

Impact of Share Pledging by Controlling Shareholders on Firm Value in the Context of China's Tightened Regulatory Reforms

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Abstract

This study investigates the effect of the 2018 regulatory reforms of share pledging by a controlling shareholder on firm value in China. Using a data set spanning the period 2015 to 2020, we provide robust results suggesting that tighter regulations effectively reduce firms' crash risk, relax financial constraints, reduce bankruptcy risk, and mitigate the controlling shareholder expropriation of minority shareholders' wealth via tunnelling. Additionally, controlling shareholders by investing more pledged funds in the listed firm after reforms, foster capital investment and R&D expenditure, which benefit firm growth and competitiveness and ultimately increase firm long-term value.

Keywords: Share Pledging; Regulatory Reforms; Firm Value; R&D

1. Introduction

Share pledges afford insiders with the opportunity to purchase investment assets and/or consumption goods with funds borrowed against their ownership stakes (Anderson and Puleo, 2020). For example, in April 2022, Elon Musk announced his intention to acquire Twitter for \$44 billion, of which \$12.5 billion would be from his Tesla share pledges. In recent years, share pledges have become a serious corporate governance concern amongst regulators and institutional investors globally¹. On 12 March 2018, the China Securities Regulatory Commission (CSRC) approved the ‘strictest’ regulatory reforms on share pledging in history (hereafter referred to as ‘regulatory reforms’)², which is aimed at preventing systemic risks to the Chinese capital market from share pledging³. However, the existing studies on share pledging in China mostly focused on the regulatory change on 24 May 2013, which was reported to likely adversely affect firm value. Considering the comprehensive measures for regulatory reforms and the unique characteristics of Chinese governance, we posit that an assessment of the effect of reforms on firm value offers valuable insights to academics and practitioners.

First, in China, most listed firms have controlling shareholders that are either government entities or wealthy individuals/families (Chen *et al.*, 2013; Guan *et al.*, 2016)⁴. As the real decision-makers of the firm, controlling shareholders’ motivation and behaviour are the most important determinants of firm value and are comprehensively

¹ For example, in 2006, the Securities and Exchange Commission (SEC) forced publicly listed firms to disclose in their proxy statements the count of shares that were pledged by their directors and named executive officers. Similarly, in 2011, the regulator in Taiwan restricted the voting rights associated with the shares pledged by insiders. The regulator in India has enforced multiple disclosure requirements since 2009. In 2013, the Institutional Shareholder Services responded to institutional investor concerns over pledging by including it as a new criterion in its governance rating system. See: <https://www.issgovernance.com/file/2013-policies/2013ExecutiveSummary.pdf> (Dou *et al.*, 2019).

² Here, we refer to ‘The Guidance on Stock Pledge Repurchase Transactions, Registration and Settlement’ (Revised in 2018) issued by the Shanghai Stock Exchange and China Securities Depository and Clearing Corporation Limited (CSDC). Available from: http://www.sse.com.cn/lawandrules/sserules/trading/stock/c/c_20180112_4449493.shtml

³ See Appendix B.

⁴ Several studies exclude state-owned companies (SOE) from their research samples, because controlling shareholders of SOEs is the government (e.g., Guo *et al.*, 2020; He *et al.*, 2022). We do not exclude SOEs in our research as 32.9% of our samples are SOEs. Moreover, many of them engage in share pledging business. However, a regulation issued by the Ministry of Finance of China in 2002 requires that SOEs be pledged only for loans to listed firms or to their subsidiaries (Wang *et al.*, 2020), http://www.gov.cn/gongbao/content/2002/content_61623.htm.

impacted by regulation changes, therefore, our study focuses on firm controlling shareholders rather than other shareholders. Several notorious examples in the Chinese stock market, such as Yao Zhenhua, the controller of Baoneng, which is a local real estate firm in Shenzhen, illustrate how the controlling shareholder brings risks to listed firms by share pledging. Yao used Baoneng and other companies he controlled to raise money through share pledging and insurance funding and acquired a 25.4% stake in Vanke, a famous Fortune 500 company and became the largest shareholder by the end of 2016. This hostile merger caused a strong counterattack from Vanke's management, to fight for the controlling rights of the company, which alerted the CSRC and the China Insurance Regulatory Commission (CIRC). Although Yao failed to acquire Vanke eventually, this situation reflects the big loopholes in the share pledge regulations⁵. Given these negative effects and the lack of positive evidence, the question on the legalisation of share pledges seems an important issue in China and many other economies⁶. Therefore, to examine how the tighter regulatory requirements may potentially affect controlling shareholders' motivation, it seems meaningful to better understand the legalisation of share pledges.

Second, in the past several decades, the Chinese economy has undergone an upsurge in entrepreneurship in the private sector⁷. However, the tremendous growth of the private sector is unlikely to have been financed by the banking system, which is largely owned by the state (Brandt and Li, 2003; Song *et al.*, 2011). As a unique financing vehicle at the intersection of the banking system and the stock market, share pledging is a significant supporting practice for China's economic growth, especially from the private sector. Therefore, regulators and investors would benefit from examining whether tighter

⁵ See Appendix C.

⁶ For example, in US, skeptics suggested a blanket prohibition on pledging, while advocates argued that permitting it through recourse loans could alleviate the adverse incentives it creates (Scott and Seelig, 2013).

⁷ For example, by the end of 2017, privately owned enterprises contributed more than 50% of tax revenue, 60% of GDP, 70% of technological innovation, 80% of urban employment, and 90% of new jobs and firms to the Chinese economy. Source: President Xi Jinping's speech at the Privately Owned Enterprises Symposium on 1 November 2018. Available at: http://www.xinhuanet.com/politics/2018-11/01/c_1123649488.htm (He et al., 2022).

regulatory reforms can prevent controlling shareholders from engaging in activities that reduce firm value while relaxing the financial constraints of firms to support their operations and increase their value.

Third, most previous Chinese studies used the 2013 regulatory shock as a quasi-natural experiment and documented that share pledging impairs firm value (Li *et al.*, 2020; Meng *et al.*, 2019; Xie *et al.*, 2016; Zheng *et al.*, 2014). In early 2018, the CSRC began reinforcing the regulations on share pledging. Although Dou *et al.* (2019); Wang and Chou (2018) examined changes in laws on governing directors' voting rights in Taiwan, they documented that firms' Tobin's Q improves significantly⁸. However, in China, besides the ceiling on the ratio of shares pledged, other measures, such as restricting the usage of pledged funds, banning small-value pledges, and prohibiting pledges involved performance commitments. Moreover, the impact of these measures on controlling shareholders' motivation to expropriate minority shareholders and how to restrict their activities that damage firm value, are still unclear. Therefore, this study attempts to fill this gap. To the best of our knowledge, this study is the first to explore such aspects of pledging regulation.

To accurately capture the effect of the new share pledging regulatory reforms, we restricted our sample to three years before and after the reform (2015–2020). We synthesised two variables as a proxy of firm value, the first is a short-term accounting indicator—net profit to total assets (*ROA*)—to measure firm performance (Xie, *et al.*, 2016; Zheng, *et al.*, 2014); the second is a long-term market indicator—Tobin's Q (*TOBINQ*)—to measure the growth of firm value in the long run (Dou *et al.*, 2019; Singh, 2018; Wang and Chou, 2018)⁹. Following Wang and Chou (2018), we apply the

⁸ Refer to the passage of the 2011 amendment to the Company Act in Taiwan (Wang and Chou, 2018). In 2011, the Taiwanese legislature introduced and passed a new statute that abolished the voting rights of a portion of an insider's pledged shareholdings that exceeds 50% of their total beneficial ownership (Dou *et al.*, 2019).

⁹ Dou *et al.* (2019); Wang and Chou (2018) use cumulative abnormal return (CARs) to measure the market reaction;

difference-in-differences (DID) approach to examine the difference in performance/value between the pledging firms (treatment group) and the non-pledging firms (control group), since non-share pledging firms theoretically should not be affected by new regulatory reforms.

We first examine the interaction effect between share pledging and regulatory reforms on firm value. The results show that new regulatory reforms positively affect firm performance and value. We further conduct a channel analysis to illustrate how regulatory reforms transform the negative effect of controlling shareholders' activities on firm value into a positive one. The analysis shows how tighter regulatory requirements reverse controlling shareholders' motivation and behaviour by reducing firm crash risk, relaxing financial constraints, reducing bankruptcy risk, and mitigating controlling shareholder expropriation of wealth via tunnelling.

We adopt several strategies to address endogeneity concerns. In particular, we control for firm fixed effects throughout our regression analysis to mitigate the concern about the unobserved time-invariant firm characteristics that may affect both regulatory reforms and firm value. Additionally, we perform propensity score matching to mitigate the concern about the functional form misspecification problem. We further conduct regression tests with share pledging ratio, dynamic analysis, and the placebo test, and adopt alternative variables probing to mitigate the concerns about reverse causality and other potential omitted variables. The results are consistent with our baseline results.

Finally, we explore the effects of relaxing financial constraints and find that the average pledged funds invested in listed firms by controlling shareholders increased 3.2% more than before the establishment of regulatory reforms. Driven by the tighter

we did not adopt CARs as a proxy, mainly because since the outbreak of COVID-19 from December 2019 in China, stocks exhibit extreme asymmetric volatility that correlates negatively with stock returns (Ramelli and Wagner, 2020). Therefore, using CARs as a proxy may underestimate the firm value.

requirements, controlling shareholders generate more personal loans back to the listed firm, which fosters firm capital investment and R&D expenditure, and positively affects firm growth and competitiveness.

This study contributes to the literature in two ways. First, our findings empirically support the assertion that by adjusting the regulations, share pledging can be an effective external financial vehicle, positively affect firm growth, benefit real economics, especially from the private sector, and further support the legality of share pledges in China's capital market¹⁰. This study enriches the literature by filling the existing research gaps and may, therefore, provide a complete perception of the share pledging business in China.

Second, previous studies argue that share pledging stifles firm innovations because pledges lead controlling shareholders to a potential risk of losing control right, as well as reduce the risk tolerance of investments (Pang and Wang, 2020; Wang et al., 2020). Wang et al., (2020) called on policy-makers to introduce effective regulatory reforms on share pledging. Our findings partially answer their call, as restricting the usage of pledged funds reduces controlling shareholders' potential risk of losing the control rights of their firm, and driving controlling shareholders to plough more pledged funds back to listed firms, which fosters firm capital investment and R&D expenditure, and increases firm long-term value. As such, our study extends the literature on finance, capital investment, and R&D expenditure.

