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Private firms' financial constraints and share pledging by controlling shareholders of publicly listed firms: Evidence from China[☆]

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ABSTRACT

Private firms face significant financial constraints that limit their investment and growth. Recognizing the fact that many private firms belong to business groups that contain at least one publicly listed firm, we hypothesize that private firms can partially relieve their financial constraints through the cash proceeds from share pledging of publicly listed firms by the common controlling shareholder. Using data from publicly listed Chinese firms, we find results consistent with this hypothesis, especially for private firms facing greater financial constraints. However, such share pledging also creates a negative spillover on shareholder value of publicly listed firms under common ownership.

1. Introduction

Existing research shows that lack of access to finance negatively affects privately held firms' investment and growth (e.g., Cull and Xu, 2005; Beck and Demirgüç-Kunt, 2006; Beck et al., 2005, 2008; Ayyagari et al., 2010; Guariglia et al., 2011; Saunders and Steffen, 2011). Privately held firms' financial constraints are particularly acute in many emerging market economies due to underdeveloped financial intermediaries (Allen et al., 2005). Prior research (e.g., Khanna and Yafeh, 2007) also shows that ownership of privately held

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firms and publicly listed firms by a common controlling shareholder is a prevalent phenomenon in emerging markets. Hence, the objective of this study is to examine whether common controllers have an incentive to pledge their liquid shares of publicly listed firms as one means to help alleviate the financial constraints of their privately held firms. In addition, we examine whether controlling shareholders' share pledging reduces shareholder value of publicly listed firms, representing a negative externality resulting from the financial constraints of privately held firms under common ownership.

We test our idea using publicly listed Chinese firms over the period 2007–2017. China is an excellent setting to test our idea for several reasons. First, China is one representative country where many privately held firms face severe financial constraints (Allen et al., 2005). Second, common ownership control of privately held firms and publicly listed firms is widespread (see Section 4.1). Third, share pledging is extremely popular among controlling shareholders of publicly listed Chinese firms.¹ For these reasons, it is important to understand whether there is a causal connection between privately held firms' financial constraints and share pledging and shareholder value of publicly listed firms.

There are two distinct types of ownership structures in China: SOEs (i.e., firms controlled by various government entities) and non-SOEs (i.e., firms controlled by private investors). While the controlling shareholders of both privately held SOEs and privately held non-SOEs have sufficient freedom to pledge their shares of publicly listed firms under common ownership, existing research shows that controlling shareholders of privately held SOEs face lower financial constraints due to their favourable treatment by state-controlled banks and the China Securities Regulatory Commission (CSRC) (Li et al., 2009; Firth et al., 2009; Chen et al., 2010; Cull et al., 2015; Wong, 2016; Cong et al., 2019). As a result, controlling shareholders of privately held SOEs should have a lower incentive to raise cash through pledging the shares of publicly listed SOEs owned by the same controllers. Hence, we use the share pledging by controlling shareholders of publicly listed SOEs as a benchmark to isolate the *total effect* of privately held firms' financial constraints on share pledging by controlling shareholders of publicly listed non-SOEs under common ownership.

Consistent with our prediction, we find that the extent of share pledging by controlling shareholders is significantly higher for publicly listed non-SOEs than for publicly listed SOEs. This difference is smaller for publicly listed non-SOEs with at least one minority shareholder that is an SOE or government agency, suggesting that such government connections allow controlling shareholders of publicly listed non-SOEs to gain better access to cheap financing channels and hence a lower demand for more costly share pledging.

In terms of economic magnitude, we find that the average percentage of shares pledged by controlling shareholders of publicly listed SOEs is only 8%. In contrast, the average percentage of shares pledged by controlling shareholders of publicly listed non-SOEs is 38%, nearly five times the magnitude of publicly listed SOEs. Moreover, the average percentage of shares pledged by controlling shareholders of publicly listed non-SOEs has been steadily increasing over time, rising from 33.7% in 2007, the start of our sample period, to 48.0% in 2017, the end of our sample period. Our back-of-the-envelope calculation suggests that on average non-SOEs' controlling shareholders received RMB76 million from share pledging every year, which seems an economically significant amount.

We next employ cross-sectional regressions to show that the difference in controlling shareholders' share pledging for publicly listed non-SOEs versus publicly listed SOEs is driven by the financial constraints of privately held non-SOEs controlled by the common controllers. We develop three firm-level proxies for the extent of a privately held firm's financial constraints. The first proxy is the number of privately held firms that are majority owned by the controlling shareholder of a publicly listed firm. We argue that the higher the value of this proxy is, the greater are the total financing needs of these privately held non-SOEs, but we don't expect the same relation for privately held SOEs due to the latter's special relationship with the government noted above. Consistent with this hypothesis, we find that the difference in controlling shareholders' share pledging for publicly listed non-SOEs versus publicly listed SOEs increases with the number of privately held firms controlled by the controlling shareholder of a publicly listed firm.

The second proxy is a direct measure of the average financial leverage for privately held firms controlled by the controlling shareholder of a publicly listed firm. The sample for this second proxy is smaller because financial data for privately held firms are not always available. Nevertheless, we continue to find that the difference in controlling shareholders' share pledging for publicly listed non-SOEs versus publicly listed SOEs increases with the average financial leverage of privately held firms controlled by the controlling shareholder of a publicly listed firm.

