year dummy variables, while the two dotted lines indicate confidence intervals. The coefficients for the years following the program's initiation are negative and statistically significant, while preceding it are not significantly different from zero. This pattern indicates that the reduction in government control became significant only after the implementation of the short-selling program, which proves the absence of a pre-existing trend, confirming the absence of a pre-existing trend.

6.3 Robustness Tests

We conducted several robustness tests, with results presented in Table 7. First, we included firms that exited the short-selling and margin-trading program in later years following their initial participation[7]. Panel A of Table 7 shows the regression results. The coefficients for the variable *SHORT remain* significantly negative and closely aligned with those in Table 5 across all columns, reinforcing the robustness of our findings. For instance, the coefficient of *SHORT* in column (1) is -1.7007, closely matching the -1.8142 reported in column (1) of Table 5.

[7] The sample is comprised of 769 SOEs and 12204 firm-year observations including the samples that exited the short-selling and margin-trading program in later years subsequent to their initial participation.

Second, a potential concern is that if treatment and control firms differ along observable dimensions, they may also differ along unobservable dimensions. Such unobservable heterogeneity could limit our ability to control adequately for differences between the two samples. To address this, we apply the Propensity Score Matching (PSM) method to construct a matched sample of control firms, using a nearest-neighbor PSM approach. In the first step, we run a Logit regression with a binary indicator variable, set to one if the firm participates in the program and zero otherwise. According to the standard for short-selling and margin-trading in detailed implementation rules, we include previously mentioned control variables along with the fraction of tradable shares (*TDSH*), the Scale of short-selling (*SCAL*), and the turnover rate (*TURN*) as the covariant variables. Using the estimated coefficients from this regression, we predict the probability of treatment and perform nearest-neighbor matching to identify matched control firms. We then re-run the main test with the matched sample and report the results Panel B of Table 7. The coefficient for the term *SHORT* remains negative and statistically significant, further confirming the robustness of our findings.

Third, the identifying assumption of our DID framework may not hold if the firms in the program are selected by the government according to their performance and corporate governance. Specifically, our estimates would be systematically biased if the short-selling pilot program had a different impact on corporate governance in eligible firms compared to ineligible firms. As an additional robustness check, we conduct a placebo test following Cantoni et al. (2017). Specifically, we randomly assign a participation year to a subset of firms that are randomly selected without replacement.

The years are drawn from the actual set of participation years for short-selling and margin-trading. In each year, the number of firms assigned a placebo participation year matches the number of firms in the actual treatment groups, but the assignment is made to a randomly selected set of firms. Based on these random assignments, we then construct a falsified short-selling pilot reform variable $\widetilde{SHORT}_{it}$ and use it as the key regressor in a reduced-form regression similar to equation (23), i.e.,

$$GC_{it} = \beta_0 + \beta_1 \widetilde{SHORT}_{it} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it} \quad (25)$$

After 1000 iterations, if equation (25) is correctly specified, we expect the majority of these 1000 estimated coefficients $\hat{\beta}_1$ to be close to zero, with no systematically deviation from zero on average.

In Figure 2, using the government control index (*INDEX_S*) as a representative, we plot the distribution of t-statistics from the 1,000 estimates from the random draw of the short-selling pilot program years. The distribution of these t-statistics is centered around zero, with a mean t-statistic of 0.05997 and a mean coefficient of 0.0015. This suggests that the placebo test does not show significant deviations, enhancing our confidence that our findings are not severely affected by misspecification of the estimation equation.

Finally, we include firms that listed on the non-main board in the regression sample. The coefficient of *SHORT* remains statistically significant across all four columns, further supporting the robustness of our main findings.

6.4 The Mediating Effect of Corporate Governance

In the theoretical model, we demonstrate that the short-selling program reduces government control by enhancing market discipline, which in turn improves firms' internal governance, particularly corporate governance. This market-driven improvement can substitute for government control and governance for SOEs. In this section, we will empirically test this mechanism using a mediation analysis approach (Becker and Woessmann, 2009; Dippel et al. 2019; Frolich and Huber, 2017).

Firstly, we use the following regression to demonstrate that the short-selling program has significantly enhanced the corporate governance of SOEs:

$$CG_{it} = \alpha_0 + \alpha_1 SHORT_{it} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it} \quad (26)$$

In this analysis, CG_{it} represents the degree of corporate governance of firm i in year t. We incorporate five specific variables previously identified, while other variables align with those inequation (23). The coefficient α_1 quantifies the impact of short-selling on corporate governance, and we expect α_1 to be significantly positive. Table 8 reports the regression results for various proxy variables of corporate governance. The coefficients associated with *SHORT* are consistently positive and statistically significant, supporting our theory and indicating improvement in corporate governance across multiple dimensions. For instance, the coefficient of *SHORT* in column (3) is 0.0144, suggesting that the proportion of academic board directors increased by an average of 1.44% following the implementing of the short-selling program. Then we use the following regression analysis to investigate the mediating effect of corporate governance on government control:

$$GC_{it} = \varphi_0 + \varphi_1 SHORT_{it} + \varphi_2 CG_{it} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it} \quad (27)$$

In this regression analysis, we include both the *SHORT* dummy variable and corporate governance variable *CG*, represented by the corporate governance index *INDEX_CG*. The coefficient φ_2 captures the effect of corporate governance on government control, and we expect φ_2 to be significantly negative, indicating a substitution relationship between corporate governance and government control within SOEs. To address the potential endogeneity issue between corporate governance and government control, we employed an instrumental variable (IV) mediating effect method (Dippel et al. 2019; Frolich and Huber, 2017). In this regression, we utilized the industry-level mean of the corporate governance index (*INDEX_CG*) as the IV variable. Table 9 presents the regression results for various proxy variables of government control. The coefficients of *INDEX_CG* are all significantly negative, aligning with our theoretical conclusions and conjecture. For example, the coefficient of *CG* is -6.6299 in column (2), indicating that a one-unit increase in the corporate governance index corresponds to a 6.6% reduction in the shareholding proportion of state-owned controlling shareholders. This finding reinforces the notion that improved corporate governance serves as a mechanism for reducing government control over SOEs.

6.5 Cross-Sectional Analyses

Although all A-share SOEs listed on the mainland stock market were subject to the same short-selling and margin-trading program, the impact may have differed across various types of firms. To explore this, we examine how the program's effect on

government control varies depending on the firms' corporate governance characteristics. Our theoretical model suggests that when the margin effect of corporate governance-specifically in preventing tunneling behavior-is substantial, or when tunneling is extensive, an enhancement in corporate governance will likely reduce the level of government control. To test this hypothesis, we employ several variables to measure the effect of corporate governance and the severity of agency problems. The construction process of these variables is detailed below.

6.5.1 *Cross-Sectional Analyses with agency problem from firm level*

We begin by analyzing how changes in government control differ among firms with varying degrees of agency problems from a firm-level perspective. In firms where agency problems are more pronounced, corporate governance plays a more significant role in enhancing the efficiency of the board's monitoring functions after the market efficiency improves. Consequently, government control diminishes to a greater extent. To test this hypothesis, we construct three variables to measure the severity of agency problems in enterprises. The construction process and subsequent testing of these variables are described in detail below.

First, following the literature (Adams et al., 2010; Liu et al., 2015), we posit that higher levels of other receivables often indicate a serious agency problem. This is because significant agency problems can lead to increased tunneling activities, which are reflected in elevated levels of other receivables. Therefore, we use the variable *OTH*, defined as the proportion of other receivables to total assets, to quantify the firm's

tunneling level and the severity of its agency problem. Second, more severe agency problems are often reflected by higher levels of earnings management. Therefore, we use earnings management as additional proxy for agency conflicts between inside managers and external investors. This proxy helps us further assess the extent of agency issues impacting firm governance. When executive goals deviate from corporate value, the managers may have incentives to manipulate accruals or engage in real activities manipulation during the year to meet certain earnings targets (Guidry et al., 1999; Kothari, 2001; Roychowdhury, 2006). Additionally, the extent of earnings management serves as an indicator of the quality of a firm's earnings information. Higher level of earnings management suggests lower information transparency and greater information asymmetry within the enterprise (Bhattacharya et al., 2003; Lang et al., 2012; Francis et al., 2005; Ng, 2011). Therefore, in environments characterized by low information transparency, managers and shareholders can more easily obtain private benefit through hidden ways to circumvent internal and external supervision (Leuz et al., 2003; Gopalan and Jayaraman, 2012). This lack of transparency exacerbates agency problems (An et al., 2016), and underscores the importance of effective corporate governance to mitigate these issues (Xie et al., 2003). We use real earning management (*REM*) as outlined by Roychowdhury (2006) in our analyses. Third, firm growth can also provide insights into the impact of corporate governance and agency problems. On the one hand, firms with abundant investment opportunities stand to gain significantly from robust corporate governance, which is particularly important for firms with substantial growth prospects (Hutchinson and Gul, 2004); on the other hand, growing firms are more

adaptable, allowing corporate governance to play a more effective and pivotal role. To characterize growing firms, we use the variable market-to-book ratio (*MB*) to as a proxy.

We classified the samples based on the three variables and examined the differences in treatment effect between the top 40% (High group) and the bottom 40% (Low group) to accentuate the observed differences. Panel A of Table 10 presents the effects of the short-selling and margin-trading program on government control across different levels of other receivables groups. The absolute value of the coefficients of *SHORT* are more significant and larger in groups with high levels of other receivables, which is consistent with our conjecture. For example, *TOP1* shows a significantly decrease of 2.67 percent on average in the high level of other receivables groups and the coefficient for *SHORT* is insignificant in Column (2) of Panel A. We present the results of the treatment effect difference based on earning management in Panel B of Table 10. Just as expected, firms with higher level of earning management tend to experience a greater reduction in government control following the introduction of short-selling and margin-trading. Panel C of Table 10 shows the effects of the short-selling and margin-trading program on government control across different levels of market-to-book ratio groups. Consistent with our expectations, the short-selling and margin-trading have a more pronounced effect on firms with higher *MB*. These results that the coefficient for *SHORT* is more significant and has a r larger absolute value in high groups shows that the government control decreases more in firms with more severe agency problems.