This paper proceeds as follows. Section 2 reviews the related literature, and institutional background and develops the hypotheses tested in the study. Section 3 discusses the sample selection and data, while Section 4 reports the empirical analysis.

¹⁰ On Sept. 6 2021, the director of the listing department of the CSRC announced at the *2021 Beijing Financial Street Forum*, that “after more than three years implement of the new regulatory, as of the end of June 2021, the financing balance dropped to RMB 1.7 trillion, a decrease of 59% and 36% from the peak respectively. Percentage of market value of share pledge from 10.86% in 2017, 9.75% in 2018, fall to 7.97% in 2019, 5.66% in 2020, the risk of share pledges has been substantially mitigated”. (Source: China Financial Stability Report (2020); Oriental Fortune Network).

Section 5 presents the robustness tests, Section 6 presents further analysis, and Section 7 concludes the study.

2. Related Literature, Institutional Background, and Hypothesis Development

2.1 Related Literature

Using the Taiwanese reform in ‘restricted voting rights’ in 2011 that exogenously decreased pledging, Dou *et al.* (2019) documented a negative causal effect of pledging on shareholder wealth. They found that share pledging causes severe price falls, which triggers margin calls and exacerbates the crash risk of pledging firms, and that insider pledging is associated with reduced firm risk-taking. Moreover, they reported that risk reduction incentives can destroy shareholder value as they can create an under-investment problem whereby insiders cause the firm to forego risky but profitable investment projects. Dou *et al.* (2019) and Wang and Chou (2018) also showed that after the changes in the law governing directors’ voting rights, Tobin’s Q for firms with share pledging showed considerable improvements. Anderson and Puleo (2020), using data of randomly selected S&P 1500 firms, documented an economically and statistically significant positive relation between insider pledging and equity risk, suggesting that corporate insiders appear to be extracting private benefits through pledging activities at the expense of outside shareholders. Using data from India, Singh (2018) found that share pledges for personal loans reduce the effective ownership of controlling shareholders and destroy firm value. In contrast, share pledges for firm loans can mitigate problems associated with the limited pledgeability of cash flows and may increase firm value. Anderson and Puleo (2020) and Singh (2018) also suggested that stricter disclosure requirements for insider pledges in the US and India may improve governance quality.

Chinese studies on share pledging are mostly focused on its causes and economic

consequences. Regarding causes, Li *et al.* (2020) suggested that the largest shareholders pledge greater fractions of their holdings when their firms belong to growth industries, are less profitable, are non-SOEs, or have higher leverage. Guo *et al.* (2020) found that shareholders pledge shares to reduce the financial constraints of their non-listed holdings. Regarding consequences, pledging shareholders who fear the loss of their control rights over listed firms are likely to alter their decisions, through earnings management (DeJong *et al.*, 2020), corporate innovation (Pang and Wang, 2020; Wang *et al.*, 2020), and mergers and acquisitions (Zhu *et al.*, 2021). Share pledging is also believed to destroy firm value because of large shareholders' expropriation (Li *et al.*, 2020; Xie *et al.*, 2016; Zheng *et al.*, 2014) and reduced corporate risk-taking (Meng *et al.*, 2019). The negative returns have also been found to be contagious amongst highly pledged stocks in adverse market circumstances (Li *et al.*, 2020). An exception to this trend is that reported by Pan and Qian (2019), who documented a positive shareholder wealth effect in China. As mentioned earlier, most of these studies explored the situation before the 2018 share pledging regulatory reforms and only partially depicted the share pledging business.

2.2 Institutional background

In 1995, the Guarantee Law clarified the legality of share pledges, thus prompting a few companies to engage in share pledging. The business experienced growth after the 2007 Property Law consolidated the legality of share pledges. Table 1 shows the annual distribution of share pledges from 2007 to 2020¹¹. Before 2013, share pledging was organised in the over-the-counter (OTC) market, which was relatively small. Commercial banks and trust firms were the major lenders in this market. In 2013, as a major financial innovation encouraged by the CSRC, the Shanghai Stock Exchange, Shenzhen Stock

¹¹ For the data selection process and source, see Section 3.1 (Sample Selection).

Exchange, and China Securities Depository and Clearing Corporation Limited (CSDC) jointly launched a centralised pledging system in the two stock exchanges. In the exchange market, securities firms became the dominant lender¹². Before 2013, only banks and trust firms were qualified to grant share pledging loans to pledgors (borrowers); however, the guidance allowed securities firms to engage in the business of share pledging transactions. Compared with banks and trust firms, security firms set fewer restrictions on the use of loans and approved transactions more rapidly. Consequently, since the issuance of the guidance, share pledging transactions have grown rapidly (Meng *et al.*, 2019). Panel A of Figure 1 shows the trend in the number of controlling shareholders' share pledging transactions during the period from 2007 through 2020. The year-on-year increases in the ratio based on 2013 stood at 4.7% (2014), 11.6% (2015), 11.77% (2016), and 15.76% (2017).

The risk associated with share pledging drew increasing attention from regulators and investors as it grew into a huge market. In the 2015 A-share market crash, many pledging shareholders received margin calls owing to the significant drops in share prices and collateral values (Bian *et al.*, 2021). Many of them were unable to fulfil the margin requirements and were forced to sell their shares. This caused even more significant price drops for the pledged shares and other shares they held, resulting in widespread panic across the market. Since then, the seemingly oversized share pledging market has been believed to be a new source of systemic risk in the Chinese financial system.

In March 2018, the CSRC began reinforcing the regulations on share pledging¹³. Since then, the Chinese share pledging market shrank gradually. In 2018, 2019, and 2020, the year-on-year increase ratios decreased to 0.43%, -0.31%, and -0.83%, respectively.

¹² On 24 May 2013, the Shanghai Stock Exchange and CSDC issued 'The Guidance on Stock Pledge Repurchase Transactions, Registration and Settlement'. Issuing the guidance was aimed at improving the efficiency of the registration and settlement process of share pledging transactions and reducing the cost of pledging.

¹³ For details of reinforced regulations on share pledging, see appendix D.

Panel B of Figure 1 shows the trends in the number and percentage of controlling shareholders' share pledging transactions from 2015 to 2020. The mean of the percentage of share pledging declined after 2016.

INSERT TABLE 1 HERE

INSERT FIGURE 1 Panel A and Panel B HERE

2.3 Hypothesis Development

One of the most important provisions of the new regulation is as follows: 'For a listed firm, the total number of shares pledged could not exceed 50% of its total shares; for a single pledgor, the overall shares pledged could not exceed 60% of this pledgor's total holdings'. Although this provision is more binding on controlling shareholders whose current share pledge ratio is close to 50%, the reinforcing of relevant regulatory requirements, including the upper limit of the pledge ratio, usually has policy spillover effects, which will also affect the pledging willingness of controlling shareholders with a low pledge ratio (Boehmer *et al.*, 2020). Consequently, they are more cautious in reducing the pledge ratio and reserving more space for maintaining the stability of the stock price in future (Xu *et al.*, 2021). As the controller is the real decision maker of a listed firm, the controlling shareholders face not only the immense pressure brought by debt repayment but also the possibility of losing control over the firm if price declines worsen and if they fail to meet the margin call. Therefore, controlling shareholders are most concerned about keeping the stock price of their pledged shares above the margin call line to protect their control rights. As the share pledge ratio drops for both firms and a single pledgor, controlling shareholders' motivation to maintain the stability of the stock price is reinforced on the one hand, and the possibility of default risk in share pledging is lower on the other hand, as controlling shareholders retain more unpledged shares. Therefore, we presume that imposing a ceiling on the ratio of shares pledged may effectively

decrease the possibility of triggering margin calls by the lender; hence, crash risk and the possibility of forced liquidation are reduced, and firm value increases.

As another important provision, ‘share pledging funds were only allowed to be used in the real economy. Moreover, investments in obsolete industries¹⁴ and the stock market were prohibited’. Before the reinforcing of regulatory reforms, shareholders can use pledged funds in various flexible ways, including making investments, paying off debts, and/or spending on other personal expenses, such as home decoration, college tuition, or large purchases (Larcker and Tayan, 2010). Currently, this restriction on the usage of pledged funds implies that controlling shareholders’ use of funds through share pledging for personal consumption, investment in other businesses and investment in financial products is prohibited; in other words, the obtained funds should be invested in the operation of firms and serve the real economy, thus increasing corporate performance as well as firm value. This provision ensures that controlling shareholders may not be able to use pledged funds to purchase listed firm stakes, such as Yao of Baoneng attempting to acquire Vanke.

Another provision states that ‘small-value share pledging is banned, and that the transaction value had to be larger than 5 million RMB’; in other words, regulators reinforce the limitation on share pledging for personal consumption and purchase of other firms’ stocks by shareholders. This provision also implies that the Shanghai Stock Exchange, Shenzhen Stock Exchange, and CSDC will reinforce the supervision of the disclosure of share pledge information to ensure that pledged funds meet the requirements. Pan and Qian (2019) reported a positive shareholder wealth effect of insiders pledging firm stocks as collateral for personal loans through intercorporate borrowing and

¹⁴ Obsolete Industries refer to investing in projects listed in the catalogue of eliminated industries or in violation of national macro-control policies and environmental protection policies;
http://www.sse.com.cn/lawandrules/sserules/trading/stock/c/c_20180112_4449493.shtml.

explained that the funds that insiders receive flow into firms to relax the firms' financial constraints and that the increases in outside shareholder wealth are larger for financially constrained firms. Based on data on India, Singh (2018) found that share pledges for personal loans reduce the effective ownership of controlling shareholders and destroy firm value, whereas share pledges for firm loans can mitigate problems associated with the limited pledgeability of cash flows and further increase firm value. Therefore, we expect that the two provisions about the restriction on the usage of pledged funds and banning small-value share pledging for shareholders can effectively reduce the financial constraints of listed firms, reinforce the supervision over the disclosure of share pledge information, mitigate the agency conflicts between controlling and minority shareholders, and reduce their motivation to expropriate minority shareholders via tunnelling.

The last important provision of the new regulation is that 'pledged shares involved in performance commitments to share compensation are prohibited from financing through share pledging.' This provision means that firms with performance commitments will be excluded from allowing share pledge financing, and the firms that are allowed to implement share pledges for financing would be free from pressure brought by performance commitments. Meeting performance commitment targets is the main motivation for controlling shareholders to engage in earnings manipulation (DeLong *et al.*, 2019), which increases firms' business risk, and causes firms to face greater bankruptcy risk (Singh, 2018), thereby reducing firm value. The implementation of this provision will effectively address the aforementioned issues. Therefore, we propose that prohibiting pledged shares involved in performance commitments effectively reduces controlling shareholders' motivation to make firm performance 'look good' and decrease firms' business risk, thereby reducing bankruptcy risk and the negative effect on firm value.