Prior research (Jian and Wong, 2010; Jia et al., 2013) shows that controlling shareholders of privately held non-SOEs can tap the resources of publicly listed non-SOEs under common ownership (e.g., intercorporate loans, related party transactions, etc.) when the privately held non-SOEs face financial difficulties. As the financing costs of equity offerings for publicly listed firms are generally lower than the financing costs of share pledging, we expect controlling shareholders of publicly listed non-SOEs to use share pledging as a last resort, i.e., only when the publicly listed firms controlled by the same owners have already exhausted their financing channels from public capital markets. Because publicly listed Chinese firms are generally barred explicitly or implicitly by the CSRC from raising

¹ Pledging shares for personal loans by the controlling shareholders of publicly listed firms is a common phenomenon around the world (CFA Institute, 2009). For example, Elon Musk, co-founder and CEO of Tesla, pledged 54% of his Tesla shares worth 15 billion as collateral for personal loans (Wall Street Journal, 2020). In fact, share pledging is especially popular in emerging market economies. In India, the insiders of over 20% listed firms pledged their shares in 2013 (Chan et al., 2018). In mainland China, shares worth 6 trillion yuan (US\$898 billion), or a tenth of the total market value of mainland China's stock market was pledged in June 2017 (Reuters, 2017). In Taiwan, the insiders of approximately half of the listed firms pledged shares in the period 2003–2013 (Dou et al., 2019).

external capital in consecutive years, we use whether a publicly listed firm has raised seasoned equity offering in the prior year as our third firm-level proxy for privately held firms' financial constraints.² We argue that privately held non-SOEs' financial constraints are higher when publicly listed non-SOEs under common ownership face difficulty raising external equity capital, but we do not expect the same relationship for privately held SOEs due to their special relationship with the government. Consistent with this prediction, we find that controlling shareholders of publicly listed non-SOEs pledge more shares when the publicly listed non-SOEs under common ownership experience lower accounting profitability and higher financial leverage, supporting the hypothesis that share pledging is controlling shareholders' last resort. More importantly, we find that the difference in controlling shareholders' share pledging for publicly listed non-SOEs versus publicly listed SOEs is significantly larger for publicly listed firms that have issued seasoned equity offering in the prior year.

To further demonstrate the causal effect of privately held firms' financial constraints on share pledging, we also perform a difference-in-difference-in-differences analysis by taking advantage of China's four trillion stimulus plan announced in November 2008 targeting specific industries. While most money from the four trillion stimulus plan went to SOEs in selected industries (Cong et al., 2019; Deng et al., 2015; Liu et al., 2018), we argue that non-SOEs in the targeted industries can also benefit from the four trillion stimulus plan because prior research shows that SOEs often serve as a financing channel for non-SOEs in the same industries (Allen et al., 2019; Ruan, 2018; Du et al., 2016). Liu et al. (2018) find evidence suggesting that the four trillion stimulus plan benefited non-SOEs in the targeted industries due to local governments' strong encouragement of bank lending. Hence, we expect controlling shareholders of publicly listed non-SOEs in the targeted industries to significantly reduce the extent of share pledging following the launch of the four trillion stimulus plan. On the other hand, we expect the negative effect of the four trillion stimulus plan on share pledging to be smaller for controlling shareholders of publicly listed SOEs in the targeted industries because SOEs in general start with little demand for share pledging. We find results consistent with our prediction.

Publicly listed SOEs differ from publicly listed non-SOEs on many dimensions other than ownership structure. Even though we have controlled for such firm characteristics in our regressions, the controls may not be adequate due to potential non-linearity in the effects of firm characteristics. Hence, we also match each non-SOE year with an SOE year using the propensity score matching method and rerun all relevant regression models. We find similar inferences. Overall, our share pledging regression results support our hypothesis that financial constraints of privately held non-SOEs are an important determinant of share pledging by controlling shareholders of publicly listed non-SOEs under common ownership.

To provide further support for the main hypothesis, we next examine how controlling shareholders of publicly listed non-SOEs use the cash proceeds from share pledging. We classify a controlling shareholder's cash usage into three non-mutually exclusive ways, including (i) propping up publicly listed firms under their control, (ii) relieving the financial constraints of their privately held firms by providing more equity capital (focus of this study), or (iii) paying for personal consumption. Due to lack of data, we cannot directly test the validity of usage (iii). However, we doubt the significance of this usage due to the large dollar magnitude of pledged shares by controlling shareholders of publicly listed non-SOEs and lack of evidence to support usage (iii) from a CSRC survey reported by He et al. (2022). Hence, we focus on testing the validity of usage (i) versus usage (ii). We first examine whether cash proceeds from share pledging are primarily used to support publicly listed firms under common ownership (i.e., usage (i)). There are three common channels through which a controlling shareholder props up a publicly listed firm: (a) the controlling shareholder provides intercorporate loans to the listed firm; (b) the controlling shareholder subscribes to a seasoned equity offering issued by the listed firm; or (c) the controlling shareholder offers trade credits to the listed firm. Our empirical analyses show little evidence that the primary purpose of share pledging by controlling shareholders of publicly listed non-SOEs is to support the publicly listed firms under common ownership, a finding consistent with He et al. (2022).

We next examine the validity of usage (ii): controlling shareholders of publicly listed non-SOEs use a portion of the cash proceeds from share pledging to relieve the financial constraints of privately held non-SOEs under common ownership. Using a small sample of privately held firms in the manufacturing sector over the period 2008–2013 from the Chinese Industrial Enterprise Database (CIED), we find a more negative association between cash proceeds from share pledging in a year and changes in financial leverage for privately held non-SOEs under common ownership than for privately held SOEs under common ownership, supporting the hypothesis that usage (ii) is an important driver of share pledging by controlling shareholders of publicly listed non-SOEs.

Our final analysis examines the impact of share pledging on shareholder value of publicly listed non-SOEs. Using an instrumental variable regression approach to deal with the endogeneity of share pledging, we find that share pledging is negatively associated with Tobin's Q for publicly listed non-SOEs. This finding is consistent with Dou et al. (2019) who focus on Taiwan and several studies that document various side effects of share pledging for publicly listed Chinese firms (Liu and Tian, 2021; Hu et al., 2021; Zhou et al., 2021).