6.5.2 *Cross-Sectional Analyses with product market competition and institution*

We then explore the variations in changes in government control among firms subject to different levels of industry competition and institutional environments, both of which can influence the effectiveness of corporate governance. First, from an information perspective, in more competitive industries or regions with well-developed institutional frameworks, the business environment tends to be more robust. Consequently, in such settings, short-selling and margin-trading is likely to lead to greater information disclosure. Moreover, firms in competitive industries tend to conceal information (Verrecchia, 1983; Boubaker et al., 2018). However, the introduction of short-selling and margin-trading may lead to greater information disclosure, thereby enhancing corporate governance and reducing government control. Second, acting as an external disciplinary mechanism, competitive product market can provide greater incentives for managers and mitigating the agency problem (Hart, 1983; Shleifer and Vishny, 1997; Dyck and Zingales, 2004; Baggs and Bettignies, 2007; Giroud and Mueller, 2010; Chhaochharia et al., 2017; Boubaker et al., 2018). This environment enables corporate governance to play a more effective role, improving the quality and efficiency of corporate governance.

We use two variables to measure product market competition. The first is Herfindahl Index (*HHI*), which is calculated as the sum of the squares of the ratio of the main business income[8] of each company in the industry to the total main business income of the industry, and the second one is another industry concentration variable (*CRT*),

[8] We also tried the Hfinddahl index that is calculated using total assets and owners' equity, and the results are similar and are consistent with our conjecture.

defined as the proportion of the main business income of the top eight companies in the industry to the total main business income of the industry. Additionally, we use the government-market relations (*GMR*) variable, developed by Fan et al. (2009), to measure the institution and marketization level of the province where the firm is located. The variable measures the extent of local government's involvement in businesses, with a higher *GMR* score indicating less government intervention and a greater reliance on market mechanisms for resource allocation (Hu et al., 2024).

We continued to classify the samples according to these three variables. We compared the treatment effect between the top 40% of the samples (High group) and the bottom 40% (Low group) in order to make the differences more pronounced. Panel A and Panel B of Table 11 illustrate the effects of the short-selling and margin-trading program on government control across different firm groups categorized by industry competition. The coefficients of *SHORT* are more significant in firms operating within more-competitive industries, indicating a greater reduction in government control in these firms. This finding aligns with our hypothesis. Panel C of Table 11 presents the results based on government-market relationship index, comparing firms located in provinces with varying level of government intervention. It is clear that firms situated in provinces with low government intervention (high government-market relationship index) experience a greater decrease in government control following the implementation of short-selling and margin-trading program. These results suggest that corporate governance is more efficient and has a substantial effect in reducing tunneling, thereby making government control less necessary.

7. Conclusion

This paper utilizes the short-selling and margin-trading program in China's stock market as a natural experiment to investigate its impact on the government control over SOEs. It illustrated the interplay between two kinds of governance modes for SOEs. Our theoretical analysis demonstrates that shareholders are incentivized to adopt more effective corporate governance structure in order to mitigate tunneling. Consequently, state shareholders will select an optimal control level that maximize the government's utility, resulting in a decrease in government control as corporate governance improves. As a result, the eligibility of short-selling and margin-trading enhances pricing efficiency and information transparency, thereby reducing government control over listed SOEs. Furthermore, when corporate governance effectively mitigates tunneling, the impact of short-selling on reducing government control is more pronounced. We conducted empirical analyses using data on the government control of A-share SOEs and confirmed that the short-selling program has a persistent, strong, and negative effect on government control. This effect is particularly pronounced in firms with more effective corporate governance or more severe agency problem. These findings remained robust across a variety of alternative tests. Additionally, our data enabled us to estimate the significance of the annual treatment effects through common pre-trend test.

Our findings have practical implications for policymakers. Our results show that the short-selling and margin-trading program significantly impacts government control of SOEs by improving corporate governance. Thus, from the perspective of corporate

governance, market-based discipline can serve a substitute for government control of SOEs, providing a valuable contribution to the existing literature. This conclusion also contributes to the SOE reform policies, particularly the mixed-ownership reform. The Chinese government could further promote SOE reform by improving pricing efficiency in the stock market.

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Appendix A: Variables' Definition

Table 1

This table provides the definitions of the variables employed in the paper.

TOP1	The largest proportion of state shareholders in top ten shareholders.
TOP10	The sum proportion of state shareholders in top ten shareholders.
CONTR_A	The proportion of control rights of the state-owned ultimate controlling shareholder.
CONTR_F	The proportion of cash flow rights of the state-owned ultimate controlling shareholder.
INDEX_S	Calculated as the equally-weighted average of all the four proxies, *TOP1, TOP10, CONTR_A, CONTR_F,* normalized with respect to their standard deviations.
FINC	Calculated as the proportion of board directors with finance working experience in firms other than the listed companies.
TECH	Calculated as the proportion of board directors with production, R&D, and design working experience in firms other than the listed companies.
ACAD	The proportion of directors with academic experiences, such as from having worked as professors or researchers.
INDP	Defined as the proportion of non-executive directors, capturing the board's level of independence.
INDEX_CG	Calculated as the equally-weighted average of all the four proxies, *FINC, TECH, ACAD and INDP,* normalized with respect to their standard deviations.
SHORT	Dummy variable which equals one if it corresponds to the year in which the firm is eligible for short-selling and zero otherwise.
SIZE	The natural logarithm of total assets plus one each year.
LEV	The financial leverage, calculated as the total debt divided by the total assets.
ROA	The return on assets, which is calculated as the ratio of operating profit to total assets.

ROS	The return on sales, which is calculated as the operating profit divided by sales.
ROI	The return of investment, which is calculated as investment return divided by investments.
AGE	Measured as the natural logarithm of the firm's age.
MB	The market-to-book ratio.
CAP	The capital raised in the IPO as deflated by the total assets.
HERF	Herfindahl Index of industry.
FCF	Free cash-flow, defined as the ratio of cash-flow from operation to total assets.
CAC	Cumulative abnormal return, measured as the cumulative holding period return for a firm in each year.
BSHA	Board shareholding, calculated as the percentage of common stock owned by all company directors.
MSHA	Management shareholding, calculated as the percentage of common stock owned by officers and inside directors of a firm.
REG	Dummy variable which equals one for post-2012 observations and zero otherwise.
D^{-i}	Year dummy variables which equal one for firm in the ith year before short-selling and margin-trading program and zero otherwise. $i = 1,2, \dots 5.$
D^{+i}	Year dummy variables which equal one for firm in the ith year after the short selling and margin trading program and zero otherwise. $i = 1,2, \dots 5.$
D^{0}	Dummy variable which equals one if it is the year that the short sell and margin trading is available, and zero otherwise.
D^{+6}	Dummy variable which equals one if it is six or more years after the year that the short sell and margin trading is available, and zero otherwise.
OTH	The proportion of other receivables in total assets.
REM	Real earning management following Roychowdhury (2006).

GMR	The relationship of market and government index developed by Fan et al. (2009), to measure the institution and marketization level of the province where the firm is located.
HHI	The square of the ratio of the main business income of each company in the industry to the total main business income of the industry.
CRT	The proportion of the main business income of the top eight companies in the industry to the main business income of the whole industry.

Appendix B: Figures and Tables

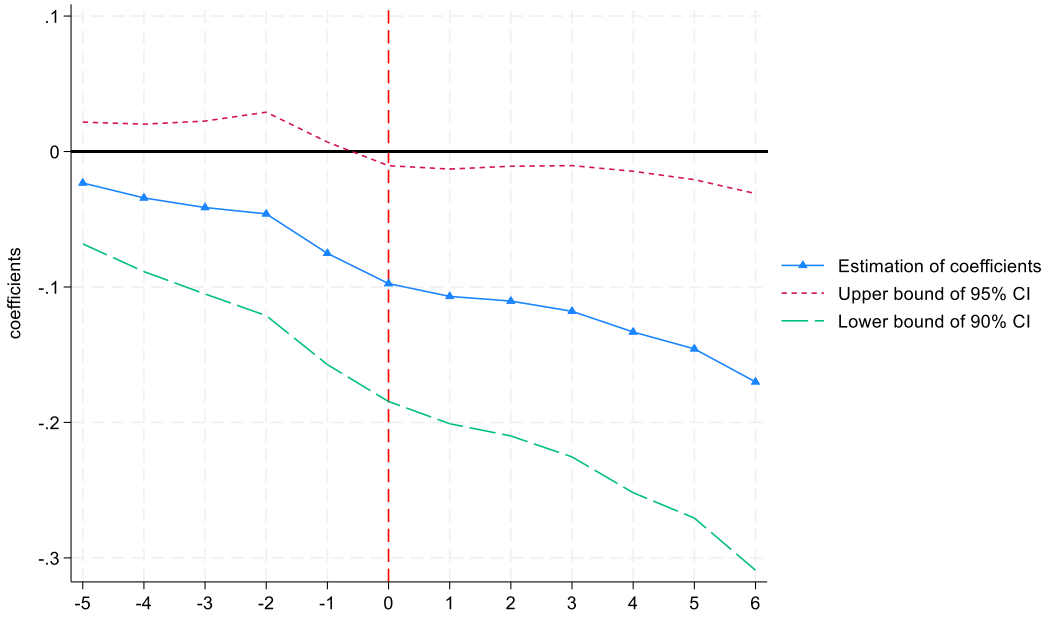

Figure 1. **Dynamics of short selling and margin trading on government control.**

The figure plots the impact of the program on government control, and we use the government control index (*INDEX_S*) as a representative in empirical work. We consider a nine-year window, spanning from four years before this program until four years after this program. The dashed lines represent 95% confidence intervals, adjusted for state-level clustering. The solid line contains the coefficients of the year dummies. Specifically, we report estimated coefficients from the following regression:

$$GC_{it} = \beta_0 + \beta_1 {D_{it}}^{-5} + \beta_2 {D_{it}}^{-4} + \cdots \beta_6 {D^0}_{it} + \cdots \beta_{11} {D_{it}}^{+5} + \beta_{12} {D_{it}}^{+6} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it}$$

Here the year dummy variables, the "D's" equal zero, except as follows: D^{-j} equals one for firm in the jth year before reform, while D^{+j} equals one for firm in the jth year after reform. We exclude the years four years before the program, thus estimating the dynamic effect of reform on the state ownership relative to the beginning years. The vectors A_i and B_t are dummies for firm and year, respectively. X_{it} is a set of time-varying control variables that determine the normal level of board characteristics and ε_{it} is the error term.