Based on the above discussion, we propose the following main hypothesis:

H1: New tighter regulatory requirements of share pledging significantly alleviate the negative effect of controlling shareholders' activities on firm value, thus improving firm value.

In gaining further insight into the underlying channels, we propose the following hypotheses:

H2a: Imposing a ceiling on the ratio of shares pledged effectively reduces firm crash risk.

H2b: Setting restrictions on the usage of pledged funds and banning small-value share pledging effectively reduces the financial constraints of listed firms and mitigates the controlling shareholder expropriation of minority shareholders' wealth via tunnelling.

H2c: Prohibiting share pledging involved in performance commitments effectively reduces firms' bankruptcy risk.

3. Sample Selection and Data Discussion

3.1 Sample Selection

Our initial sample included all Chinese listed firms (A-shares) from 2015 to 2020. We selected 2015 as the baseline year because we needed observations from three years before the policy reform, which was implemented in 2018. The firms' financial data are collected from the China Stock Market and Accounting Research (CSMAR) database¹⁵. Consistent with previous studies, we exclude observations in financial industries owing to their atypical characteristics in terms of operation, and reported and deleted the observations with missing data to calculate variables. The final sample comprises 18,261 firm–year observations. To reduce the influence of outliers, we winsorize all the continuous variables at the 1st and 99th percentiles. We use robust standard errors

¹⁵ The CSMAR database is an economic and financial database developed by the Shenzhen Sysma Data Technology Co., Ltd. for academic research.

clustered at the firm level in each regression to mitigate concerns regarding heteroscedasticity and serial correlation in the error term (Petersen, 2009).

3.2 Data Discussion

Table 2 presents the descriptive statistics for our main variables. Panel A presents the full sample, the average 47.4% of firms have pledged shares, and the mean (median) values of *ROA* and *TOBINQ* are 3.2% (3.6%) and 2.245 (1.659), respectively. Regarding the firm characteristic variables, the average firm size (*SIZE*) is 22.257 in the natural logarithm of the total assets. The leverage ratio (*LEV*) has a mean value of 42.70%. Panel B presents the values for our main variables for pledged firms. The mean values of *ROA* and *TOBINQ* are 3.3% and 2.364, respectively. Panel C presents the values for the variables for non-pledged firms. The mean values of *ROA* and *TOBINQ* are 3.1% and 2.137, respectively. By comparing the two subsamples we find that corporate performance and firm value are higher in pledged firms than in non-pledged firms.

INSERT TABLE 2 HERE

Table 3 presents the differences-in-differences analyses of *ROA* and *TOBINQ* for the two subsamples. Panel A reports the *ROA* results. The difference-in-differences test shows that the difference in the change in the mean *ROA* between pledged and non-pledged firms is 2.4% and is significant at the 1% level. This result indicates that compared with non-pledged firms, pledged firms experienced a more significant increase in *ROA* following the regulatory reforms. Panel A of Figure 2 shows the trend change of *ROA* between pledged and non-pledged firms from 2015 to 2020. Before 2018, the *ROA* of pledged firms was lower than that of non-pledged firms; however, after 2018, the *ROA* of pledged firms exceeded that of non-pledged firms.

Panel B shows the results of *TOBINQ*. The DID test shows that the difference in the change in the mean *TOBINQ* between pledged firms and non-pledged firms is 0.404 and

is significant at the 5% level. This result indicates that compared with non-pledged firms, pledged firms experienced a significant increase in *TOBINQ* following the regulatory reforms. Panel B of Figure 2 shows the trend changes of *TOBINQ* between pledged and non-pledged firms from 2015 to 2020. Before 2018, the *TOBINQ* of pledged firms was lower than that of non-pledged firms; however, after 2018, the *TOBINQ* of pledged firms exceeded that of non-pledged firms. Overall, the above estimates with DID analysis meet our expectations.

INSERT TABLE 3 HERE

INSERT FIGURE 2 Panel A and Panel B HERE

4. Empirical Analysis

4.1 Model Specification

4.1.1 Firm performance/value

Drawing on research on share pledging (Wang and Chou, 2018), we estimated the following DID approach to examine (1) the general relationship between corporate performance (*ROA*), regulatory reforms (*POST*), and the interaction effects between share pledging and regulatory reforms (*PLEDGE*POST*); and (2) the relationship between firm value (*TOBINQ*), regulatory reforms (*POST*), and the interaction effects between share pledging and regulatory reforms (*PLEDGE*POST*).

$$ROA_{i,t} = \beta_0 + \beta_1 PLEDGE_{i,t} * POST_{i,t} + \beta_2 POST_{i,t} + \gamma CONTROLS_{i,t} + \sum YEAR + \sum FIRM + \varepsilon_{i,t} \quad (1)$$

$$TOBINQ_{i,t} = \beta_0 + \beta_1 PLEDGE_{i,t} * POST_{i,t} + \beta_2 POST_{i,t} + \gamma CONTROLS_{i,t} + \sum YEAR + \sum FIRM + \varepsilon_{i,t} \quad (2)$$

where *i* denotes the firm, *t* denotes the year, *YEAR* is the year fixed effects, *FIRM* is the

firm fixed effects, and ε is the error term. In models 1 and 2, the dependent variables are *ROA* and *TOBINQ*, respectively; a dummy variable for controlling shareholder share pledging, *PLEDGE*, is set to 1 for the treatment group and 0 for the control group; we set *POST* as an indicator variable equal to 1 for the post-regulatory reform period (years $t + 0$, $t + 1$, and $t + 2$) and equal to 0 for the pre-regulatory reform period (years $t - 3$, $t - 2$, and $t - 1$). We performed a regression analysis using ordinary least squares (OLS) with t -statistics robust to heteroscedasticity and clustering at the firm level. The other variables are defined in Appendix A.

Following extant studies, we controlled the relevant factors in models 1 and 2 as follows. We included the percentage holding of the largest shareholder (*FIRST*) to control for the institutional shareholders' monitoring effects (Gotti *et al.*, 2012; Mitra *et al.*, 2007). The divergence between cash flow rights and control rights (*SEP*) owing to their significant effects on agency problems were controlled (Claessens *et al.*, 2002)¹⁶, thus influencing firm performance and value. Following Anderson and Puleo (2020) and Singh (2018), we controlled for the following: the proportion of independent directors on the board to reflect governance effects (*INDEP*), size effects (*SIZE*) given that large companies are generally more stable, the ratio of total liabilities to total assets (*LEV*), and cash holding (*CASH*) given that the companies that lost money in the previous year are more likely to report unstable accrued profits. *BIG 4* and the audit opinion (*OPINION*) were controlled for an auditor-specific effect (Zhang *et al.*, 2007). We controlled the corporate ownership structure (*SOE*) because the non-SOE controlling shareholders face more serious financing constraints (Faccio, 2006). We also controlled R&D intensity for innovation (*R&D*) because it captures the effects of agency problems related to contracting

¹⁶ The definition of the cash flows and control rights of the ultimate owners is the same as in Claessens *et al.* (2002), where cash flow rights are measured by the sum of the products of the proportion of ownership along the control chains, and the control rights are measured by the minimum proportion of ownership along the control chains.

imperfections typically associated with greater innovation (Anderson and Puleo, 2020).

4.1.2 Channel Analysis

Following previous literature (e.g. Chen *et al.*, 2001; Kim *et al.*, 2011), we use the negative conditional return skewness (*NCSKEW*) as our primary measure of stock price crash risk. We calculate *NCSKEW* by taking the negative of the third moment of firm-specific weekly returns scaled by the standard deviation of firm-specific weekly returns raised to the third power. The alternative measure of stock price crash risk is ‘down-to-up volatility’ (*DUVOL*), which is calculated as the log of the ratio of the standard deviation on negative firm-specific return periods to the positive periods. Therefore, *DUVOL* captures asymmetric volatilities between down periods and up periods.

Following Almeida *et al.* (2004) and Pan and Qian, (2019), we use the SA index (*SA*, based on Hadlock and Pierce, 2010) as a measure of firm financial constraints. Firms with a higher *SA* score are more likely to experience difficulties when financial conditions worsen because they may have difficulty financing their ongoing operations.

To shed light on the controlling shareholder expropriation of wealth via the tunnelling channel, following Jiang *et al.*, 2015; Liu and Tian (2021), we use controlling shareholders’ tunnelling activities to evaluate the agency conflict between controlling and minority shareholders. We evaluate the controlling shareholder's tunnelling based on inter-corporate loans (also called funds occupation) developed by Jiang et al. (2010). We also use other receivables to total assets (*OTHER*) to evaluate inter-corporate loans to controlling shareholders.

Following previous literature (e.g. Charitou *et al.*, 2011; Franzen *et al.*, 2007; Singh, 2018), we used Altman’s Z-score (*ZSCORE*) to proxy for firm bankruptcy risk; a higher *ZSCORE* indicates a low risk of bankruptcy.

To test the channel analysis, we then construct the following DID model:

$$CHANNEL_{i,t} = \beta_0 + \beta_1 PLEDGE_i * POST_{i,t} + \beta_2 POST_{i,t} + \gamma CONTROLS_{i,t} + \sum YEAR + \sum FIRM + \varepsilon_{i,t} \quad (3)$$

CHANNEL is an umbrella term that captures the following five dependent variables, *NCSKEW*, *DUVOL*, *SA*, *OTHER*, and *ZSCORE* where *i* denotes the firm, *t* denotes the year, *YEAR* is the year fixed effects, *FIRM* is the firm fixed effects, and ε is the error term. *PLEDGE* as a dummy variable, is set to 1 for the treatment group and 0 for the control group; we set *POST* as an indicator variable equal to 1 for the post-regulatory reform period and equal to 0 for the pre-regulatory reform period. We perform a regression analysis using OLS with t-statistics robust to heteroscedasticity and clustering at the firm level. The independent variables and other variables are defined in Appendix A.