We contribute to several streams of existing literature. First, this study is related to the literature on the consequences of financial constraints facing privately held non-SOEs. Prior studies (e.g., Allen et al., 2005; Ayyagari et al., 2010) show that privately held non-SOEs have limited access to formal financing channels such as bank loans. Hence, they have to resort to alternative financing channels such as internal cash flows (Guariglia et al., 2011), relationships based informal financing channels (Allen et al., 2005; Li et al., 2008; Wang, 2015; Cull et al., 2015), or shadow banking (Allen et al., 2019; Wang et al., 2019). This literature implicitly assumes that privately held non-SOEs cannot benefit from public equity markets. We contribute to this literature by showing that privately held non-

² One could argue that privately held firms should face lower rather than higher financial constraints when the publicly listed firms under common ownership raised equity capital from public capital markets in the prior year. This argument does not apply to China because the CSRC requires all seasoned equity offering proposals to explicitly declare the specific uses of raised funds in advance and any material change on the use of the funds requires the CSRC approval. Our subsequent regression results are inconsistent with this alternative argument.

SOEs can also benefit indirectly from public equity markets through the channel of share pledging of publicly listed firms under common ownership. However, we show that this channel also creates a negative spillover on shareholder value of publicly listed non-SOEs under common ownership.

Second, this study contributes to the literature of share pledging by controlling shareholders of publicly listed non-SOEs. Prior research focuses on the impact of share pledging on various behaviors of publicly listed firms (e.g. [Kao et al., 2004](#); [Lee and Yeh, 2004](#); [Yeh et al., 2009](#); [Wang and Chou, 2018](#); [Dou et al., 2019](#); [Chan et al., 2018](#); [Liu and Tian, 2021](#); [Hu et al., 2021](#); [Zhou et al., 2021](#)). To our best knowledge, there has been no research on the factors that drive controlling shareholders' share pledging. We contribute to this literature by identifying financial constraints of privately held non-SOEs as one determinant of share pledging by controlling shareholders of publicly listed non-SOEs.

Finally, this study is related to the literature on business groups. One important hypothesis of this literature is that in emerging market economies, business groups arise as an effective remedy to the underdeveloped financial institutions ([Stein, 1997](#); [Fauver et al., 2003](#); [Almeida and Wolfenzon, 2005](#); [Khanna and Yafeh, 2007](#)). Consistent with this hypothesis, many studies show how internal capital markets within business groups help group members relax their financial constraints (e.g., [Gopalan et al., 2007](#); [Buchuk et al., 2014](#); [Jia et al., 2013](#)). An implicit assumption of this literature is that there are always some stronger members who can help alleviate the financial constraints of the weaker members belonging to the same business group. An interesting question this literature has not investigated is how the common controller of a business group would manage its internal capital markets when all members become distressed in the same time. Our study sheds direct light on this important question by showing that controlling shareholders of publicly listed non-SOEs have a strong incentive to support their privately held firms via share pledging of publicly listed firms at the expense of minority shareholder interests in the publicly listed firms. We believe that this type of minority investor expropriation deserves special attention because they are frequent but relatively neglected by the extant governance literature that tends to focus on minority investor expropriation via real transactions such as excessive executive compensation, intercorporate loans or related party transactions ([Johnson et al., 2000](#); [Bertrand et al., 2002](#); [Jiang et al., 2010](#)).

The rest of the paper is organized as follows. Section 2 develops the hypotheses H1-H2. Sections 3 and 4 conduct the tests of H1 and H2, respectively. Section 5 examines how controlling shareholders of publicly listed non-SOEs deploy the cash proceeds from share pledging. Section 6 analyzes the impact of share pledging on shareholder value of publicly listed non-SOEs. Section 7 concludes.

2. Hypothesis development

In this section, we develop our hypotheses on the impact of privately held non-SOEs' financial constraints on share pledging by controlling shareholders of publicly listed non-SOEs. As we explain below, privately held SOEs face smaller financial constraints than privately held non-SOEs. Hence, our first-cut analysis uses publicly listed SOEs as a benchmark group to isolate the total effect of privately held non-SOEs' financial constraints on share pledging by controlling shareholders of publicly listed non-SOEs under common ownership.

Shareholders of both publicly listed non-SOEs and publicly listed SOEs have sufficient freedom to pledge their shares. Ministry of Finance issued an explicit rule in 2001 to regulate share pledging by state owners, including controlling shareholders of publicly listed SOEs.³ This rule imposes two restrictions on state owners' share pledging: (i) state owners cannot pledge >50% of their total ownership; and (ii) state owners are allowed to pledge their shares only for the benefits of themselves and their subsidiaries. Condition (i) is almost never binding in our setting because controlling shareholders' share pledging ratio rarely exceeds 50% (see [Table 2](#) below). Condition (ii) is not relevant to us because our research question focuses on share pledging by controlling shareholders for the benefits of controlling shareholders and their subsidiaries. Hence, share pledging by publicly listed SOEs can serve as a reasonable benchmark group for share pledging by publicly listed non-SOEs.