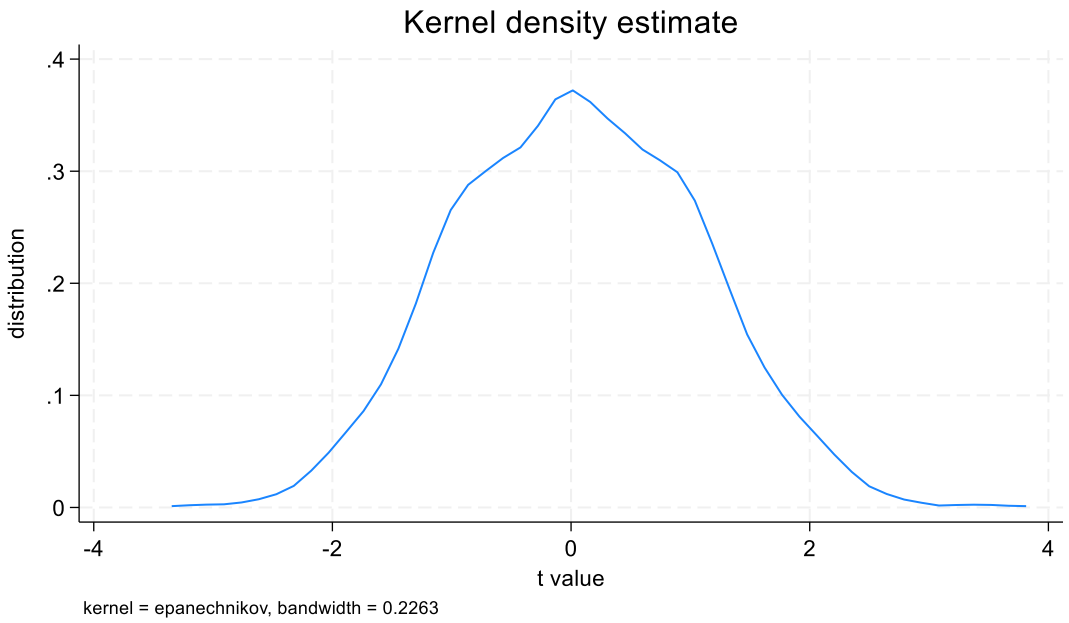

Figure 2. Placebo Test

We construct a false short-selling pilot reform variable $\widetilde{SHORT}_{it}$ and use it as the regressor of interest in a reduced-form regression similar to equation (13), i.e.,

$$GC_{it} = \beta_0 + \beta_1 \widetilde{SHORT}_{it} + \gamma X_{it} + \boldsymbol{A_i} + \boldsymbol{B}_t + \varepsilon_{it}$$

We use the government control index (*INDEX_S*) as a representative in empirical work. This figure plots the density distribution of the 1000 estimates from the random draw of the short-selling pilot reform years. We find that the distribution of these estimates is centered around zero (i.e., mean value of t statistic is 0.0599667, mean value of coefficients is 0.0015464).

Table 1

Timeline and the Number of firms of Short Selling and Margin Trading in each year

This table shows the timeline of this reform. No. added means the total number of new stocks added to the short-selling and margin-trading list in that year. No. deleted means the total number of new stocks deleted that year. No. on list means the cumulative number of stocks eligible for margin-trading and short-selling in that year. We exclude delisting firms in the sample.

Year	No. added	No. deleted	No. on list
2010	92	6	86
2011	180	1	265
2012	0	0	265
2013	467	54	678
2014	207	17	868
2015	0	5	863
2016	76	15	924
2017	36	33	927
2018	25	17	935
2019	731	16	1650

Table 2

Descriptive Statistics for Government Control of SOEs

This table presents the summary statistics of the four government control proxies (*TOP1, TOP10, GOV_SHR, CONTR_A and CONTR_F*) across different stages. We divide the entire sampling period from 2003 to 2019 into two stages: before and after the short-selling and margin-trading program for each firm. In the first stage, the firm is non-shortable, and in the second stage, it is shortable. Panel A shows the results for all the SOEs while Panel B focuses on SOEs that participated in short-selling and margin-trading program.

Panel A: All SOEs

	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
Overall observations from 2003 to 2019				
Obs.	11080	11080	10242	10242
mean	37.84	44.62	41.25	37.22
median	37.92	47.15	41.72	36.35
Observations before short selling and margin trading program (including SOEs that never participated in short selling and margin trading program)				
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
Obs.	8221	8221	7546	7546
mean	37.64	43.90	40.58	36.78
median	37.30	46.51	40.99	35.99
Observations after short selling and margin trading program				
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
Obs.	2859	2859	2696	2696
mean	38.41	46.71	43.11	38.45
median	39.07	48.31	43.82	37.85

Panel B: SOEs That Participated in Short Selling and Margin Trading Program

	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
Overall observations from 2003 to 2019				
Obs.	7822	7822	7185	7185
mean	39.79	47.18	43.98	39.65
median	41.03	49.52	44.78	38.81

Observations before short selling and margin trading program				
Obs.	4963	4963	4489	4489
mean	40.59	47.45	44.49	40.37
median	41.95	50.23	45.29	39.37
Observations after short selling and margin trading program				
Obs.	2859	2859	2696	2696
mean	38.41	46.71	43.11	38.45
median	39.07	48.31	43.82	37.85

Table 3

Descriptive Statistics for the Board Characteristics

This table presents the number of observations, means, and medians for the board characteristics of SOEs that participated in short-selling and margin-trading program from 2003 to 2019. The definitions of the variables can be found in Appendix A. We divide the entire sampling period from 2003 to 2019 into two distinct stages: prior to and following the implementation of short-selling and margin-trading program for each firm. In the initial stage for a firm, it is classified as non-shortable; conversely, in the subsequent stage, it becomes shortable.

	FINC	*TECH*	*ACAD*	*INDP*	*INDEX_CG*
Overall observations from 2003 to 2019					
Obs.	5407	7822	7822	7822	4433
mean	0.09	0.13	0.21	0.68	1.47
median	0.00	0.08	0.21	0.71	1.46
Observations before short selling and margin trading program					
Obs.	3096	4963	4963	4963	2988
mean	0.04	0.09	0.15	0.68	1.41
median	0.00	0.00	0.11	0.70	1.38
Observations after short selling and margin trading program					
Obs.	2311	2859	2859	2859	1445
mean	0.14	0.18	0.30	0.69	1.61
median	0.08	0.14	0.29	0.71	1.62

Table 4

Descriptive Statistics for the Control Variables

This table presents the number of observations, means, medians, and the 25% and 75% quantile values of firm- or market-characteristics for all SOEs from 2003 to 2019. The definitions of the variables are in Appendix A.

	Obs.	Mean	Median	STD	P25	P75
SHORT	11080	0.26	0.00	0.44	0.00	1.00
SIZE	11028	8.63	8.39	1.62	7.51	9.52
LEV	11028	0.52	0.53	0.20	0.38	0.67
ROA	11079	0.03	0.03	0.05	0.01	0.05
ROS	11071	0.08	0.06	0.19	0.02	0.13
ROI	10188	0.29	0.06	1.16	0.01	0.18
AGE	11061	2.46	2.64	0.62	2.20	2.89
MB	10831	1.69	1.32	1.02	1.09	1.84
CAP	10961	0.11	0.06	0.13	0.02	0.15
HERF	11080	0.08	0.02	0.11	0.02	0.09
FCF	10997	0.14	0.12	0.11	0.07	0.19
CAC	11035	0.23	0.01	0.75	-0.25	0.46
BSHA	11079	0.07	0.00	0.36	0.00	0.01
MSHA	11079	0.01	0.00	0.08	0.00	0.00
REG	11080	0.43	0.00	0.50	0.00	1.00
OTH	10871	0.02	0.01	0.04	0.00	0.02
REM	10148	0.10	0.07	0.10	0.03	0.13
MRT	8309	7.64	7.78	1.59	6.68	8.60
HHI	10744	0.14	0.09	0.16	0.06	0.15
CONT	9964	0.66	0.66	0.17	0.55	0.78

Table 5

The Effect of Short-Selling and Margin Trading Program on Governance Control of Firms When Using the DID Method

The alternative dependent variables in this table are *TOP1, TOP10, CONTR_A,* and *CONTR_F*. The definitions of the variables are in Appendix A. T-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