4.2 Empirical Results

4.2.1 Main Results

Table 4 presents the results of the baseline regression. Column 1 shows that *POST* is positively related to *ROA* and significant at the 1% level. Column 2 shows the results after the addition of the control variables, *POST* is significantly positively related to *ROA*, and the interaction between *POST* and *PLEDGE* is positively related to *ROA* and is significant at the 1% level. This indicates that after the regulatory reforms, controlling shareholders, as firm decision makers, changed their motivation and behaviours, thereby transforming the negative effect of the share pledging business into a positive one and helping firms improve the ability to obtain profits and increase short-term performance. Column 3 shows similar results to *TOBINQ*, the impact of *POST* becomes positive to *TOBINQ*, significantly at the 1% level. Column 4 shows the results after the addition of the control variables. The interaction between *POST* and *PLEDGE* is positively related to *TOBINQ* and significant at the 5% level. This result suggests that tighter requirements for share pledging also change controlling shareholders' motivation, driving them to

focus more on long-term firm performance. This changes the effect of share pledging on firm value from negative to positive. In sum, these findings suggest that new regulatory reforms for share pledging may significantly alleviate the destructive effect of controlling shareholders' activities on firm value and improve overall firm performance and value. Therefore, hypothesis 1 is supported.

INSERT TABLE 4 HERE

Regarding the control variables, Columns 2 and 4 of Table 4 show that *SEP* is insignificantly negatively related to *ROA* but insignificantly positively related to *TOBINQ*, this result seems to contradict our proposition and the classical literature (e.g. Claessens *et al.*, 2002). The possible reason is the influence of our sample interval. After the regulatory reforms in 2018, the separation of control rights and cash flow rights weakened the effect on firm performance. The results of *FIRST*, *INDEP*, *SIZE*, *LEV*, *CASH*, *BIG4*, *OPINION*, *SOE*, and *R&D* are all consistent with those in the existing literature.

4.2.2 Channel Analysis Results

Table 5 shows the results of the channels analyses. In Column 1, the coefficient of *PLEDGE*POST* is negatively related to *NCSKEW* and significant at the 1% level. This result indicates that the interaction effect between share pledging and regulatory reforms results in a lower *NCSKEW*. In Column 2, the coefficient of *PLEDGE*POST* is negatively related to *DUVOL* and significant at the 1% level. A lower *DUVOL* means that the risk of a stock price crash is lower. This result suggests that tighter regulatory requirements motivate controlling shareholders to take caution to avoid firm crash risk compared with before the reforms. The result is consistent with hypothesis 2a.

In Column 3, the coefficient of *PLEDGE*POST* is negatively related to *SA* and significant at the 1% level. This indicates that the interaction effect between share

pledging and regulatory reforms results in a lower *SA*. This result suggests that tighter regulatory requirements drive the flow of controlling shareholders' pledged funds back to listed firms to support firm operation and reduce firms' financial constraints¹⁷. In Column 4, the coefficient of *PLEDGE*POST* is negatively related to *OTHER* and significant at the 10% level. This result suggests that regulatory reforms also limit controlling shareholders' motivation to exploit shareholders' wealth through tunnelling behaviours. Collectively, the results support hypothesis 2b.

In Column 5, the coefficient of *PLEDGE*POST* is positively related to *ZSCORE* and significant at the 5% level. This indicates that the interaction effect between share pledging and regulatory reforms results in a higher *ZSCORE*. Higher *ZSCORE* means a low risk of bankruptcy, suggesting that new regulatory reforms motivate controlling shareholders to reduce business risk and avoid share pledging default.¹⁸ Therefore, hypothesis 2c is supported.

INSERT TABLE 5 HERE

5. Robustness Tests

5.1 Propensity Score Matching Approach

We perform PSM analysis to control for observed differences between pledged firms and non-pledged firms. Specifically, to obtain propensity scores, we run a logit regression to calculate the likelihood of a firm with shareholder pledging (*PLEDGE*=1), which provides estimates given the function on firm-level financial characteristics. The variables used in the PSM approach include *FIRST*, *SEP*, *INDEP*, *SOE*, *OPINION*, *BIG4*,

¹⁷ We also construct a KZ index following Kaplan and Zingales (1997) as an alternative measure of financial constraints and find that the results are similar.

¹⁸ Following Singh, (2018), we use Ohlson's O-score (OSCORE) as an alternative proxy for firm bankruptcy risk, and find that the results are similar.

SIZE, *LEV*, *CASH*, and *R&D*. We further construct a one-to-one match using a calliper distance of 0.03 from those firms without share pledging (*PLEDGE*=0) to form a control group. Table 6 presents the regression results by using the matched samples. These results are consistent with the previous findings.

INSERT TABLE 6 HERE

5.2 Regression Test with Share Pledging Ratio

Following He et al., (2022), we use share pledging ratio (*PLEDGE_R*) as an alternative proxy for the pledges dummy variable, which is a continuous variable defined as the percentage of shares pledged by the controlling shareholders in the year end out of the total firm shares. Using continuous variables can eliminate the effects of changes in transaction quantities since share pledging declines dramatically after regulatory reforms. Table 7 reports the estimation results, In Columns 1 and 2, the coefficient of *PLEDGE_R*POST* is positively related to *ROA* and *TOBINQ*, significant at the 1% and 5% levels, respectively. The main findings stay qualitatively unchanged with this alternative proxy.

INSERT TABLE 7 HERE

5.3 Dynamic Approach Test

To corroborate our results, we further perform a dynamic analysis. We set five indicator variables: *Y2016*, *Y2017*, *Y2018*, *Y2019*, and *Y2020*. Specifically, *Y2016* is equal to 1 for year 2016 and 0 otherwise, *Y2017* is equal to 1 for year 2017 and 0 otherwise, *Y2018* is equal to 1 for year 2018 and 0 otherwise, *Y2019* is equal to 1 for year 2019 and 0 otherwise, and *Y2020* is equal to 1 for year 2020 and 0 otherwise. Table 8 reports the regression results using the dynamic approach. The coefficients on *PLEDGE*Y2016* and *PLEDGE*Y2017* are insignificant. Meanwhile, the coefficients on *PLEDGE*Y2018*,

*PLEDGE*Y2019*, and *PLEDGE*Y2020* are positively significant, suggesting that these results are consistent with our expectation; after regulatory reforms, firm value increases.

INSERT TABLE 8 HERE

5.4 Placebo Test

Following previous studies, we employ a non-parametric permutation test to make a statistical inference by comparing the actual estimated coefficients with the distribution of placebo coefficients estimated when pledged firms' identity is randomly assigned to observations. To conduct the test, we randomly assign pledged and non-pledged to observations without replacement 500 times. We then estimate the regression of our main models using each of the 500 randomly drawn placebo assignments. In Figure 3, we plot the distribution of the estimated coefficients on *PLEDGE*POST* when the dependent variables are *ROA* and *TOBINQ* from the 500 sets of regressions and determine the location of the coefficient from the actual dataset. As expected, the distribution of placebo coefficients is centred around 0, and none of the estimates is more positive than our true estimates. The results indicate that the actual estimated regulatory effect is unlikely to be owing to accidental factors.

INSERT FIGURE 3 Panel A and Panel B HERE

5.5 Further Alternative Probing

As China's real estate industry shows the characteristics of virtualisation similar to the financial industry, we further exclude real estate firms from the sample using the same basis as that used for excluding financial firms. We replace *ROA* with net profit divided by total equity (*ROE*) and with EBIT divided by total assets (*ROI*). Table 9 presents the regression results by using these alternative variables. The coefficients on

*PLEDGE*POST* are both significantly positive, which is consistent with the previous findings.

INSERT TABLE 9 HERE

6. Further Analysis

We conduct further analysis to examine the effects of relaxed financial constraints. Although we find that tighter requirements relax a firm's financial constraints and positively affect firm value, the underlying mechanism is still ambiguous. Conventional wisdom suggests that loans obtained by controlling shareholders may flow back to the listed firms via borrowings, equity investments, or other related-party transactions (e.g. Meng et al., 2019; Pang and Wang, 2020)¹⁹. However, some researchers argue that a large fraction of share pledging used by controlling shareholders may support their entrepreneurial activities or invest in listed firms (Guo *et al.*, 2020; He et al., 2022). If the funds obtained through share pledging are not invested in the firm, the firm's financial constraints will not be relieved (Singh, 2018). To identify how pledged funds influence the relaxation of a firm's financial constraints, we conduct this underlying mechanism analysis in two steps. First, we collect the disclosure information of the share pledge in CSMAR and divide it into three categories according to the pledged funds usage, personal loans, firm loans, and financing third parties. Following Pan and Qian (2019), we expect that firm loans and financing third parties within the scope can relax the firm's financial constraints directly.

Second, because listed firms are not required to disclose the purpose of share

¹⁹ Meng et al. (2019) suggested that share pledging is a financing channel for firms heavily dependent on external financing. Pang and Wang (2020) argued that compared with traditional external financing, share pledging is an easier, faster, and less costly financing channel for listed firms.

pledges by shareholders, we are unable to directly investigate information regarding personal loans. We, therefore, adopt indirect measures to replace it. We select capital investment projects and R&D expenditure as our measures of controlling shareholders' investment by their personal loans, as they can significantly affect firm value and competitiveness, especially from long-term growth (Pang and Wang, 2020; Wang, et al., 2020), which is also impeded by the firm's financial constraints (Brown et al., 2009; Hsu et al., 2014). We presume that controlling shareholders are the ultimate decision-makers of the firm and, under the new restriction of the usage of pledged funds, if the firm's financial constraint is relaxed, their best option is to invest personal loans into projects that generate profits for the firm. If this financial constraint relaxation hypothesis is correct, we should be able to observe a positive relationship between relaxed financial constraints and firm capital investment, as well as R&D expenditure.

To test these predictions, we employ a regression model of the following specification:

$$INVEST_{i,t} = \beta_0 + \beta_1 POST_{i,t} + \gamma CONTROLS_{i,t} + \sum YEAR + \sum INDUSTRY + \sum FIRM + \varepsilon_{i,t} \quad (4)$$

INVEST is an umbrella term that captures the following three dependent variables, *PROJECT*, *CAPX* and *R&D*. *PROJECT* is a dummy variable that equals 1 if pledged funds invest to firm, 0 otherwise; *CAPX* and *R&D* are dependent variables, respectively. *i* denotes the firm, *t* denotes the year, *YEAR* is the year fixed effects, *INDUSTRY* is the industry fixed effects, *FIRM* is the firm fixed effects, and ε is the error term. We set *POST* as an indicator variable equal to 1 for the post-regulatory reform period and equal to 0 for the pre-regulatory reform period. We perform a regression analysis using OLS with t-statistics robust to heteroscedasticity and clustering at the firm level. The independent variable and other variables are defined in Appendix A.