Compared with publicly listed firms, which have direct access to public debt and equity markets, privately held firms face greater financial constraints ([Beck et al., 2005, 2008](#); [Schenone, 2010](#); [Saunders and Steffen, 2011](#)). Prior research also shows that bank financing is a major source of external financing for privately held firms ([Berger and Udell, 2006](#); [Firth et al., 2009](#); [Ayyagari et al., 2010](#)). Compared with privately held SOEs, privately held non-SOEs face a significant disadvantage in access to debt financing, especially in emerging market countries such as China where the financial system remains highly regulated and underdeveloped ([Dewenter and Malatesta, 2001](#); [Brandt and Li, 2003](#); [Cull and Xu, 2005](#); [Firth et al., 2009](#); [Li et al., 2009](#); [Cong et al., 2019](#)). One common explanation for this phenomenon is the soft budget constraint of SOEs: the government has strong incentives to support SOEs in financial troubles because SOEs are an important government policy apparatus ([Lin et al., 1998](#); [Lin and Tan, 1999](#); [Dewenter and Malatesta, 2001](#); [Cong et al., 2019](#)). Consequently, lenders, most of which are state controlled, find it less risky both financially and politically to make loans to SOEs, even if the SOEs are financially struggling. In contrast, lenders may be more reluctant to provide bank loans to privately controlled non-SOEs. In addition, even if lenders are willing to provide loans to privately held non-SOEs, they would impose more stringent conditions on the loans such as higher interest rates or collaterals ([Allen et al., 2005](#)).

Facing the difficulty of obtaining debt financing from banks, we expect privately held non-SOEs to have a strong incentive to explore alternative financing options. When a privately held non-SOE and a publicly listed non-SOE are controlled by a common owner, the privately held non-SOE could obtain financing through the publicly listed firm because the latter has direct access to public debt and equity markets ([Jian and Wong, 2010](#); [Jia et al., 2013](#)). However, the publicly listed firm may not always have the ability to

³ http://www.gov.cn/gongbao/content/2002/content_61623.htm (in Chinese).

tap public markets for financing, especially when the public listed firm itself is in financial distress. Under such situations, the privately held non-SOE could obtain financing from the common controlling shareholder by asking the latter to pledge its share ownership in the publicly listed firm as collateral for a personal loan.⁴ Share pledging could be especially attractive when the publicly listed firm itself is facing financial constraints and therefore could not lend a hand to the struggling privately held firm under the common ownership. Based on the above discussions, we formally state our first hypothesis as follows:

H1. Controlling shareholders of publicly listed non-SOEs pledge a larger fraction of their ownership in the publicly listed firms than controlling shareholders of publicly listed SOEs.

To show more directly the causal impact of privately held non-SOEs' financial constraints on share pledging, we next examine how the effect of H1 varies with the financial constraints of privately held non-SOEs. We argue that as privately held non-SOEs' financial constraints increase, the controlling shareholders of publicly listed non-SOEs under common ownership should pledge more shares of publicly listed non-SOEs to help relax the financial constraints of privately held non-SOEs. Due to SOEs' special relationship with the government and the soft budget constraint noted above, we do not expect a similar positive relation between privately held SOEs' financial constraints and share pledging by the controlling shareholders of publicly listed SOEs under common ownership. We formally state this prediction in the following hypothesis:

H2. The effect of H1 increases with the financial constraints of privately held firms controlled by the controlling shareholders of publicly listed firms.

It is important to note that we do not claim that controlling shareholders of publicly listed firms use share pledging solely to support privately held firms. As discussed in Section 5, cash proceeds from share pledging could be deployed in many different ways, including supporting the needs of privately held firms under common ownership hypothesized in H1 and H2.

3. Test of H1

3.1. Regression model

We use the following regression model to test H1:

$$PLEDGE_t = \beta_0 + \beta_1 NSOE_t + \beta_2 CONTROL_{t-1} + \text{industry fixed effects} + \text{year fixed effects} \quad (1)$$

See the Appendix for all variable definitions. The unit of observation is a firm-year. The dependent variable, $PLEDGE_t$, is defined as total number of shares pledged by the controlling shareholder of a publicly listed firm divided by total number of shares owned by the controlling shareholder at the end of fiscal year t . Our key independent variable is $NSOE$, a dummy variable that equals one if the largest immediate shareholder of a publicly listed firm is an individual directly or indirectly, and zero otherwise. H1 predicts the coefficient on $NSOE$ to be positive.

We include three types of controlling variables ($CONTROL$) that may affect controlling shareholders' share pledging behavior. All controlling variables are lagged by one year to mitigate the endogeneity concern. In addition, we winsorize all continuous variables at the top and bottom one percentiles. First, we include variables that capture a creditor's willingness to accept shares as collateral. Dou et al. (2019) argue that shareholders can pledge their shares more easily when the publicly listed firms are larger, less risky, more transparent and have more liquid stock. Accordingly, we follow Dou et al. (2019) by using the following variables to capture those firm characteristics such as firm size ($SIZE$), sales growth ($GROWTH$), stock return volatility ($VOLATILITY$), firm age (AGE), analyst following ($FOLLOWING$) and share liquidity ($LIQUIDITY$). We also use two balance sheet variables, leverage (LEV) and total cash holding ($CASH$), to capture the financial stability of a publicly listed firm (Dou et al., 2019; Li et al., 2019b). Second, we control for variables related to firm performance because lenders may be more willing to accept shares of firms with good performance as collateral. Therefore, we control for a publicly listed firm's accounting performance (ROE , $LOSS$), stock performance (RET) and Tobin's Q ($TOBINQ$). We also control for a stock's trading status ($DELISTING$) because, in China, publicly listed firms with persistent poor performance would be labelled as "special treatment" firms and become unattractive to investors (Jia et al., 2013). Third, we include variables that capture the quality of a publicly listed firm's corporate governance since Lee and Yeh (2004) and Dou et al. (2019) argue that share pledging is more common in firms with poorer corporate governance. Accordingly, we use the following variables to capture the quality of both external and internal corporate governance: auditing quality ($BIG10$), percentage of shares owned by institutional investors ($INSTITUTIONAL_FUND$, $INSTITUTIONAL_OTHER$), voting rights ($VOTINGRIGHT$) and cash flow rights ($CASHRIGHT$) possessed by the ultimate controller of a publicly listed firm, and ownership possessed by the second largest controller of a publicly listed firm ($SECOND_OWNERSHIP$). When the gap between the ownership of the ultimate owner and the ownership of the second largest owner becomes smaller, the ultimate owner may be less likely to pledge their shares for the fear of losing their controlling rights. Finally, we include industry and year fixed effects.