	(1)	(2)	(3)	(4)
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
SHORT	-1.8142***	-2.0007***	-2.0352***	-2.2947***
	(-3.25)	(-2.89)	(-3.41)	(-3.69)
SIZE	2.0239***	5.0159***	3.7565***	3.6016***
	(3.10)	(6.67)	(5.57)	(5.41)
LEV	-2.2379	-7.1028***	-3.6589	-2.4739
	(-1.08)	(-2.85)	(-1.59)	(-1.00)
ROA	6.7366	8.5034	9.0363*	10.1212*
	(1.40)	(1.44)	(1.75)	(1.85)
ROS	2.9759	3.0457	2.1202	2.3235
	(1.58)	(1.47)	(1.21)	(1.29)
ROI	-0.0167	0.0014	-0.0059	-0.0093
	(-0.16)	(0.01)	(-0.05)	(-0.08)
AGE	-0.8684	-2.9802***	-2.1904**	-2.4423**
	(-1.02)	(-2.91)	(-2.36)	(-2.49)
MB	-0.4667**	-0.7449***	-0.5887**	-0.4391
	(-1.98)	(-2.70)	(-2.10)	(-1.43)
CAP	0.9765	0.9477	-0.2174	2.9358
	(0.19)	(0.16)	(-0.04)	(0.51)
HERF	2.5468	-2.6018	0.3326	-1.7473
	(0.63)	(-0.53)	(0.07)	(-0.34)
FCF	0.4202	3.7669	2.6306	2.3473

	(0.19)	(1.43)	(1.05)	(0.93)
PRLIM	0.6038***	0.7523***	0.4860***	0.4245**
	(3.54)	(3.63)	(2.75)	(2.14)
BSHA	-2.6979***	-3.8442***	-3.3617***	-3.2528***
	(-3.41)	(-3.33)	(-2.83)	(-2.80)
MSHA	-6.1363**	-9.4592**	-7.6652**	-6.4839*
	(-2.10)	(-2.35)	(-2.01)	(-1.75)
REG	-8.6807***	-10.2395***	-8.9276***	-9.7235***
	(-5.31)	(-4.99)	(-4.87)	(-4.96)
Constant	30.7654***	21.9230***	24.1079***	22.1903***
	(4.86)	(3.03)	(3.46)	(3.19)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	9892	9892	9159	9159
Adjusted R^2	0.13	0.17	0.14	0.14

Table 6

Dynamics of Deregulation on Governance Control

The alternative dependent variables in this table are *TOP1, TOP10, CONTR_A, and CONTR_F.* The definitions of the variables are in Appendix A. *T*-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

	(1)	(2)	(3)	(4)
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
D^{-5}	-0.2860	0.1189	-0.5037	-0.2922
	(-0.62)	(0.22)	(-0.96)	(-0.53)
D^{-4}	-0.4058	-0.1035	-0.4951	-0.5023
	(-0.74)	(-0.15)	(-0.77)	(-0.74)
D^{-3}	-0.7461	-0.6073	-0.4101	-0.6895
	(-1.16)	(-0.73)	(-0.54)	(-0.87)
D^{-2}	-0.7468	-0.6872	-0.4283	-0.6962
	(-0.99)	(-0.72)	(-0.48)	(-0.75)
D^{-1}	-1.2991	-1.5013	-0.8891	-0.9950
	(-1.62)	(-1.46)	(-0.92)	(-1.00)
D^{0}	-1.5032*	-2.1387*	-1.3873	-1.6499
	(-1.74)	(-1.93)	(-1.35)	(-1.57)
D^{1}	-1.5630*	-2.3981**	-1.5261	-1.8944*
	(-1.66)	(-1.97)	(-1.38)	(-1.67)
D^{2}	-1.7649*	-2.7589**	-1.5074	-1.8984
	(-1.74)	(-2.12)	(-1.30)	(-1.57)
D^{3}	-1.5525	-2.9337**	-1.8649	-2.2580*
	(-1.42)	(-2.10)	(-1.49)	(-1.73)
D^{4}	-1.5898	-3.2038**	-2.3224*	-2.7309*
	(-1.33)	(-2.10)	(-1.68)	(-1.89)
D^{5}	-1.7974	-3.6856**	-2.4036	-3.1458**
	(-1.42)	(-2.29)	(-1.64)	(-2.06)

D^6	-1.9893	-4.1758**	-3.0360*	-3.7990**
	(-1.36)	(-2.25)	(-1.87)	(-2.25)
SIZE	2.3346***	5.2045***	3.1684***	2.8372***
	(2.64)	(6.77)	(3.94)	(3.40)
LEV	1.0485	-7.2267***	-1.5336	-0.3405
	(0.45)	(-2.90)	(-0.65)	(-0.13)
ROA	5.7063	8.5881	7.7961	8.8865
	(1.13)	(1.46)	(1.50)	(1.62)
ROS	4.0185**	2.9429	3.3929*	3.6327**
	(2.10)	(1.42)	(1.90)	(1.98)
ROI	-0.0504	-0.0024	-0.0573	-0.0599
	(-0.48)	(-0.02)	(-0.52)	(-0.50)
AGE	-0.2193	-2.8648***	-1.8615*	-2.1939**
	(-0.25)	(-2.78)	(-1.92)	(-2.14)
MB	-0.7035***	-0.7576***	-1.0048***	-0.8763***
	(-2.92)	(-2.71)	(-3.45)	(-2.78)
CAP	0.7416	1.7732	-1.5031	0.9838
	(0.13)	(0.30)	(-0.24)	(0.16)
HERF	1.9838	-3.8243	-0.3292	-2.7680
	(0.46)	(-0.76)	(-0.06)	(-0.52)
FCF	1.1648	3.7449	2.8653	2.5972
	(0.51)	(1.43)	(1.12)	(1.01)
PRLIM	0.6054***	0.7734***	0.5692***	0.5056**
	(3.51)	(3.72)	(3.21)	(2.55)
BSHA	-171.0772**	-3.9124***	-3.4052***	-3.2934***
	(-2.32)	(-3.38)	(-2.90)	(-2.86)
MSHA	-240.7999**	-9.5233**	-7.6223**	-6.5324*
	(-2.36)	(-2.37)	(-1.99)	(-1.76)
REG	-8.3551***	-9.4692***	-6.5800***	-6.9140***

	(-4.62)	(-4.25)	(-3.07)	(-3.03)
Constant	26.8463***	20.3249***	27.9310***	27.6675***
	(3.23)	(2.77)	(3.36)	(3.20)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	9892	9892	9159	9159
Adjusted R^2	0.12	0.17	0.13	0.13

Table 7

Robustness Tests

The alternative dependent variables in this table are *TOP1, TOP10, CONTR_A* and *CONTR_F.* The definitions of the variables are in Appendix A. *T*-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

Panel A: Including the Firms that Quit from the Group of Short-Selling and Margin-Trading in Later Years.

	(1)	(2)	(3)	(4)
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
SHORT	-1.7007***	-1.9896***	-1.9274***	-2.1220***
	(-3.48)	(-3.27)	(-3.67)	(-3.86)
SIZE	2.2629***	5.1479***	3.8105***	3.6049***
	(3.62)	(7.16)	(5.89)	(5.65)
LEV	-2.6557	-7.0581***	-4.0445*	-2.8963
	(-1.37)	(-3.02)	(-1.85)	(-1.24)
ROA	5.6367	6.9463	8.3490*	8.3912
	(1.23)	(1.24)	(1.70)	(1.62)
ROS	3.5476**	3.6483*	2.0509	2.5265
	(2.06)	(1.89)	(1.28)	(1.54)
ROI	-0.0138	-0.0028	-0.0088	-0.0096
	(-0.14)	(-0.03)	(-0.08)	(-0.08)
AGE	-0.8380	-2.8053***	-2.2351**	-2.5956***
	(-1.03)	(-2.78)	(-2.50)	(-2.75)
MB	-0.4515**	-0.7258***	-0.5804**	-0.4272
	(-1.97)	(-2.70)	(-2.14)	(-1.43)
CAP	2.0032	2.5863	1.6017	4.9896
	(0.40)	(0.46)	(0.29)	(0.90)
HERF	3.4340	-0.9624	0.7653	-0.2871
	(0.95)	(-0.22)	(0.17)	(-0.06)

FCF	0.1794	3.9907	2.6945	1.8482
	(0.08)	(1.60)	(1.14)	(0.77)
PRLIM	0.5736***	0.7377***	0.4499***	0.3454*
	(3.58)	(3.73)	(2.67)	(1.83)
BSHA	-2.6554***	-3.9031***	-3.2324***	-3.1208***
	(-3.46)	(-3.51)	(-2.82)	(-2.78)
MSHA	-6.6148**	-10.4289***	-7.6230**	-6.5778*
	(-2.28)	(-2.59)	(-2.00)	(-1.78)
REG	-9.4057***	-10.4393***	-9.1838***	-9.7275***
	(-6.03)	(-5.22)	(-5.18)	(-5.13)
Constant	28.9739***	20.0071***	23.6976***	22.3848***
	(4.76)	(2.86)	(3.55)	(3.36)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10827	10827	10003	10003
Adjusted R^2	0.14	0.17	0.15	0.15

Panel B: PSM-DID Method

	(1)	(2)	(3)	(4)
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
SHORT	-0.9484**	-1.4773**	-1.5653***	-1.8133***
	(-2.13)	(-2.53)	(-3.03)	(-3.37)
SIZE	1.0757	4.8711***	3.9807***	3.7222***
	(1.34)	(6.06)	(4.51)	(4.18)
LEV	2.9528	-2.1904	-1.2775	-0.3823
	(1.40)	(-0.92)	(-0.56)	(-0.15)
ROA	4.6111	0.3017	1.2599	2.9264
	(1.04)	(0.05)	(0.24)	(0.52)
ROS	0.5459	-0.5341	1.1945	0.9482