Panel A of Table 10 shows funds invested into firm (*PROJECT*). The mean value of *PROJECT* for pledged firms in the post-regulatory reforms period (after 2018) is 14.6%, 3.2% higher than that in the pre-regulatory reforms period (before 2018), and the differences in mean are statistically significant at the 1% level. These results indicate that the average percentage of share pledged funds invest to listed firms increases 3.2% more after regulatory reforms than before it.

INSERT TABLE 10 HERE

Panel B of Table 10 shows the results of the effects of relaxed firm's financial constraints. In Column 1, with *PROJECT* as the dependent variable, coefficient *POST* is positively related to *PROJECT* and significant at the 1% level, indicating that regulatory reforms positively affect share pledges funds flow back to the listed firm. In Columns 2 and 3, with *CAPX* and *R&D* as the dependent variable respectively, the coefficients of *POST* are positively related to *CAPX* and *R&D*, both significant at the 1% level, suggesting that regulatory reforms relax firm's financial constraints, and the relaxation of financial constraints positively affect firm capital investment and R&D expenditure. More investment in capital investment projects and R&D expenditure will benefit firm growth and competitiveness, hence, increasing firm long-term value.

7. Conclusion

Extant literature on share pledging in China mostly focused on the regulatory shock that took place in May 2013 and found that share pledging had likely had a negative effect on firm value. This study utilises the 2018 regulatory framework reforms as a quasi-natural experiment and investigates the effect of tighter regulations on firm value as well

as explores the mechanism through which adjusting pledging regulations affects value. Our findings show that tighter regulatory requirements, such as the cap in share pledge ratio, restricting the usage of pledged funds, banning small-value pledges, and prohibiting share pledges involved in performance commitments, can effectively reduce firms' crash risk, relax financial constraints, reduce bankruptcy risk, and mitigate controlling shareholder expropriation of minority shareholders wealth via tunnelling. These effects significantly alleviate the destructive effect of controlling shareholders' activities on firm and increase firm value.

We also demonstrate that regulatory reforms relax firm's financial constraints, as well as drive controlling shareholders to plough more pledged funds back to listed firms, which in turn, fosters firm capital investment and R&D expenditure, benefits firm growth and competitiveness and ultimately increases firm long-term value.

Our findings not only have significant implications for policymakers and investors facing share pledge reforms in China but also for regulators in other economies with similar concentrated ownership structure, specifically, restricting the usage of pledged funds and prohibiting share pledges involved in performance commitments.

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Appendix A: Definitions of Variables

Dependent variables	Definition
<i>ROA</i>	Return on assets, the ratio of net profit to total assets (source: CSMAR)
<i>TOBINQ</i>	Sum of the market value of equity and the book value of debt scaled by total assets (source: CSMAR)
<i>NCSKEW</i>	The negative of the third moment of firm-specific weekly returns scaled by the standard deviation of firm-specific weekly returns raised to the third power (source: CSMAR)
<i>DUVOL</i>	The down-to-up volatility that is calculated as the log of the ratio of the standard deviation on negative firm-specific return weeks to positive weeks (source: CSMAR)
<i>SA</i>	A measurement for firms' financial constraints calculated based on Hadlock and Pierce (2010) (source: CSMAR)
<i>ZSCORE</i>	Altman Z-score (Altman, 1968), which is a formula for determining whether a company is headed for bankruptcy (source: CSMAR)
<i>OTHER</i>	Other receivables scaled by total assets (source: CSMAR)
<i>CAPX</i>	Cash paid for the construction of fixed assets, intangible assets and other long-term assets scaled by total assets (source: CSMAR)
<i>R&D</i>	R&D expenditure scaled by total operating income

	(source: CSMAR)
<i>PROJECT</i>	Dummy variable, equal to 1 for share pledged funds flow to firms and 0 otherwise (source: CSMAR)
Independent variables	Definition
<i>PLEDGE</i>	Dummy variable, equal to 1 for firms with share pledges during the period from 2015 through 2020 and 0 otherwise (source: CSMAR)
<i>PLEDGE_R</i>	The percentage of shares pledged by the controlling shareholders scaled by the total shares of the listed firm (source: CSMAR).
<i>POST</i>	Indicator variable equal to 1 for the post-regulatory reform period (years $t + 0$, $t + 1$, and $t + 2$) and equal to 0 for the pre-regulatory reform period (years $t - 3$, $t - 2$, and $t - 1$)
<i>ROE</i>	The ratio of net profit to total equity (source: CSMAR)
<i>ROI</i>	The ratio of EBIT to total assets (source: CSMAR)
Control variables	Definition
<i>FIRST</i>	Proportion of shareholding by the largest shareholder (source: CSMAR)
<i>SEP</i>	The difference between the largest shareholder's control rights and cash flow rights (Claessens <i>et al.</i> , 2002) (source: CSMAR).
<i>INDEP</i>	Proportion of independent directors in the board (source: CSMAR)
<i>SOE</i>	Dummy variable, equal to 1 if the firm is owned by state and 0 otherwise (source: CSMAR)
<i>OPINION</i>	Dummy variable, equal to 1 if the firm audit opinion is issued with non-standard and 0 otherwise (source: CSMAR)
<i>BIG4</i>	Dummy variable, equal to 1 if the firm is audited by one of the Big 4 auditors and 0 otherwise (source: CSMAR)
<i>SIZE</i>	Natural logarithm of total assets (source: CSMAR)
<i>LEV</i>	Ratio of total liabilities to total assets (source: CSMAR)
<i>CASH</i>	Monetary capital scaled by total assets (source: CSMAR)
<i>YEAR</i>	Year fixed effect
<i>FIRM</i>	Firm fixed effect
<i>INDUSTRY</i>	Industry fixed effect

Appendix B

The Chinese A-share index declined from a peak of 5,178 points in 2015 to 3,295 points at the end of 2017. Since February 2018, the index has been recording a rapid decline; it fell below 3,000 and 2,500 points in June and October 2018, respectively. Despite this plunge in the stock index, there has been a surge in the share pledging business. According to the WIND statistics, in 2015, 2016, and 2017, controlling shareholders pledged 1,376, 1,622, and 1,987 companies, respectively. We note an

average increase of 20%. By the end of 2017, 97.9% of A-share companies had implemented share pledges. In February 2018, approximately 117 companies (mainly private companies) had already triggered the margin call, possibly having to liquidate their shares. The forced liquidation and auction of the shares of controlling shareholders can result in the translocation of the actual controllers of private enterprises, affect company operations, and drag down other enterprises upstream and downstream of the industrial chain, thereby causing a decline in the economic growth rate. If the share price falls and shares are liquidated, then a large number of banks, securities firms, and trusts would suffer huge losses and even systemic risks. Aware of the huge systemic risks caused by share pledges, the China Securities Regulatory Commission (CSRC) introduced policies to alleviate the problem of share pledging (source: WIND, 2021; Oriental Fortune Network).

Appendix C

Yao Zhenhua, the controller of Baoneng, which is a local real estate firm in Shenzhen. In July 2015, Yao used Baoneng and other companies he controlled to raise money, through share pledging and insurance funding, and acquired a 15% stake of Vanke, a famous Fortune 500 company. He further used the 15% of the stake of Vanke to take six rounds of recycling pledges and purchased another 10.4% stake of Vanke. By the end of 2016, he held 25.4% stake of Vanke and became the largest shareholder. This "snake swallowing elephant" hostile merger caused a strong counterattack from Vanke's management, to fight for the controlling rights of the company, which also alerted the CSRC and the China Insurance Regulatory Commission (CIRC). On 24 February 2017, CIRC punished Baoneng for the illegal use of funds and awarded Yao a 10-year penalty ban in the insurance industry.

Appendix D

In March 2018, the CSRC began reinforcing the regulations on share pledging, resulting in the following mandates: i) for a listed firm, the total number of shares pledged could not exceed 50% of its total shares; for a single pledgor, the overall shares pledged could not exceed 60% of this pledgor's total holdings; ii) share pledging funds should only be used in the real economy, and investments in obsolete industries and the stock market are prohibited; iii) small-value share pledging was banned, and the transaction value should be greater than 5 million RMB; iv) pledged shares involved in performance commitments to share compensation are prohibited from financing through share pledging.

Table 1: Annual distribution of controlling shareholders' share pledging during the period 2007–2020

Year	Obs	Number of Pledged Firms	Percent (%)
2007	1,270	400	31.50
2008	1,377	452	32.82
2009	1,486	526	35.40
2010	1,807	739	40.90
2011	2,092	924	44.17
2012	2,252	1,022	45.38
2013	2,222	996	44.82
2014	2,255	1,043	46.25
2015	2,443	1,164	47.65
2016	2,701	1,301	48.17
2017	3,140	1,506	47.96
2018	3,335	1,572	47.14
2019	3,333	1,567	47.01
2020	3,309	1,554	46.96

Table 2: Descriptive statistics

Panel A: Full Sample								
Variable	Obs	Mean	SD	Min	Q1	Median	Q3	Max
<i>ROA</i>	18261	0.032	0.083	-0.447	0.013	0.036	0.066	0.203
<i>TOBINQ</i>	18261	2.245	1.542	0.844	1.247	1.659	2.421	10.167
<i>PLEDGE</i>	18261	0.474	0.499	0.000	0.000	0.000	1.000	1.000
<i>PLEDGE_R</i>	7657	0.035	0.049	0.000	0.005	0.016	0.050	0.256
<i>POST</i>	18261	0.546	0.498	0.000	0.000	1.000	1.000	1.000
<i>NCSKEW</i>	17243	-0.293	0.795	-2.457	-0.713	-0.271	0.139	1.930
<i>DUVOL</i>	17243	-0.194	0.516	-1.387	-0.531	-0.204	0.124	1.163
<i>SA</i>	18261	-3.837	.256	-5.600	-3.998	-3.837	-3.677	-2.112
<i>ZSCORE</i>	18261	5.034	6.177	-1.080	1.787	3.112	5.743	30.392
<i>OTHER</i>	18246	0.052	0.127	0.000	0.005	0.015	0.038	0.919
<i>CAPX</i>	7657	0.047	0.044	0.001	0.015	0.034	0.066	0.223
<i>PROJECT</i>	7657	0.131	0.338	0	0	0	0	1
<i>FIRST</i>	18261	0.338	0.144	0.084	0.226	0.316	0.432	0.737
<i>SEP</i>	18261	0.050	0.075	0.000	0.000	0.000	0.086	0.286
<i>INDEP</i>	18261	0.378	0.054	0.333	0.333	0.364	0.429	0.571
<i>SOE</i>	18261	0.329	0.470	0.000	0.000	0.000	1.000	1.000
<i>OPINION</i>	18261	0.049	0.215	0.000	0.000	0.000	0.000	1.000
<i>BIG4</i>	18261	0.056	0.229	0.000	0.000	0.000	0.000	1.000
<i>SIZE</i>	18261	22.257	1.328	19.654	21.318	22.096	22.996	27.162
<i>LEV</i>	18261	0.427	0.207	0.060	0.263	0.414	0.574	0.966
<i>CASH</i>	18261	0.171	0.118	0.011	0.088	0.141	0.222	0.613
<i>R&D</i>	18261	0.040	0.045	0.000	0.005	0.032	0.051	0.255
Panel B: Pledged Firms								
Variable	Obs	Mean	SD	Min	Q1	Median	Q3	Max
<i>ROA</i>	8664	0.033	0.089	-0.447	0.012	0.035	0.065	0.203
<i>TOBINQ</i>	8664	2.364	1.491	0.844	1.316	1.747	2.520	10.167
Panel C: Non-Pledged Firms								
Variable	Obs	Mean	SD	Min	Q1	Median	Q3	Max
<i>ROA</i>	9597	0.031	0.077	-0.447	0.013	0.036	0.067	0.203
<i>TOBINQ</i>	9597	2.137	1.586	0.844	1.191	1.581	2.331	10.167