⁴ Due to lack of liquidity, banks and other qualified financial intermediaries generally would not accept the shares of privately held firms as collateral for personal loans. We confirmed this from a few Chinese banks.

3.2. Sample selection procedures and descriptive statistics

Our sample includes all publicly listed A-share firms listed on the Shanghai and Shenzhen stock exchanges from 2007 to 2017. We start from 2007 because China adopted a new set of accounting standards that are substantially converged with IFRS in 2007 and hence financial data for the years since 2007 may not be fully comparable with those prior to 2007. We remove firms in the financial industry because of their uniqueness. In addition, their controllers can rely on relational lending (La Porta et al., 2003) rather than share pledging to relax financial constraints. We also delete the firm-year observations when a publicly listed firm's ultimate controller changes during the year. In addition, we require that the ownership of the ultimate controller exceeds 20% to make sure the ultimate controller has a substantial stake in the publicly listed firm. Our final sample contains 19,734 firm years after deleting observations with missing control variables. Table 1 describes our sample selection procedures in more details.

We collect data needed for subsequent regression analyses from various sources. The share pledging data and the data on firm characteristics are from the CSMAR database. Firm level financial data for privately held firms are from the Chinese Industrial Enterprise Database (CIED), which includes the universe of manufacturing firms whose sales are larger than 5 million yuan until 2009 and 20 million yuan from 2010 to 2013. Data on the number of privately held firms controlled by the controlling shareholder of each publicly listed firm is collected from the Qichacha database, which provides company registration information for all Chinese firms.

Table 2 shows the summary statistics of the variables used in the subsequent regression analyses. Panel A shows the results for publicly listed SOEs and Panel B the results for publicly listed non-SOEs. 52% of the firm years are publicly listed non-SOEs (un-tabulated). The mean percentage of pledged shares by controlling shareholders (*PLEDGE*) is 23% for all publicly listed firms as a whole (un-tabulated). The mean percentage of pledged shares by controlling shareholders of publicly listed non-SOEs is 38% while the corresponding percentage for publicly listed SOEs is only 8%, a difference of 30%. This finding is consistent with H1.

Fig. 1 reports the mean value of *PLEDGE* for both publicly listed SOEs and non-SOEs separately by year. The mean value of *PLEDGE* for publicly listed SOEs remains relatively stable (<10%) over our sample period 2007–2017. In contrast, the mean value of *PLEDGE* is always higher for publicly listed non-SOEs than for publicly listed SOEs. The mean value of *PLEDGE* is 33.7% in 2007 and remains relatively stable up to 2012, but it started to increase starting from 2013, the year when the Shanghai Stock Exchange and Shenzhen Stock Exchange allowed financial intermediaries other than banks and trust companies to participate in the share pledging business, resulting in a significant reduction in share pledging costs. By the end of 2017, the mean value of *PLEDGE* reaches the highest point of 48.0%. Our untabulated estimate shows that on average non-SOEs' (SOEs') controlling shareholders in our sample received RMB76 million (RMB12 million) from share pledging each year.

Table 3 reports the Pearson correlation table for the regression variables. There is no evidence of multicollinearity among the explanatory variables.

3.3. Regression results of H1

Column (1) of Table 4 shows the OLS regression results of model (1). Unless stated otherwise, all regression standard errors in the paper are clustered by both firm and year. Consistent with H1, the coefficient on *NSOE* is significantly positive, suggesting that compared with controlling shareholders of publicly listed SOEs, controlling shareholders of publicly listed non-SOEs pledge a higher fraction of their ownership. The coefficient on *NSOE* is also economically significant. The coefficient on *NSOE* in column (1) is 0.356, 4.5 times the mean *PLEDGE* for publicly listed SOEs (0.08).

Regarding the control variables, we find a significantly positive coefficient on *AGE* and a significantly negative coefficient on *LIQUIDITY*, suggesting that shares of publicly listed firms with a longer listing history and higher liquidity are more likely to be pledged. We also find that controlling shareholders of publicly listed firms with higher financial leverage ratios (*LEV*), lower cash holding (*CASH*) and lower performance (*ROE*) pledge more shares. Untabulated regression results show that the coefficient on *LEV* is significantly positive but the coefficients on *CASH* and *ROE* are insignificant for publicly listed SOEs; in contrast, the coefficient on *LEV* is more positive while the coefficient on *ROE* is more negative for publicly listed non-SOEs than for publicly listed SOEs. These results are consistent with Li et al., 2019b that controlling shareholders whose publicly listed firms face greater financial constraints are more likely to use share pledging to raise capital.

Some publicly listed non-SOEs have large minority shareholders that are SOEs or government agencies. Because of such government connections, the controlling shareholders of these publicly listed non-SOEs may have better access to cheap financing channels. Hence, these controlling shareholders may find it less necessary to pledge their ownership in publicly listed non-SOEs, which tends to be more costly than normal financing channels. To test this prediction, we break publicly listed non-SOEs into two types: publicly listed non-SOEs that have at least one large (defined as 5% ownership or higher) minority shareholder that is an SOE or government agency (denoted as *NSOE_STATE*), and the remaining publicly listed non-SOEs (denoted as *NSOE_PRIVATE*). Column (2) of Table 4 shows the regression results. The coefficients on both *NSOE_STATE* and *NSOE_PRIVATE* are significantly positive (0.315 vs. 0.361) but the coefficient on *NSOE_PRIVATE* is significantly larger than that on *NSOE_STATE* (two-tailed $p = 0.08$), as predicted.