	(0.45)	(-0.29)	(0.78)	(0.57)
ROI	-0.0694	-0.0271	-0.0588	-0.0663
	(-0.76)	(-0.24)	(-0.58)	(-0.59)
AGE	-0.1315	-2.4490	-3.5188**	-3.6394**
	(-0.12)	(-1.52)	(-2.13)	(-2.02)
MB	-0.3041	-0.0005	-0.5763***	-0.4057*
	(-1.30)	(-0.00)	(-2.64)	(-1.72)
CAP	-0.1721	-2.7202	-3.9714	-0.4217
	(-0.03)	(-0.40)	(-0.51)	(-0.06)
HERF	13.1808**	8.3620	11.1113*	9.8876
	(2.26)	(1.27)	(1.72)	(1.57)
FCF	0.5846	5.4890*	3.2401	3.3117
	(0.26)	(1.93)	(1.17)	(1.21)
PRLIM	0.4276**	0.1597	0.5969***	0.3092
	(1.99)	(0.61)	(2.70)	(1.32)
BSHA	-1.3957**	-2.2022**	-1.4320**	-1.1363*
	(-2.41)	(-2.27)	(-2.27)	(-1.83)
MSHA	-2.2188	-4.7557	-3.3615*	-3.2369*
	(-1.19)	(-1.61)	(-1.82)	(-1.75)
REG	-4.7279*	-5.1919	-2.7894	-5.4364
	(-1.88)	(-1.56)	(-0.82)	(-1.40)
Constant	29.2712***	11.2822	16.8969*	17.5499*
	(3.94)	(1.43)	(1.90)	(1.89)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	6730	6728	6455	6455
Adjusted R^2	0.04	0.08	0.09	0.07

Panel C: Including the Firms that Listed on Non-mainboard.

	(1)	(2)	(3)	(4)
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
SHORT	-1.4932***	-1.7668***	-1.7878***	-2.0306***
	(-2.85)	(-2.73)	(-3.14)	(-3.45)
SIZE	1.8935***	4.7371***	3.5613***	3.4241***
	(3.03)	(6.60)	(5.54)	(5.39)
LEV	-1.6334	-6.2745***	-2.9789	-1.9763
	(-0.82)	(-2.62)	(-1.35)	(-0.84)
ROA	6.6726	7.6875	9.3490*	9.9974*
	(1.40)	(1.33)	(1.88)	(1.90)
ROS	3.1787*	3.5103*	2.1371	2.2725
	(1.68)	(1.70)	(1.24)	(1.28)
ROI	-0.0098	0.0298	0.0025	0.0031
	(-0.11)	(0.33)	(0.03)	(0.03)
AGE	-1.1789*	-3.4226***	-2.6145***	-2.8603***
	(-1.70)	(-4.14)	(-3.38)	(-3.56)
MB	-0.4555**	-0.7577***	-0.6195**	-0.4604*
	(-2.21)	(-3.19)	(-2.52)	(-1.72)
CAP	1.3840	1.5417	0.7765	3.4759
	(0.30)	(0.30)	(0.15)	(0.67)
HERF	0.6056	-3.7817	-2.6341	-5.1465
	(0.16)	(-0.85)	(-0.60)	(-1.10)
FCF	0.0873	3.1617	1.7986	1.7752
	(0.04)	(1.34)	(0.79)	(0.78)
PRLIM	0.5412***	0.6282***	0.3469**	0.3255*
	(3.46)	(3.32)	(2.10)	(1.80)
BSHA	-0.4528***	-0.7302***	-0.6503***	-0.6152***
	(-3.24)	(-3.75)	(-3.36)	(-3.14)
MSHA	-0.1892	-0.2898*	-0.3176*	-0.2541

	(-1.49)	(-1.67)	(-1.88)	(-1.53)
REG	-8.4651***	-9.6444***	-8.1139***	-9.1031***
	(-5.94)	(-5.31)	(-4.91)	(-5.22)
Constant	31.8297***	24.3759***	26.0075***	24.1603***
	(5.41)	(3.66)	(4.06)	(3.77)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10962	10962	10160	10160
Adjusted R^2	0.12	0.16	0.14	0.14

Table 8

The Effect of *SHORT* on Corporate Governance

The alternative dependent variables in this table are *FINC, TECH, ACAD, INDP* and *INDEX_CG*. The definitions of the variables are in Appendix A. T-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

	(1)	(2)	(3)	(4)	(5)
	FINC	*TECH*	*ACAD*	*INDP*	*INDEX_CG*
SHORT	0.0089*	0.0151**	0.0144**	0.0184**	0.0488**
	(1.77)	(2.30)	(2.32)	(2.47)	(2.30)
SIZE	0.0058	-0.0026	0.0159***	-0.0082	0.0074
	(1.20)	(-0.49)	(2.88)	(-1.06)	(0.35)
LEV	0.0128	0.0035	-0.0396**	-0.0261	-0.0226
	(0.72)	(0.18)	(-2.27)	(-1.07)	(-0.38)
ROA	-0.0622	-0.0196	0.0548	-0.0157	-0.1874
	(-1.57)	(-0.47)	(1.17)	(-0.26)	(-1.11)
ROS	0.0328**	-0.0164	-0.0188	0.0251	0.0258
	(2.24)	(-1.18)	(-1.09)	(1.23)	(0.38)
ROI	-0.0002	0.0044***	-0.0008	-0.0019	0.0068
	(-0.24)	(3.27)	(-0.67)	(-1.31)	(1.52)
AGE	0.0045	0.0086	0.0079	-0.0029	0.0415
	(0.59)	(0.81)	(0.86)	(-0.22)	(1.23)
MB	-0.0045**	0.0014	0.0022	-0.0030	-0.0062
	(-2.38)	(0.53)	(0.79)	(-0.87)	(-0.66)
CAP	0.0088	-0.1531***	0.0421	0.0036	-0.1651
	(0.26)	(-3.85)	(1.03)	(0.08)	(-1.44)
HERF	0.0796**	-0.1014*	0.0212	-0.0135	-0.2589
	(2.06)	(-1.86)	(0.39)	(-0.18)	(-1.32)
FCF	0.0226	-0.0104	0.0219	-0.0124	0.0319
	(1.21)	(-0.47)	(0.97)	(-0.41)	(0.41)

PRLIM	0.0018	-0.0028	-0.0056**	-0.0013	-0.0153**
	(1.15)	(-1.14)	(-2.28)	(-0.42)	(-1.98)
BSHA	-0.0085	-0.0085	0.0000	-0.0101	-0.0416**
	(-1.32)	(-1.04)	(0.00)	(-1.15)	(-2.41)
MSHA	0.0633***	0.0752**	0.0699**	-0.0223	0.2555**
	(2.65)	(2.19)	(2.11)	(-0.71)	(2.33)
REG	0.2276***	0.1148***	0.2140***	0.0485**	0.3432***
	(13.94)	(6.27)	(12.33)	(2.04)	(4.94)
Constant	-0.0337	0.0456	-0.1327**	0.7199***	1.0972***
	(-0.71)	(0.90)	(-2.44)	(9.92)	(5.53)
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Observations	6907	9892	9892	9892	5638
Adjusted R^2	0.63	0.38	0.64	0.01	0.24

Table 9

The Mediating Effect of Corporate Governance

The alternative dependent variables in this table are *TOP1, TOP10, CONTR_A, and CONTR_F*. The definitions of the variables are in Appendix A. T-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

	(1)	(2)	(3)	(4)
	TOP1	*TOP10*	*CONTR_A*	*CONTR_F*
INDEX_CG	-4.9186*	-6.6299*	-8.3166***	-10.8797***
	(-1.78)	(-1.77)	(-2.81)	(-3.09)
SHORT	-0.7334	-0.5740	-1.4359**	-1.6162**
	(-1.20)	(-0.74)	(-2.07)	(-2.22)
SIZE	2.6625***	5.3122***	4.8467***	3.9328***
	(2.84)	(5.15)	(5.65)	(4.22)
LEV	-2.0562	-5.0356	-5.1976*	-3.6532
	(-0.78)	(-1.56)	(-1.88)	(-1.25)
ROA	10.0006	16.3754*	15.7942**	13.7402*
	(1.45)	(1.80)	(2.18)	(1.84)
ROS	1.0918	-0.7446	-0.6764	0.1422
	(0.40)	(-0.22)	(-0.27)	(0.06)
ROI	-0.0041	-0.0478	0.0816	0.0985
	(-0.03)	(-0.27)	(0.62)	(0.69)
AGE	-1.2335	-2.6796**	-1.7497*	-2.0458*
	(-1.32)	(-2.12)	(-1.72)	(-1.69)
MB	-0.1069	-0.2326	0.0373	0.0546
	(-0.43)	(-0.77)	(0.14)	(0.19)
CAP	-2.1950	-1.2838	-0.9837	-0.4238
	(-0.38)	(-0.18)	(-0.16)	(-0.06)
HERF	0.6902	-8.2938	-5.0417	-6.4815
	(0.15)	(-1.42)	(-0.87)	(-0.87)

FCF	0.5909	5.0989	0.2242	1.5850
	(0.22)	(1.58)	(0.08)	(0.53)
PRLIM	0.4318**	0.4872**	0.2954	0.1799
	(2.41)	(2.11)	(1.38)	(0.75)
BSHA	-2.8596***	-3.7863**	-4.2475***	-4.5004***
	(-2.85)	(-2.48)	(-2.86)	(-2.92)
MSHA	-1.2894	-5.2207	-2.3363	-1.5600
	(-0.42)	(-0.95)	(-0.61)	(-0.40)
REG	-7.1203***	-8.1377**	-6.8232***	-5.3586*
	(-2.85)	(-2.47)	(-2.67)	(-1.79)
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	5583	5583	5200	5200
Adjusted R^2	0.11	0.12	0.11	0.07

Table 10

The Effect of Short Selling and Margin Trading on Government Control: Heterogeneous Effects by Agency Problem.