Note. This table presents the descriptive statistics for the firms in our sample for the period from 2015 through 2020. Panel A shows the full sample, which includes 18,261 firm-year observations whilst Panels B and C show the descriptive statistics of pledged/non-pledged firms for the two variables, *ROA* and *TOBINQ*; the observations for these variables are 8,664 and 9,597, respectively. All the variables are defined in Appendix A.

Table 3: Differences between pledged and non-pledged firms affected by tighter regulatory reforms for share pledging: *ROA* and *TOBINQ*

Panel A: <i>ROA</i>					
Variable	Year < 2018		Year $\geq$ 2018		Diff
	N	Mean	N	Mean	
PLEDGE	4313	0.017	4693	0.047	0.030***
NON- PLEDGE	3971	0.028	4693	0.034	0.006***
Diff-in-Diff (PLEDGE-NON-PLEDGE)					0.024***
Panel B: <i>TOBINQ</i>					
Variable	Year < 2018		Year $\geq$ 2018		Diff
	N	Mean	N	Mean	
PLEDGE	4313	1.597	5284	2.573	0.976***
NON- PLEDGE	3791	1.823	5284	2.395	0.572***
Diff-in-Diff (PLEDGE-NON-PLEDGE)					0.404**

Note. This table presents the difference-in-differences results between pledged and non-pledged firms affected by the tighter regulatory reforms for share pledging in 2018. Panel A shows the results of *ROA*, Panel B shows the results of *TOBINQ*. All the variables are defined in Appendix A. *t* (*z*)-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively.

Table 4: Share pledging – *ROA* and *TOBINQ*

	(1) <i>ROA</i>	(2) <i>ROA</i>	(3) <i>TOBINQ</i>	(4) <i>TOBINQ</i>
<i>POST</i>	0.0187*** (7.847)	0.0142*** (5.939)	0.6152*** (14.285)	0.5837*** (12.659)
<i>PLEDGE*POST</i>		0.0090*** (4.631)		0.0814** (2.066)
<i>FIRST</i>	0.0911*** (5.700)	0.0828*** (5.212)	-0.4924 (-1.627)	-0.5659* (-1.860)
<i>SEP</i>	-0.0108 (-0.729)	-0.0108 (-0.733)	0.3684 (1.401)	0.3638 (1.385)
<i>INDEP</i>	-0.0111 (-0.536)	-0.0113 (-0.550)	0.2964 (0.951)	0.2992 (0.960)
<i>SOE</i>	-0.0113* (-1.771)	-0.0095 (-1.468)	-0.2208*** (-3.020)	-0.2090*** (-2.853)
<i>OPINION</i>	-0.0853*** (-15.365)	-0.0831*** (-15.005)	-0.0266 (-0.441)	-0.0176 (-0.291)
<i>BIG4</i>	0.0056 (1.106)	0.0053 (1.034)	0.0990 (0.716)	0.0990 (0.719)
<i>SIZE</i>	0.0429*** (15.396)	0.0436*** (15.411)	-0.6503*** (-11.212)	-0.6455*** (-11.113)
<i>LEV</i>	-0.2586*** (-25.779)	-0.2551*** (-25.556)	0.0036 (0.020)	0.0185 (0.103)
<i>CASH</i>	0.0348*** (3.977)	0.0346*** (3.908)	0.0383 (0.216)	0.0248 (0.140)
<i>R&D</i>	-0.5786*** (-10.481)	-0.5753*** (-10.507)	-1.0805* (-1.750)	-1.0463* (-1.695)
<i>CONS</i>	-0.8232*** (-13.119)	-0.7550*** (-9.692)	16.1432*** (11.550)	16.0338*** (11.435)
<i>YEAR</i>	YES	YES	YES	YES
<i>FIRM</i>	YES	YES	YES	YES
<i>N</i>	18261	18261	18261	18261
<i>R</i> ²	0.280	0.286	0.270	0.271

Note. This table presents the results from the OLS regression test. Columns 1 and 2 use *ROA* as the dependent variable and examine its relationship with *POST*, as well as the interaction effect between *PLEDGE* and *POST*. Columns 3 and 4 use *TOBINQ* as the dependent variable and examine its relationship with *POST*, as well as the interaction effect between *PLEDGE* and *POST*. All the variables are defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively.

Table 5: Share pledging and channel analysis

	(1) <i>NCSKEW</i>	(2) <i>DUVOL</i>	(3) <i>SA</i>	(4) <i>OTHER</i>	(5) <i>ZSCORE</i>
<i>POST</i>	0.2797*** (10.290)	0.2511*** (9.227)	-0.1771*** (-30.050)	-0.0028 (-0.921)	1.5037*** (9.202)
<i>PLEDGE*POST</i>	-0.0919*** (-3.439)	-0.0785*** (-2.941)	-0.0113*** (-5.408)	-0.0276* (-1.931)	0.3343** (2.212)
<i>FIRST</i>	-0.2352 (-1.394)	-0.2255 (-1.328)	0.0629*** (2.657)	-0.0534*** (-5.446)	-0.5337 (-0.440)
<i>SEP</i>	-0.2471 (-1.251)	-0.2486 (-1.253)	0.0020 (0.134)	0.0386* (1.912)	0.8270 (0.860)
<i>INDEP</i>	0.1461 (0.666)	0.1746 (0.794)	-0.0052 (-0.342)	0.0460* (1.915)	1.1791 (1.033)
<i>SOE</i>	-0.0660 (-1.174)	-0.0710 (-1.254)	-0.0021 (-0.485)	-0.0085** (-2.396)	-0.0340 (-0.121)
<i>OPINION</i>	0.1178*** (2.792)	0.1198*** (2.836)	0.0112*** (3.326)	0.1517*** (11.401)	0.5052** (2.197)
<i>BIG4</i>	-0.0240 (-0.322)	-0.0282 (-0.380)	0.0216** (2.569)	0.0055 (0.666)	-0.7562 (-1.363)
<i>SIZE</i>	0.0551** (2.374)	0.0574** (2.473)	-0.0202*** (-3.443)	-0.0014 (-0.860)	-0.8449*** (-4.425)
<i>LEV</i>	0.0849 (1.006)	0.0828 (0.980)	-0.0078 (-0.578)	0.0350*** (3.417)	-16.1074*** (-25.402)
<i>CASH</i>	0.0662 (0.681)	0.0729 (0.746)	0.0460*** (4.080)	-0.0654*** (-5.640)	2.1365*** (2.934)
<i>R&D</i>	0.0669 (0.162)	0.0721 (0.173)	-0.0459 (-1.535)	0.1424*** (3.151)	-2.8951 (-0.981)
<i>CONS</i>	-1.6520*** (-3.113)	-1.7171*** (-3.235)	-3.3149*** (-25.872)	0.0970** (2.332)	30.4309*** (6.980)
<i>YEAR</i>	YES	YES	YES	YES	YES
<i>FIRM</i>	YES	YES	YES	YES	YES
<i>N</i>	17243	17243	18261	18246	18261
<i>R²</i>	0.038	0.044	0.161	0.207	0.411

Note. This table presents the results of *NCSKEW*, *DUVOL*, *SA*, *OTHER*, and *ZSCORE* in relation to *POST* and *PLEDGE*POST* and to the control variables. In Column 1, we use *NCSKEW* as the dependent variable; in Columns 2, 3, 4, and 5 we use *DUVOL*, *SA*, *OTHER*, and *ZSCORE* as the dependent variable, respectively. All the variables are defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively.

Table 6: Robustness test with regressions using PSM

	(1) <i>ROA</i>	(2) <i>TOBINQ</i>
<i>POST</i>	0.0015 (0.541)	1.0125*** (16.020)
<i>PLEDGE*POST</i>	0.0057** (2.091)	0.0722** (2.237)
<i>FIRST</i>	0.0647*** (9.383)	-0.5721*** (-3.777)
<i>SEP</i>	-0.0282** (-2.486)	1.1476*** (4.117)
<i>INDEP</i>	-0.0250 (-1.372)	1.3651*** (3.273)
<i>SOE</i>	-0.0177*** (-6.917)	0.1325** (2.101)
<i>OPINION</i>	-0.1107*** (-15.537)	0.6498*** (5.090)
<i>BIG4</i>	0.0062 (1.528)	0.6877*** (5.704)
<i>SIZE</i>	0.0137*** (12.176)	-0.5656*** (-14.925)
<i>LEV</i>	-0.1413*** (-19.868)	0.1569 (0.916)
<i>CASH</i>	0.0813*** (9.068)	0.8434*** (4.043)
<i>R&D</i>	-0.1421*** (-3.713)	3.7775*** (3.985)
<i>CONS</i>	-0.2203*** (-8.629)	14.0993*** (17.621)
<i>YEAR</i>	YES	YES
<i>FIRM</i>	YES	YES
<i>N</i>	10472	10472
<i>R²</i>	0.321	0.312

Note. This table presents the results of the robustness test with regressions using the PSM method. For the PSM method, matching with non-pledged firms was based on firm *FIRST*, *SEP*, *INDEP*, *SOE*, *OPINION*, *BIG4*, *SIZE*, *LEV*, *CASH*, and *R&D* and then, construct a one-to-one match to form a control group. All variables are defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively.