Table 1
Sample selection procedures.

	No. of firm-year observations
1. all A-shares observations during 2007–2017	26,017
2. remove financial firms	(483)
3. remove observations with missing shareholder information	(20)
4. remove observations where a firm's ultimate controlling shareholder changes in the year	(765)
5. remove observations where the ownership of the largest shareholder is <20%	(2184)
6. remove observations with missing values for control variables ^a	(2831)
Final sample	19,734

^a Among 2831 deleted observations, 2012 observations are dropped because they are IPO firms that do not have data for lagged control variables. 797 observations are dropped because of missing stock return volatility which requires at least 5 active months in the past 24 months. An additional 22 observations are dropped because of missing data on growth and liquidity.

4. Test of H2

H1 does not manipulate the driver of H1: financial constraints of privately held firms. To show this mechanism behind H1 more directly, we next manipulate privately held firms' financial constraints as hypothesized by H2. We adopt two different approaches to testing H2. First, we examine how the effect of H1 varies cross-sectionally with privately held firms' financial constraints in Section 4.1. Second, we use a difference-in-difference-in-differences analysis to show the causal effect of H2 in Section 4.2.

4.1. Cross-sectional variations in privately held firms' financial constraints

We first test H2 using cross-sectional proxies for privately held firms' financial constraints. We develop three complementary firm-level proxies for privately held firms' financial constraints. The first firm-specific proxy, *NONLISTED*, is the number of privately held firms that are at least 50% owned by the controlling shareholder of a publicly listed firm.⁵ Please see the Appendix for a more detailed explanation of the definition of *NONLISTED*. Because we collected the ownership data on privately held firms from the Qichacha database, we lost 3591 firm years due to failure to match the names of controlling shareholders in our primary sample with the names of controlling shareholders in the Qichacha database.

For our sample of publicly listed SOEs, there are 12,741 privately held SOEs controlled by controlling shareholders of publicly listed SOEs. For our sample of publicly listed non-SOEs, there are 9789 privately held non-SOEs controlled by controlling shareholders of publicly listed non-SOEs. These untabulated statistics highlight the substantial overlap in ownership between privately held firms and publicly listed firms for both publicly listed SOEs and publicly listed non-SOEs.

Column (1) of Table 5 shows the regression results of H2 using *NONLISTED*. The key variable of interest is *NSOE* × *NONLISTED*. As predicted, the coefficient on *NSOE* × *NONLISTED* is significantly positive, suggesting that the difference in controlling shareholders' share pledging between publicly listed non-SOEs and publicly listed SOEs is greater when the controlling shareholders of publicly listed firms control more privately held firms. In contrast, the coefficient on *NONLISTED* is significantly negative, suggesting no evidence that privately held SOEs' financial constraints encourage share pledging by controlling shareholders of publicly listed SOEs.

The coefficient on *NSOE* × *NONLISTED* (0.007) is also economically significant: a one standard deviation increase in the number of privately held firms owned by the controlling shareholder is associated with a 0.078 increase in the difference in *PLEDGE* between publicly listed non-SOEs and publicly listed SOEs. This 7.8% increase represents 25.9% of the average difference of 0.30 in *PLEDGE* between publicly listed non-SOEs and publicly listed SOEs.

Our second proxy for privately held firms' financial constraints is *LEVNONLISTED*, which is the weighted average financial leverage for the privately held firms controlled by the controlling shareholder of a publicly listed firm (see the Appendix for the detailed definition). Due to data availability constraints, our sample for this test is limited to 1529 unique publicly listed firms over the period 2007–2016. While many privately held firms in our sample cannot be matched with the firms in the CIED database due to either they are not manufacturing firms or too small, we argue that the average financial leverage of matched privately held firms should be a reasonable proxy for the financial constraints of privately held firms because the CIED database captures the most significant manufacturing firms in China.

Column (2) of Table 5 shows the regression results for *LEVNONLISTED*. Despite the smaller sample in column (2) vs. column (1), we find the coefficient on *NSOE* × *LEVNONLISTED* is significantly positive, consistent with H2. In contrast, the coefficient on *LEVNONLISTED* is insignificant, suggesting that privately held SOEs' financial constraints have no impact on share pledging by controlling shareholders of publicly listed SOEs. The coefficient on *NSOE* × *LEVNONLISTED* (0.184) is also economically significant: a one standard deviation increase in *LEVNONLISTED* is associated with a 0.061 increase in the difference in *PLEDGE* between publicly listed non-SOEs and publicly listed SOEs. This 6.1% increase represents 20.3% of the average difference of 0.30 in *PLEDGE* between publicly listed non-

⁵ The definition of *NONLISTED* does not consider the size of each privately held firm. Our inferences are qualitatively similar if we use *SIZE_NONLISTED*_{*t*-1} as an alternative proxy, which is defined as the natural logarithm of one plus the sum of the registered equity capital of all privately held firms controlled by a publicly listed firm's controlling shareholder. We use a firm's registered equity capital as a proxy for firm size as we do not have access to financial data of privately held firms such as total assets for the full sample.

Table 2
Summary statistics.