The alternative dependent variables in the three tables are *TOP1, TOP10, CONTR_A, and CONTR_F* from Column (1) to Column (8), which are all represent the government control. The definitions of the variables are in Appendix A. We use the variable *OTH*, which is defined as the proportion of other receivables in total assets, the variable real earning management (*REM)*, following Roychowdhury (2006), and the variable market to book ratio (*MB)* to evaluate the agency problems in Panel A, Panel B, and Panel C, respectively. We grouped the samples according to these three variables and compared the difference of treatment effect between the top 40% of the samples (High group) and the bottom 40% of the samples (Low group) in order to make the differences more pronounced. *T*-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

Panel A: groups according to the other receivable variable *OTH*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TOP1	*TOP1*	*TOP10*	*TOP10*	*CONTR_A*	*CONTR_A*	*CONTR_F*	*CONTR_F*
	OTH (High)	*OTH* (Low)	*OTH* (High)	*OTH* (Low)	*OTH* (High)	*OTH* (Low)	*OTH* (High)	*OTH* (Low)
SHOART	-2.6740***	-1.0048	-1.8647	-1.2782	-2.1120**	-0.5706	-2.7032***	-0.5394
	(-2.84)	(-1.42)	(-1.57)	(-1.39)	(-2.09)	(-0.69)	(-2.79)	(-0.65)
SIZE	1.6116**	1.8520	3.2960***	5.4804***	1.6704*	4.3196***	1.8714*	3.5524**
	(2.09)	(1.60)	(3.49)	(4.32)	(1.78)	(3.10)	(1.91)	(2.45)
LEV	-2.6992	4.1772	-5.3613	-0.0196	-1.6483	2.9215	-3.7910	3.2694
	(-0.93)	(1.31)	(-1.41)	(-0.01)	(-0.32)	(0.49)	(-0.70)	(0.53)

ROA	7.7032	0.6061	5.1887	3.9547	12.3369*	2.1044	12.8519*	4.0776
	(1.31)	(0.10)	(0.63)	(0.50)	(1.68)	(0.31)	(1.69)	(0.61)
ROS	2.2498	0.8691	7.0269***	-0.2679	1.3559	3.5705	1.1304	3.5976*
	(1.18)	(0.35)	(2.96)	(-0.09)	(0.60)	(1.58)	(0.51)	(1.68)
ROI	0.0666	-0.0837	-0.1293	0.0055	-0.1261	-0.1766	-0.0053	-0.1594
	(0.48)	(-0.51)	(-0.81)	(0.04)	(-0.75)	(-1.23)	(-0.03)	(-1.12)
AGE	0.0438	-0.3672	-2.3354	-2.6419	-3.3653**	-0.8088	-4.3725***	-0.8067
	(0.04)	(-0.29)	(-1.51)	(-1.65)	(-2.50)	(-0.63)	(-2.90)	(-0.62)
MB	-0.5924*	0.1670	-1.3159***	-0.2439	-1.1557**	-0.6040***	-1.1574**	-0.5055*
	(-1.81)	(0.65)	(-2.95)	(-0.75)	(-2.33)	(-2.66)	(-2.31)	(-1.88)
HERF	-0.3615	2.5657	-6.6554	-6.5038	-2.5759	-2.9033	-6.2597	-4.8224
	(-0.06)	(0.31)	(-1.01)	(-0.62)	(-0.40)	(-0.25)	(-0.93)	(-0.43)
FCF	1.8576	-2.3996	3.9205	2.9880	0.4565	0.6632	0.4369	0.0984
	(0.54)	(-0.87)	(0.93)	(0.87)	(0.12)	(0.22)	(0.11)	(0.03)
PRLIM	0.6228**	0.2797	0.9539***	0.5699*	0.4487	0.3939	0.4040	0.3325
	(2.14)	(1.12)	(2.64)	(1.76)	(1.53)	(1.45)	(1.24)	(1.21)
BSHA	-1.8564**	-3.3225**	-2.5915***	-4.5550*	-1.6358	-3.7085*	-1.7369*	-3.6934*

	(-2.56)	(-2.19)	(-2.64)	(-1.94)	(-1.43)	(-1.92)	(-1.66)	(-1.84)
MSHA	-0.9066	-4.0847	-2.8896	-6.2011	-5.2059	1.6929	-3.5999	0.3324
	(-0.31)	(-1.06)	(-0.77)	(-1.15)	(-1.29)	(0.52)	(-0.92)	(0.09)
REG	-9.3744***	-10.2109***	-8.7548***	-10.7392***	-2.5003	-12.3574***	-2.0839	-13.5966***
	(-3.98)	(-3.16)	(-2.92)	(-2.84)	(-0.86)	(-3.79)	(-0.67)	(-3.78)
Constant	30.7488***	31.6957***	32.0055***	17.2127	39.2603***	18.1412	38.5442***	21.6868*
	(4.36)	(3.17)	(3.67)	(1.61)	(4.74)	(1.57)	(4.32)	(1.80)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4185	3782	4185	3782	3786	3564	3786	3564
Adjusted R^2	0.14	0.12	0.17	0.14	0.12	0.12	0.14	0.12
Empirical p-values	0.07		0.34		0.16		0.08	

Panel B: groups according to the variable real earning management (*REM)*

	(1) *TOP1*	(2) *TOP1*	(3) *TOP10*	(4) *TOP10*	(5) *CONTR_A*	(6) *CONTR_A*	(7) *CONTR_F*	(8) *CONTR_F*
	REM (High)	*REM* (Low)	*REM* (High)	*REM* (Low)	*REM* (High)	*REM* (Low)	*REM* (High)	*REM* (Low)
SHOART	-2.3535***	-1.3337*	-2.5283***	-0.7245	-2.3636***	-0.5051	-1.8719***	-0.5621
	(-2.94)	(-1.78)	(-3.01)	(-1.01)	(-3.34)	(-0.84)	(-2.90)	(-0.99)

SIZE	1.4811**	2.1017***	3.5191***	3.8147***	3.0491***	2.2773***	2.2113***	2.0833***
	(2.36)	(2.70)	(5.59)	(5.60)	(5.13)	(3.72)	(4.30)	(3.56)
LEV	-0.8784	-3.7186	-6.3791**	-6.9993***	-3.4147	-1.9973	-0.3972	-1.7819
	(-0.32)	(-1.39)	(-2.33)	(-2.76)	(-1.31)	(-0.93)	(-0.17)	(-0.90)
ROA	4.7197	3.3718	-1.0878	8.5811	5.6236	5.0213	8.9283*	5.5524
	(0.75)	(0.50)	(-0.17)	(1.52)	(1.02)	(0.98)	(1.72)	(1.20)
ROS	3.4242	4.0027*	4.3108*	1.8140	1.4330	3.4584**	1.2033	1.9961
	(1.42)	(1.73)	(1.74)	(1.00)	(0.78)	(2.06)	(0.69)	(1.39)
ROI	-0.0861	0.1217	0.0503	-0.0438	0.0034	-0.0275	0.0414	-0.0180
	(-0.76)	(0.59)	(0.43)	(-0.27)	(0.03)	(-0.18)	(0.44)	(-0.12)
AGE	-0.8570	-2.0962	-2.4839***	-4.4311**	-1.8309**	-3.1252*	-1.7679**	-3.1468**
	(-1.07)	(-1.01)	(-3.09)	(-2.30)	(-2.37)	(-1.86)	(-2.41)	(-1.98)
MB	-0.3556	-0.3003	-0.5364	-0.3666	-0.6222**	-0.0733	-0.4504	-0.0106
	(-1.05)	(-0.87)	(-1.56)	(-1.08)	(-1.98)	(-0.29)	(-1.45)	(-0.04)
HERF	-7.9860	9.0494	-13.4078**	7.2647	-9.7128	12.6019**	-10.8957**	8.5741
	(-1.39)	(1.46)	(-2.07)	(1.25)	(-1.52)	(2.30)	(-2.01)	(1.50)
FCF	0.2694	-3.1712	1.1110	-0.6038	3.2622	0.0459	1.8276	0.1704
	(0.11)	(-0.89)	(0.41)	(-0.19)	(1.14)	(0.02)	(0.74)	(0.07)
PRLIM	0.2234	0.3956	0.2811	0.2746	0.0466	0.0953	-0.0568	0.1029
	(0.77)	(1.25)	(0.95)	(0.86)	(0.20)	(0.38)	(-0.26)	(0.44)
BSHA	-2.7753***	-2.7302**	-3.5556***	-3.0094*	-2.8808**	-3.0578*	-2.2380**	-2.9984**
	(-3.06)	(-2.16)	(-3.08)	(-1.95)	(-2.57)	(-1.84)	(-2.40)	(-2.15)
MSHA	-1.5496	-6.8029*	-0.9413	-7.4313	-0.5856	-2.3888	0.3359	-1.3658
	(-0.56)	(-1.71)	(-0.27)	(-1.62)	(-0.22)	(-0.52)	(0.15)	(-0.33)
REG	-7.1603***	-8.0096**	-7.7315***	-6.4815**	-5.8576***	-6.7778**	-5.2800***	-5.3223**
	(-3.81)	(-2.56)	(-4.05)	(-2.14)	(-3.21)	(-2.58)	(-3.05)	(-2.16)

Constant	34.1566***	33.5305***	32.6425***	33.6613***	27.3298***	36.1258***	28.4028***	32.5155***
	(6.80)	(4.57)	(6.79)	(5.22)	(5.55)	(5.96)	(6.60)	(6.03)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4090	3691	4090	3691	3759	3427	3759	3427
Adjusted R^2	0.14	0.12	0.19	0.18	0.16	0.14	0.13	0.12
Empirical p-values	0.12		0.08		0.05		0.09	