Table 7: Robustness test with regressions using *PLEDGE_R*

	(1) <i>ROA</i>	(2) <i>TOBINQ</i>
<i>PLEDGE_R</i>	-0.0432* (-1.689)	-0.6978 (-1.616)
<i>POST</i>	0.0371*** (8.348)	0.8005*** (9.704)
<i>PLEDGE_R *POST</i>	0.1238*** (3.404)	0.4335** (2.285)
<i>FIRST</i>	0.1326*** (4.594)	-0.3948 (-0.772)
<i>SEP</i>	-0.0208 (-0.788)	0.4499 (1.095)
<i>INDEP</i>	-0.0309 (-0.843)	0.0259 (0.052)
<i>SOE</i>	-0.0163 (-1.594)	-0.3025*** (-3.376)
<i>OPINION</i>	-0.0785*** (-9.683)	-0.0704 (-1.030)
<i>BIG4</i>	0.0014 (0.133)	0.2093 (0.577)
<i>SIZE</i>	0.0549*** (12.043)	-0.6304*** (-7.126)
<i>LEV</i>	-0.2584*** (-16.502)	-0.1113 (-0.446)
<i>CASH</i>	-0.0112 (-0.767)	-0.0262 (-0.097)
<i>R&D</i>	-0.7346*** (-9.219)	-2.8308*** (-3.352)
<i>CONS</i>	-1.0417*** (-10.258)	17.3707*** (8.860)
<i>YEAR</i>	YES	YES
<i>FIRM</i>	YES	YES
<i>N</i>	7657	7657
<i>R²</i>	0.300	0.341

Note. This table presents the results of the robustness test with regressions using the share pledging ratio (*PLEDGE_R*). Column 1 uses *ROA* as the dependent variable and examines its relationship with *PLEDGE_R* and *POST*, as well as the interaction effect between *PLEDGE_R* and *POST*. Column 2 uses *TOBINQ* as the dependent variable and examines its relationship with *PLEDGE_R* and *POST*, as well as the interaction effect between *PLEDGE_R* and *POST*. All the variables are defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively.

Table 8: Robustness test with dynamic approach

	(1) <i>ROA</i>	(2) <i>TOBINQ</i>
<i>PLEDGE*Y2016</i>	0.0064 (0.595)	0.2076 (0.880)
<i>PLEDGE*Y2017</i>	-0.0031 (-1.238)	0.2520 (0.951)
<i>PLEDGE*Y2018</i>	0.0074** (2.270)	0.2686*** (3.976)
<i>PLEDGE*Y2019</i>	0.0186*** (5.436)	0.2492*** (3.589)
<i>PLEDGE*Y2020</i>	0.0108*** (3.188)	0.2689*** (3.456)
<i>FIRST</i>	0.0563*** (11.162)	-0.2969* (-2.559)
<i>SEP</i>	-0.0137 (-1.615)	0.6130*** (2.935)
<i>INDEP</i>	-0.0305** (-2.353)	1.0965*** (3.668)
<i>SOE</i>	-0.0162*** (-8.751)	0.0728 (1.478)
<i>OPINION</i>	-0.1139*** (-20.007)	0.6524*** (5.973)
<i>BIG4</i>	0.0001 (0.020)	0.4389*** (5.499)
<i>SIZE</i>	0.0124*** (16.204)	-0.4725*** (-16.929)
<i>LEV</i>	-0.1396*** (-26.320)	0.0099 (0.072)
<i>CASH</i>	0.0867*** (12.374)	1.1531*** (6.015)
<i>R&D</i>	-0.1872*** (-6.716)	3.6221*** (5.825)
<i>CONS</i>	-0.1951*** (-11.307)	12.0722*** (20.115)
<i>YEAR</i>	YES	YES
<i>FIRM</i>	YES	YES
<i>N</i>	18261	18261
<i>R²</i>	0.321	0.314

Note. This table presents the results of the robustness test with the dynamic approach. We set five indicator variables – *Y2016*, *Y2017*, *Y2018*, *Y2019*, and *Y2020* – and replace the *POST* indicator in the models with these five indicators. Columns 1 and 2 show the regression results. All the variables are defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively.

Table 9: Robustness test with alternative variables

	(1) Delete Real Estate Firms <i>ROA</i>	(2) <i>TOBINQ</i>	(3) Replace <i>ROA</i> <i>ROE</i>	(4) <i>ROI</i>
<i>POST</i>	0.0147*** (5.923)	0.5998*** (12.649)	0.0284*** (5.246)	0.0136*** (5.616)
<i>PLEDGE*POST</i>	0.0099*** (4.915)	0.1056*** (2.611)	0.0206*** (4.978)	0.0086*** (4.307)
<i>FIRST</i>	0.0827*** (4.966)	-0.6886** (-2.141)	0.1451*** (4.361)	0.0841*** (5.213)
<i>SEP</i>	-0.0132 (-0.878)	0.3663 (1.325)	-0.0268 (-0.793)	-0.0122 (-0.816)
<i>INDEP</i>	-0.0097 (-0.455)	0.2790 (0.851)	-0.0563 (-1.236)	-0.0112 (-0.541)
<i>SOE</i>	-0.0093 (-1.431)	-0.2061*** (-2.844)	-0.0331** (-2.254)	-0.0108 (-1.640)
<i>OPINION</i>	-0.0846*** (-14.708)	-0.0553 (-0.862)	-0.2000*** (-15.526)	-0.0780*** (-14.464)
<i>BIG4</i>	0.0070 (1.264)	0.0537 (0.335)	0.0240* (1.867)	0.0057 (1.053)
<i>SIZE</i>	0.0442*** (15.167)	-0.6479*** (-10.580)	0.0949*** (15.438)	0.0402*** (14.623)
<i>LEV</i>	-0.2603*** (-25.611)	0.0835 (0.436)	-0.5469*** (-23.072)	-0.2294*** (-23.346)
<i>CASH</i>	0.0321*** (3.646)	0.0479 (0.261)	0.0838*** (4.890)	0.0341*** (3.832)
<i>R&D</i>	-0.5997*** (-10.802)	-0.9800 (-1.561)	-1.0904*** (-11.672)	-0.6088*** (-11.300)
<i>CONS</i>	-0.8477*** (-12.865)	16.8305*** (12.269)	-1.8230*** (-13.291)	-0.7567*** (-12.191)
<i>YEAR</i>	YES	YES	YES	YES
<i>FIRM</i>	YES	YES	YES	YES
<i>N</i>	17581	17581	18261	18261
<i>R</i> ²	0.284	0.263	0.275	0.252

Note. This table presents the results of the robustness test with alternative variables. In Columns 1 and 2, we omit real estate firms. In Columns 3 and 4, we replace *ROA* with *ROE* and *ROI*. All the variables are defined in Appendix A. *t*-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively.

Table 10: Further analysis: effects of relaxed financial constraints

Panel A:

	POST=0		POST=1		
	N	mean	N	mean	diff
PROJECT	3377	0.114	4280	0.146	0.032***

Panel B:

	(1) <i>PROJECT</i>	(2) <i>CAPX</i>	(3) <i>R&D</i>
<i>POST</i>	0.5420*** (4.170)	0.0615*** (17.691)	0.0079*** (9.249)
<i>FIRST</i>	0.2667 (0.568)	-0.0203 (-1.110)	0.0002 (0.037)
<i>SEP</i>	-1.4697** (-2.225)	-0.0205 (-0.887)	0.0083 (1.465)
<i>INDEP</i>	1.2144 (1.275)	0.0371 (1.359)	-0.0027 (-0.388)
<i>SOE</i>	0.4164** (1.995)	0.0152*** (2.788)	0.0018 (0.811)
<i>OPINION</i>	0.0290 (0.145)	0.0139** (2.331)	0.0057*** (3.596)
<i>BIG4</i>	-0.3078 (-1.198)	-0.0088 (-0.590)	0.0029 (1.323)
<i>SIZE</i>	-0.1338** (-2.351)	-0.0366*** (-10.264)	-0.0008 (-0.774)
<i>LEV</i>	-0.7935** (-2.374)	0.0699*** (5.942)	-0.0064** (-1.970)
<i>CASH</i>	0.9365* (1.813)	0.2988*** (18.635)	-0.0074** (-2.200)
<i>R&D</i>	0.0170 (0.013)	0.0500 (0.891)	-
<i>CONS</i>	4.4251*** (3.261)	0.6287*** (7.891)	0.0583** (2.445)
<i>YEAR</i>	YES	YES	YES
<i>INDUSTRY</i>	YES	NO	NO
<i>FIRM</i>	NO	YES	YES
<i>N</i>	7657	7657	7657
<i>R²</i>	0.129	0.115	0.345

Note. This table presents the results of the further analysis of the effects of relaxed financial constraints. Panel A presents the difference-in-differences results between personal loans and firm loans impacted by the tighter regulatory reforms for share pledging in 2018. Panel B presents the results of the effects of relaxed financial constraints. In Column 1, we use *PROJECT* as the dependent variable and show the results for *POST*. In Columns 2 and 3, we use *CAPX* and *R&D* as the dependent variable, respectively, and show the results for *POST*. All the variables are defined in Appendix A. *t* (*z*)-statistics appear in parentheses and are based on standard errors clustered by firm and year. ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively.