Panel A. Publicly listed SOEs								
Variables	N	Means	STD	P1	P25	Median	P75	P99
PLEDGE	9407	0.08	0.18	0.00	0.00	0.00	0.00	0.87
SIZE	9407	22.36	1.41	19.71	21.40	22.16	23.21	26.42
GROWTH	9407	1.65	37.39	0.44	0.97	1.10	1.25	4.25
CASH	9407	0.16	0.12	0.01	0.08	0.13	0.21	0.58
ROE	9407	0.02	2.28	-0.91	0.03	0.07	0.13	0.48
LOSS	9407	0.11	0.31	0.00	0.00	0.00	0.00	1.00
AGE	9407	2.40	0.60	0.00	2.20	2.56	2.83	3.18
LEV	9407	0.53	0.25	0.08	0.38	0.54	0.67	0.98
TOBINQ	9407	1.89	1.90	0.87	1.15	1.47	2.08	6.82
VOLATILITY	9407	0.15	0.10	0.06	0.11	0.14	0.18	0.33
RET	9407	0.40	0.93	-0.74	-0.19	0.15	0.73	3.77
LIQUIDITY	9407	1.10	6.11	0.03	0.21	0.43	0.92	8.26
DELISTING	9407	0.07	0.25	0.00	0.00	0.00	0.00	1.00
VOTINGRIGHT	9407	44.18	14.29	20.07	32.44	43.86	54.24	78.55
CASHRIGHT	9407	38.55	16.04	6.43	26.52	37.20	50.47	77.07
FOLLOWING	9407	1.43	1.14	0.00	0.00	1.39	2.40	3.66
INSTITUTIONAL_FUND	9407	2.37	3.80	0.00	0.00	0.66	3.01	16.89
INSTITUTIONAL_OTHER	9407	2.21	4.07	0.00	0.00	0.93	2.85	17.10
BIG10	9407	0.49	0.50	0.00	0.00	0.00	1.00	1.00
SECOND_OWNERSHIP	9407	5.48	6.27	0.23	1.45	2.99	6.78	27.19
FINDEV	9407	0.27	0.45	0.00	0.00	0.00	1.00	1.00
LEVNONLISTED	5379	0.56	0.27	0.00	0.42	0.60	0.73	1.41
CREDIT_LDR	9407	0.41	0.49	0.00	0.00	0.00	1.00	1.00
POST	9407	0.48	0.50	0.00	0.00	0.00	1.00	1.00
NONLISTED	8203	15.01	22.78	0.00	5.00	11.00	20.00	56.00
FCF	9397	-0.01	0.08	-0.24	-0.05	-0.00	0.04	0.22
DSEO	9407	0.09	0.28	0.00	0.00	0.00	0.00	1.00
NETBORROWING	9390	-0.01	2.06	-0.17	-0.00	0.00	0.00	0.25
SEO_CASH	9407	0.00	0.04	0.00	0.00	0.00	0.00	0.12
TRADE_CREDIT	9377	-0.01	0.11	-0.30	-0.00	0.00	0.00	0.18
PLEDGE_CASH	9390	0.00	0.04	-0.11	0.00	0.00	0.00	0.14

Panel B. Publicly listed non-SOEs.

Variables	N	Means	STD	P1	P25	Median	P75	P99
PLEDGE	10,327	0.38	0.37	0.00	0.00	0.27	0.72	1.00
NSOE_STATE	10,327	0.08	0.28	0.00	0.00	0.00	0.00	1.00
NSOE_PRIVATE	10,327	0.92	0.28	0.00	1.00	1.00	1.00	1.00
SIZE	10,327	21.53	1.09	19.24	20.79	21.42	22.16	24.69
GROWTH	10,327	2.67	87.08	0.38	1.00	1.14	1.33	4.28
CASH	10,327	0.22	0.16	0.01	0.10	0.17	0.29	0.74
ROE	10,327	0.15	7.21	-0.42	0.04	0.08	0.13	0.47
LOSS	10,327	0.07	0.25	0.00	0.00	0.00	0.00	1.00
AGE	10,327	1.71	0.86	0.00	1.10	1.79	2.40	3.14
LEV	10,327	0.44	1.93	0.04	0.22	0.38	0.54	0.95
TOBINQ	10,327	3.94	145.90	0.95	1.36	1.80	2.65	10.14
VOLATILITY	10,327	0.18	0.19	0.07	0.11	0.15	0.19	0.76
RET	10,327	0.48	1.20	-0.70	-0.17	0.17	0.74	5.10
LIQUIDITY	10,327	2.24	13.17	0.05	0.27	0.55	1.13	41.07
DELISTING	10,327	0.05	0.22	0.00	0.00	0.00	0.00	1.00
VOTINGRIGHT	10,327	44.06	15.67	19.61	30.75	42.12	55.68	79.57
CASHRIGHT	10,327	33.72	16.41	3.44	21.58	32.23	44.79	73.22
FOLLOWING	10,327	1.62	1.10	0.00	0.69	1.79	2.56	3.64
INSTITUTIONAL_FUND	10,327	2.42	3.61	0.00	0.00	0.74	3.51	15.60
INSTITUTIONAL_OTHER	10,327	1.98	3.23	0.00	0.00	0.80	2.65	14.45
BIG10	10,327	0.50	0.50	0.00	0.00	1.00	1.00	1.00
SECOND_OWNERSHIP	10,327	6.95	6.28	0.35	2.41	4.72	9.80	27.44
FINDEV	10,327	0.25	0.43	0.00	0.00	0.00	1.00	1.00
LEVNONLISTED	3874	0.24	0.31	0.00	0.00	0.00	0.52	0.98
CREDIT_LDR	10,327	0.58	0.49	0.00	0.00	1.00	1.00	1.00
POST	10,327	0.66	0.47	0.00	0.00	1.00	1.00	1.00
NONLISTED	7940	3.72	5.95	0.00	0.00	2.00	5.00	26.00
FCF	10,305	-0.02	0.09	-0.29	-0.07	-0.01	0.04	0.22
DSEO	10,327	0.12	0.33	0.00	0.00	0.00	0.00	1.00
NETBORROWING	10,308	0.00	0.46	-0.08	0.00	0.00	0.00	0.10

(continued on next page)

Table 2 (continued)

Panel B. Publicly listed non-SOEs.								
Variables	N	Means	STD	P1	P25	Median	P75	P99
SEO_CASH	10,327	0.00	0.02	0.00	0.00	0.00	0.00	0.12
TRADE_CREDIT	10,272	0.03	3.32	-0.11	0.00	0.00	0.00	0.04
PLEDGE_CASH	10,308	0.02	0.08	-0.16	0.00	0.00	0.03	0.32

This table shows the summary statistics of the regression variables. Please refer to the Appendix for all variable definitions.