Panel C: groups according to the variable market to book ratio (*MB)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TOP1	*TOP1*	*TOP10*	*TOP10*	*CONTR_A*	*CONTR_A*	*CONTR_F*	*CONTR_F*
	MB (High)	*MB* (Low)	*MB* (High)	*MB* (Low)	*MB* (High)	*MB* (Low)	*MB* (High)	*MB* (Low)
SHOART	-1.9665***	-0.4090	-1.8880**	0.4851	-2.9183***	-0.7161	-1.9278**	-1.3968
	(-2.60)	(-0.50)	(-2.34)	(0.45)	(-3.56)	(-0.86)	(-2.20)	(-1.62)
SIZE	0.7575	0.5855	2.5052**	3.0304**	3.1232***	3.3141***	1.7554**	3.9633***
	(0.97)	(0.57)	(2.32)	(2.22)	(3.95)	(3.52)	(2.16)	(4.32)
LEV	-4.7697**	2.6183	-4.8536*	-0.2919	-7.5185**	2.3050	-5.6756*	-1.0736
	(-2.13)	(0.67)	(-1.67)	(-0.06)	(-2.55)	(0.62)	(-1.90)	(-0.25)
ROA	10.7161**	9.4789	16.2517**	6.4761	16.6415***	9.5206	17.3856**	12.3221
	(2.18)	(0.97)	(2.38)	(0.54)	(2.60)	(0.96)	(2.58)	(1.23)

ROS	0.8121	0.9066	1.2453	5.0185	0.5368	-0.2954	0.2714	-0.8243
	(0.43)	(0.27)	(0.55)	(1.25)	(0.27)	(-0.09)	(0.13)	(-0.25)
ROI	0.0584	-0.1631	0.0561	0.0293	0.0698	-0.3375**	0.0457	-0.2205
	(0.44)	(-0.88)	(0.37)	(0.13)	(0.41)	(-2.09)	(0.26)	(-1.10)
AGE	-0.4753	-0.6488	-1.5509	-2.3586*	-2.1782	-1.0503	-3.3425**	-1.4041
	(-0.37)	(-0.55)	(-0.96)	(-1.81)	(-1.49)	(-0.82)	(-2.09)	(-1.01)
MB	-0.4937*	-1.1630	-1.2905***	-1.7714	-0.9126**	-1.1229	-0.8753**	-2.2805
	(-1.66)	(-0.71)	(-3.63)	(-0.86)	(-2.52)	(-0.72)	(-2.23)	(-1.30)
HERF	-0.1122	2.1129	-0.8503	-10.4283	4.0989	-0.4281	-0.0699	-4.3884
	(-0.02)	(0.26)	(-0.14)	(-1.00)	(0.66)	(-0.04)	(-0.01)	(-0.42)
FCF	-1.4275	-1.4281	0.2687	4.6117	0.6454	1.1722	-1.2396	-0.4254
	(-0.54)	(-0.39)	(0.08)	(1.07)	(0.24)	(0.32)	(-0.45)	(-0.12)
PRLIM	0.6515**	0.4782	0.9083***	0.5905	0.7795***	0.4285	0.5819*	0.4611
	(2.44)	(1.47)	(2.88)	(1.34)	(2.84)	(1.28)	(1.85)	(1.24)
BSHA	-2.1401***	-2.0362	-2.5828***	-3.6734	-2.2009***	0.0587	-1.8171***	0.1371
	(-3.35)	(-1.41)	(-3.03)	(-1.26)	(-3.19)	(0.03)	(-2.60)	(0.08)
MSHA	-5.2835*	-5.1227	-8.6508**	-9.8425	-8.2088**	-7.3754*	-5.9885*	-8.5940**

	(-1.72)	(-1.50)	(-2.15)	(-1.46)	(-2.30)	(-1.72)	(-1.91)	(-2.08)
REG	-6.9210***	-8.1460***	-8.6166***	-6.5591**	-5.7700**	-11.9565***	-4.6009	-13.7279***
	(-2.95)	(-2.97)	(-2.68)	(-2.04)	(-2.03)	(-4.01)	(-1.53)	(-4.12)
Constant	40.5845***	41.2238***	38.4068***	34.0097***	29.7969***	23.4933***	39.0217***	19.4381**
	(6.78)	(4.32)	(4.09)	(2.78)	(4.81)	(2.61)	(5.94)	(2.17)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3890	4041	3890	4041	3577	3771	3577	3771
Adjusted R^2	0.12	0.11	0.16	0.10	0.14	0.12	0.12	0.14
Empirical p-values	0.03		0.03		0.05		0.32	

Table 11

The Effect of Short Selling and Margin Trading on Government Control: Heterogeneous effects by product market competition and institution.

The alternative dependent variables in the three tables are *TOP1, TOP10, CONTR_A, and CONTR_F* from Column (1) to Column (8), which are all represent the government control. The definitions of the variables are in Appendix A. We use two variables Herfindahl Index (*HHI*), which is calculated as the square of the ratio of the main business income of each company in the industry to the total main business income of the industry, and the industry concentration variable (*CRT*), which is calculated as the proportion of the main business income of the top eight companies in the industry to the main business income of the whole industry, to evaluate product market competition in Panel A and Panel B, respectively. We use the government-market relations (*GMR*) variable, that is developed by Fan et al. (2009), to measure the institution and marketization level of the province that the firm is located in, in Panel C. We grouped the samples according to these three variables and compared the difference of treatment effect between the top 40% of the samples (High group) and the bottom 40% of the samples (Low group) in order to make the differences more pronounced. *T*-statistics are reported in parentheses. ***, ** and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively. All of the regressions used robust standard errors and clustered all standard errors at the firm level.

Panel A: groups according to Herfindahl Index (*HHI*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TOP1	*TOP1*	*TOP10*	*TOP10*	*CONTR_A*	*CONTR_A*	*CONTR_F*	*CONTR_F*
	HHI (High)	*HHI (Low)*	*HHI (High)*	*HHI (Low)*	*HHI (High)*	*HHI (Low)*	*HHI (High)*	*HHI (Low)*
SHORT	-0.1074	-1.6307**	-0.5136	-2.1377**	-0.2828	-1.7634**	-1.2542	-2.6168***
	(-0.15)	(-2.22)	(-0.56)	(-2.31)	(-0.41)	(-2.41)	(-1.31)	(-3.22)
SIZE	1.1927	1.5828**	4.6705***	2.9262***	2.6773***	1.7295**	2.8827**	3.6182***
	(1.59)	(2.32)	(4.07)	(3.77)	(2.70)	(2.03)	(2.33)	(3.80)
LEV	-1.5812	-2.7695	-7.2329*	-6.2222**	-4.7690	-1.4816	-4.1350	-8.6544**
	(-0.56)	(-1.20)	(-1.87)	(-2.11)	(-1.20)	(-0.36)	(-0.79)	(-2.38)

ROA	7.5520	-3.8594	7.7896	-1.9939	3.2938	2.4405	3.3781	-2.7295
	(1.54)	(-0.84)	(0.90)	(-0.31)	(0.54)	(0.34)	(0.36)	(-0.35)
ROS	-0.7131	5.7713***	-0.0449	6.0432**	1.5365	5.8664**	0.7734	7.1034***
	(-0.38)	(2.96)	(-0.02)	(2.54)	(0.88)	(2.64)	(0.30)	(2.73)
ROI	-0.1508	0.1698	-0.2006	0.0928	-0.0889	0.0503	-0.0548	0.0340
	(-1.19)	(1.15)	(-1.01)	(0.68)	(-0.60)	(0.42)	(-0.30)	(0.28)
AGE	-0.6076	0.5577	-3.2160**	-1.1892	-2.8972***	0.7904	-4.0421***	0.1026
	(-0.67)	(0.43)	(-2.53)	(-0.81)	(-2.73)	(0.43)	(-3.04)	(0.05)
MB	-0.2043	-0.1867	-0.6160	-0.4500	-0.2499	-0.3953	-0.5180	-0.2586
	(-0.79)	(-0.69)	(-1.48)	(-1.48)	(-0.95)	(-1.54)	(-1.57)	(-0.69)
HERF	-3.8299	6.4073	-13.3142**	9.8436	-8.6485	7.3854	-11.1030	2.8993
	(-0.85)	(0.89)	(-2.01)	(1.62)	(-1.59)	(1.06)	(-1.58)	(0.46)
FCF	2.1644	-2.6361	8.2320**	0.0023	3.1112	2.6907	2.7489	2.0950
	(0.72)	(-1.06)	(2.09)	(0.00)	(1.00)	(0.71)	(0.75)	(0.45)
PRLIM	0.2931	0.3143	0.9803***	0.1208	0.3996*	0.0803	0.3892	0.1673
	(1.47)	(1.19)	(3.45)	(0.40)	(1.96)	(0.35)	(1.45)	(0.46)
BSHA	-1.9009*	-0.9857**	-3.7991*	-1.7712**	-1.9073	-0.8870	-3.4029*	-1.4078**
	(-1.90)	(-2.16)	(-1.82)	(-2.55)	(-1.38)	(-1.62)	(-1.68)	(-2.52)
MSHA	-5.9871	-2.1201	-8.9944	-3.4732	-7.4219	-1.6074	-15.6798*	-1.6272
	(-1.42)	(-0.91)	(-1.14)	(-1.01)	(-1.25)	(-0.76)	(-1.78)	(-0.56)
REG	-8.4063***	-9.6248***	-11.5751***	-9.9053***	-6.4717**	-8.1814***	-8.3928***	-12.5555***
	(-3.80)	(-4.49)	(-3.42)	(-3.85)	(-2.52)	(-3.09)	(-2.65)	(-4.19)
Constant	36.8528***	30.3541***	26.2809***	33.6495***	35.9327***	30.7019***	35.0206***	20.0093***
	(5.37)	(5.40)	(2.65)	(5.20)	(4.06)	(4.59)	(3.14)	(2.90)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Observations	4119	3873	4119	3873	3819	3548	3819	3548
Adjusted R^2	0.12	0.15	0.17	0.22	0.17	0.13	0.17	0.16
Empirical p-values	0.05		0.000		0.07		0.05	