Figure Legends



Figure 1 Panel A: Trend of the number of controlling shareholders' share pledging transactions from 2007 to 2020

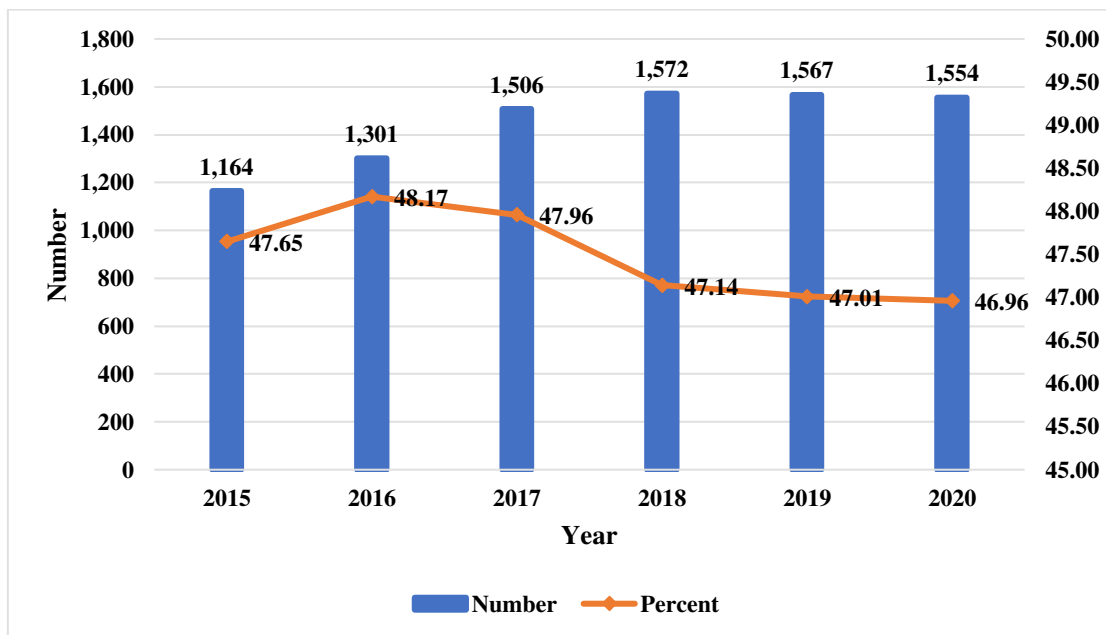


Figure 1 Panel B: Trend of the number and percentage of controlling shareholders' share pledging activities from 2015 to 2020

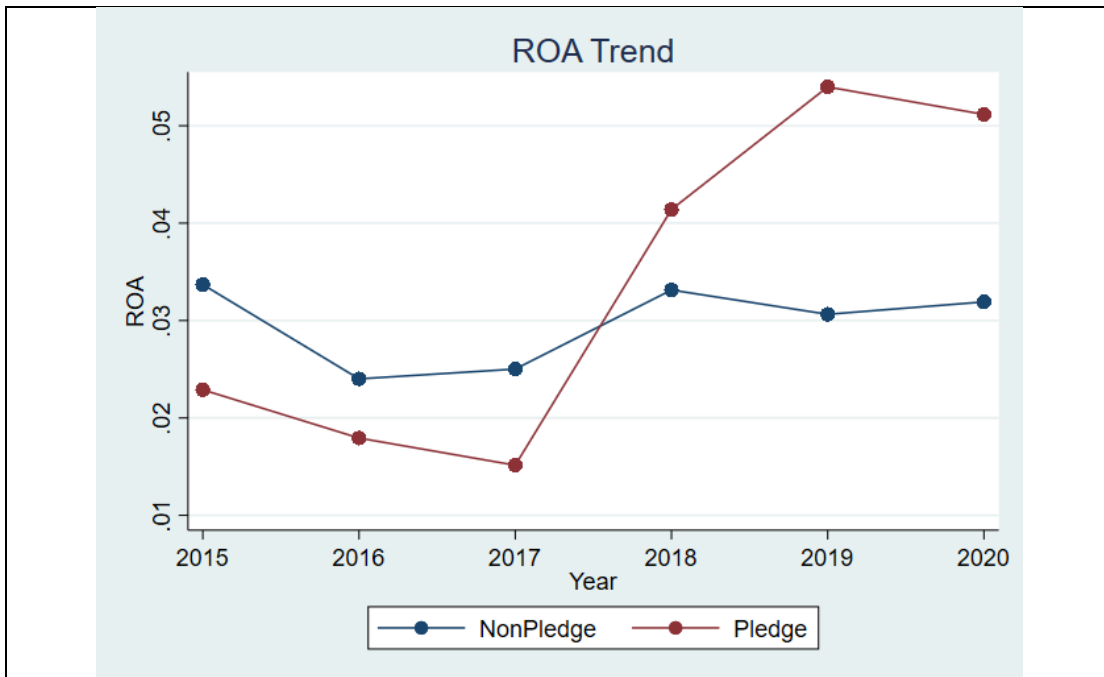


Figure 2 Panel A: Trend change of *ROA*

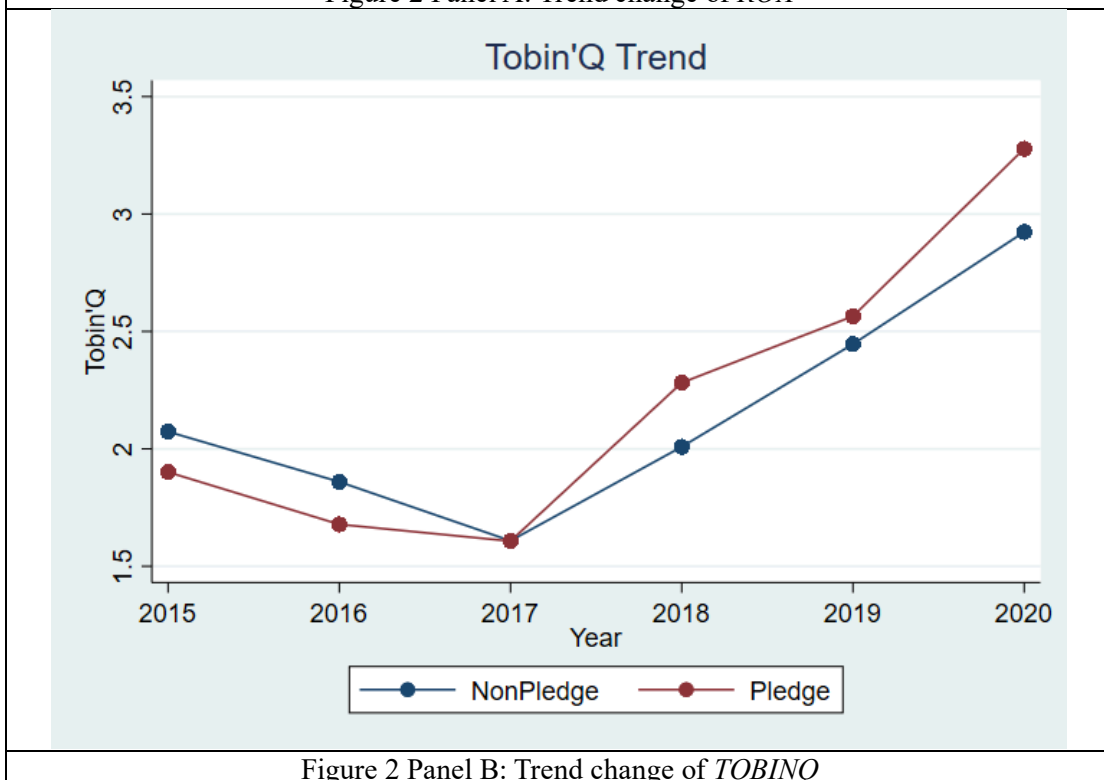


Figure 2 Panel B: Trend change of *TOBINQ*

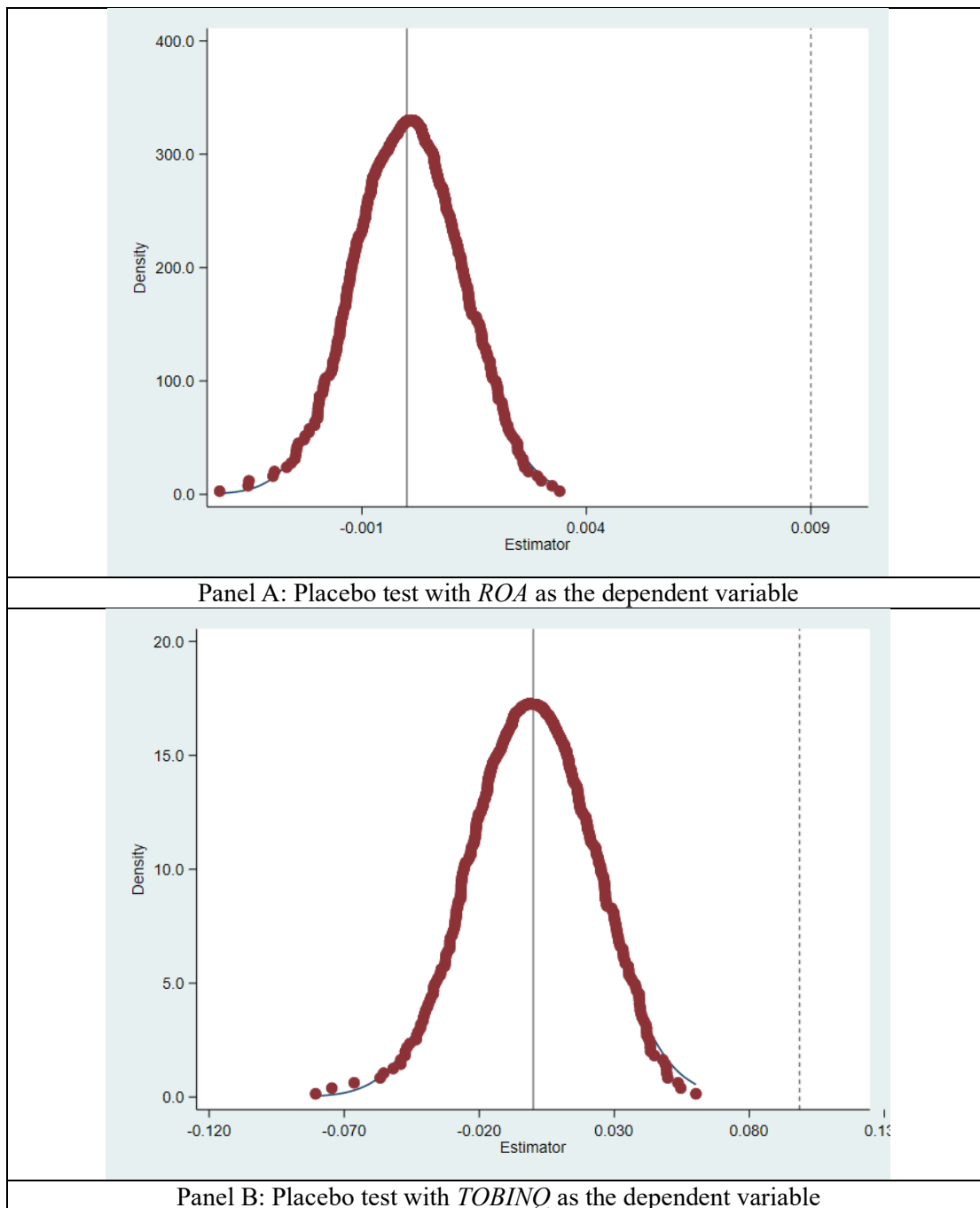


Figure 3: Robustness test with placebo tests: *ROA* and *TOBINQ*