Panel B: groups according to the industry concentration variable (*CRT*)

	(1) *TOP1*	(2) *TOP1*	(3) *TOP10*	(4) *TOP10*	(5) *CONTR_A*	(6) *CONTR_A*	(7) *CONTR_F*	(8) *CONTR_F*
	CRT (High)	*CRT* (Low)	*CRT* (High)	*CRT* (Low)	*CRT* (High)	*CRT* (Low)	*CRT* (High)	*CRT* (Low)
SHORT	-0.6359	-3.0770***	-0.4062	-3.6970***	-0.2366	-2.5658***	-1.4121	-3.3447***
	(-0.75)	(-3.30)	(-0.47)	(-3.07)	(-0.36)	(-3.52)	(-1.61)	(-3.65)
SIZE	1.6095*	1.7057*	4.6023***	3.6829***	3.1254***	1.2791	3.2947***	3.3920***
	(1.78)	(1.94)	(3.98)	(3.84)	(3.45)	(1.62)	(2.88)	(3.25)
LEV	-2.5092	-4.8611	-7.9488**	-6.9650*	-5.0372	-2.5763	-4.4802	-10.4841***
	(-0.72)	(-1.59)	(-1.99)	(-1.68)	(-1.33)	(-0.66)	(-0.93)	(-3.33)
ROA	7.8584	-2.0986	9.2437	5.2758	4.1595	5.2989	6.6517	0.5790
	(1.29)	(-0.36)	(1.16)	(0.64)	(0.71)	(0.74)	(0.76)	(0.07)
ROS	-0.7690	7.2610***	-0.5508	5.5737*	0.7195	5.4471**	-0.5033	5.4268**
	(-0.35)	(3.07)	(-0.20)	(1.86)	(0.42)	(2.51)	(-0.21)	(2.21)
ROI	-0.2201	0.1459	-0.2363	0.0856	-0.0713	0.0958	-0.0432	0.0868
	(-1.33)	(1.03)	(-1.11)	(0.65)	(-0.47)	(1.31)	(-0.22)	(0.72)
AGE	-0.9590	-1.3950	-3.1942**	-3.5699*	-2.7487***	-1.0011	-4.1063***	-2.1807
	(-0.91)	(-0.90)	(-2.58)	(-1.96)	(-3.03)	(-0.68)	(-3.51)	(-1.17)
MB	-0.4196	-0.2740	-0.7168*	-0.4985	-0.2634	-0.3254	-0.4473	-0.1430
	(-1.39)	(-0.69)	(-1.83)	(-1.14)	(-1.10)	(-1.33)	(-1.47)	(-0.37)

HERF	-7.0557	11.0891	-16.6763***	14.4011*	-10.2168*	14.2689**	-14.0680**	9.3321*
	(-1.32)	(1.49)	(-2.61)	(1.74)	(-1.91)	(2.42)	(-2.10)	(1.82)
FCF	3.8294	-4.5553	8.1536**	-1.3603	2.7233	1.1252	1.9687	0.6179
	(1.14)	(-1.48)	(2.04)	(-0.36)	(0.89)	(0.28)	(0.57)	(0.13)
PRLIM	0.6676***	0.0985	1.0737***	-0.1294	0.4678**	-0.1558	0.5216*	0.1268
	(2.99)	(0.30)	(4.02)	(-0.33)	(2.53)	(-0.72)	(1.94)	(0.35)
BSHA	-3.3347***	-1.0011	-4.8061**	-1.5132**	-2.4523*	-0.3915	-3.7751*	-0.7563
	(-2.71)	(-1.64)	(-2.50)	(-1.98)	(-1.79)	(-0.58)	(-1.88)	(-1.01)
MSHA	-8.4876*	-2.0017	-11.9840*	-3.0836	-4.8066	-2.0752	-11.0443	-2.1708
	(-1.85)	(-0.84)	(-1.75)	(-0.94)	(-1.06)	(-1.16)	(-1.58)	(-0.92)
REG	-9.8023***	-9.3757***	-10.8017***	-8.7884***	-7.6795***	-6.6507***	-9.2417***	-11.0070***
	(-3.71)	(-3.72)	(-3.31)	(-2.84)	(-3.72)	(-3.94)	(-3.28)	(-5.15)
Constant	37.0986***	34.7852***	27.7530***	31.9116***	32.3872***	37.5630***	32.3464***	26.2995***
	(4.60)	(5.18)	(2.87)	(4.07)	(3.93)	(8.06)	(3.11)	(4.10)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4541	3580	4541	3580	4220	3257	4220	3257
Adjusted R^2	0.14	0.20	0.18	0.21	0.17	0.17	0.16	0.19
Empirical p-values	0.03		0.02		0.00		0.01	

Panel C: groups according to the government-market relations (*GMR*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	TOP1	*TOP1*	*TOP10*	*TOP10*	*CONTR_F*	*CONTR_F*	*CONTR_A*	*CONTR_A*
	GMR (High)	*GMR* (Low)	*GMR* (High)	*GMR* (Low)	*GMR* (High)	*GMR* (Low)	*GMR* (High)	*GMR* (Low)

SHORT	-2.2337***	-1.4508**	-2.0960**	-1.9751***	-3.2579***	-1.3673*	-3.1007***	-1.3081*
	(-2.67)	(-2.25)	(-2.02)	(-2.72)	(-3.71)	(-1.72)	(-3.60)	(-1.79)
SIZE	1.5439**	1.9820**	4.7132***	5.1983***	3.5678***	2.7871**	4.1599***	2.6889***
	(2.29)	(2.00)	(6.52)	(4.90)	(5.59)	(2.31)	(6.68)	(2.84)
LEV	-2.7232	-4.7982	-6.9424**	-10.3697***	-2.9610	-7.1296*	-4.9409*	-5.6425
	(-1.17)	(-1.40)	(-2.47)	(-2.63)	(-1.05)	(-1.71)	(-1.86)	(-1.50)
ROA	7.3679	1.2774	4.9369	8.0200	7.1299	9.0868	4.3653	9.1063
	(1.24)	(0.24)	(0.73)	(1.13)	(1.15)	(1.18)	(0.76)	(1.29)
ROS	2.6267	3.2563	4.5375*	0.4316	2.6667	1.1162	3.0742	2.3545
	(1.23)	(1.29)	(1.83)	(0.14)	(1.33)	(0.40)	(1.57)	(0.84)
ROI	0.0739	-0.1717	0.2060	-0.2975*	0.0728	-0.2012	0.1324	-0.2247*
	(0.49)	(-1.18)	(1.25)	(-1.75)	(0.41)	(-1.52)	(0.80)	(-1.83)
AGE	-0.8303	-1.7885	-1.9738*	-5.0583***	-3.0831***	-2.4625	-2.2074**	-3.1037*
	(-0.87)	(-1.08)	(-1.76)	(-2.68)	(-2.73)	(-1.29)	(-2.13)	(-1.90)
MB	-0.7656**	-0.0916	-1.1552***	-0.4229	-0.9542**	0.0489	-0.9762**	-0.5457
	(-2.32)	(-0.30)	(-3.08)	(-1.27)	(-2.18)	(0.10)	(-2.40)	(-1.55)
HERF	1.8813	-1.7188	-3.7203	-13.2360	-9.3450	-4.7178	-4.4815	-8.8015
	(0.33)	(-0.23)	(-0.57)	(-1.35)	(-1.49)	(-0.40)	(-0.72)	(-0.93)
FCF	0.9675	-0.1271	4.9397	1.0826	3.5100	0.5495	2.6559	2.0031
	(0.35)	(-0.04)	(1.51)	(0.31)	(1.25)	(0.16)	(0.88)	(0.60)
PRLIM	0.4535*	0.6038**	0.6745**	0.8067**	0.6036**	0.1499	0.4647*	0.4536
	(1.91)	(2.22)	(2.19)	(2.31)	(2.17)	(0.44)	(1.74)	(1.52)
BSHA	-3.0281***	-2.2552	-4.2238***	-2.3534	-3.4010**	-3.4622	-3.5227***	-4.0595*
	(-3.11)	(-1.63)	(-3.02)	(-1.29)	(-2.55)	(-1.48)	(-2.64)	(-1.72)
MSHA	-4.4930	-13.2805*	-7.5351*	-17.1381*	-2.4416	-20.6668*	-3.5467	-19.8111
	(-1.45)	(-1.88)	(-1.77)	(-1.81)	(-0.74)	(-1.68)	(-1.04)	(-1.64)

REG	-6.5687***	-8.0410***	-9.7944***	-8.2972**	-5.5798**	-11.3659***	-6.1065***	-7.6640**
	(-3.58)	(-2.79)	(-4.22)	(-2.49)	(-2.54)	(-3.07)	(-2.96)	(-2.49)
Constant	34.4601***	34.9489***	21.8958***	27.4348***	23.2087***	32.6748***	20.2523***	36.6248***
	(6.24)	(4.02)	(3.71)	(2.85)	(4.21)	(3.25)	(3.76)	(4.32)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	5526	2921	5526	2921	5179	2674	5179	2674
Adjusted R^2	0.11	0.17	0.16	0.22	0.14	0.20	0.14	0.20
Empirical p-values	0.19		0.35		0.06		0.08	