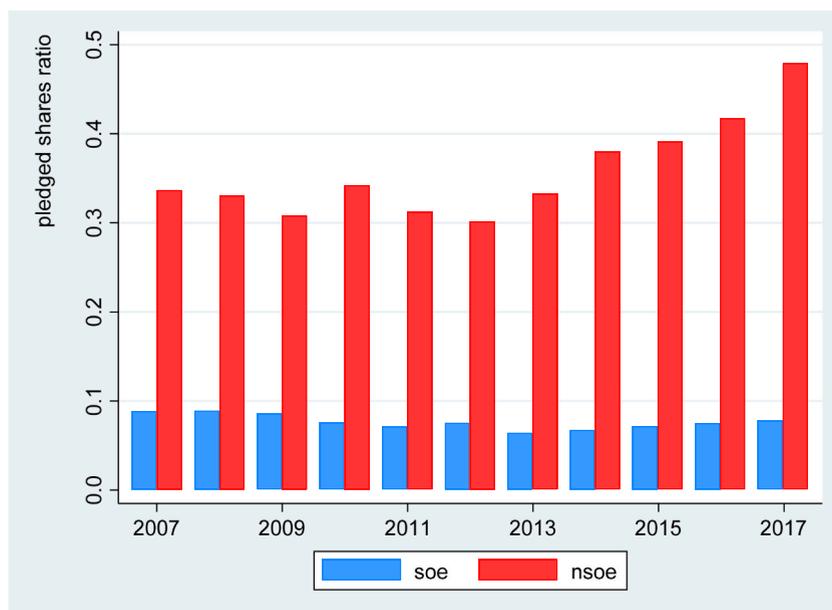


Fig. 1. The annual share pledging ratio for SOE and NSOE.

This figure reports the mean value of *PLEDGE* for publicly listed SOEs and non-SOEs separately by year. Pledged shares ratio is the number of shares pledged by the controlling shareholder (including parties acting in concert) divided by its ownership in the listed firm at the end of the fiscal year *t*.

SOEs and publicly listed SOEs.

The third firm-specific proxy for privately held firms' financial constraints is a publicly listed firm's equity capital raising ability. Compared with public equity financing, share pledging is a more costly financing channel for controlling shareholders for several reasons. First, under the stock pledged repo model, share pledging contracts allow lenders to sell the pledged shares when the stock price declines sharply and borrowers fail to provide additional collateral. In such a situation, the huge selling pressure may drive the share price even lower and trigger more margin calls. By exacerbating share price declines in this way, share pledging can increase a stock's crash risk and harm shareholders' wealth (Anderson and Puleo, 2015; Dou et al., 2019). Second, when the pledged shares are forced to be sold due to margin calls, controlling shareholders may lose their control over the publicly listed firms and thus the control premium they enjoy (Burkart et al., 2003; Nenova, 2003; Dyck and Zingales, 2004). Third, compared with other assets, the market values of shares are more volatile. The stock price volatility may make shares less attractive as a collateral for lenders. In addition, due to information asymmetry, lenders have to worry about potential overvaluation of the pledged shares. Hence, lenders usually impose a substantial discount on the collateral value of pledged shares, making share pledging a very costly financing channel (typically a 50% discount or higher as shown in the definition of *PLEDGE_CASH* in the Appendix). For these reasons, we expect controlling shareholders to first tap the cheaper equity financing channels available to publicly listed firms under their control. Pledging the controlling shareholders' ownership in publicly listed firms would be their last resort.⁶ Accordingly, we expect share pledging by the controlling shareholders of publicly listed non-SOEs to be greater for publicly listed non-SOEs that have already exhausted their external capital raising capacity. In contrast, we do not expect the same prediction for publicly listed SOEs due to the SOEs' special relationship with the Chinese government.

Column (3) of Table 5 shows the regression results of this prediction. Because publicly listed Chinese firms are generally barred

⁶ As discussed in Section 3.3, the coefficients on *LEV*, *CASH* and *ROE* in Table 4 are consistent with this prediction.

Table 3
Pearson correlation table.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	PLEDGE	1.00														
2	NSOE	0.45	1.00													
3	SIZE	-0.09	-0.32	1.00												
4	GROWTH	0.05	0.06	0.04	1.00											
5	CASH	-0.08	0.19	-0.23	0.00	1.00										
6	ROE	-0.06	0.05	0.11	0.19	0.11	1.00									
7	LOSS	0.05	-0.07	-0.07	-0.14	-0.13	-0.58	1.00								
8	AGE	0.02	-0.42	0.32	-0.02	-0.36	-0.05	0.13	1.00							
9	LEV	0.05	-0.30	0.41	0.06	-0.45	-0.08	0.21	0.42	1.00						
10	TOBINQ	0.09	0.17	-0.39	0.00	0.12	0.05	0.05	0.05	-0.24	1.00					
11	VOLATILITY	0.12	0.12	-0.16	0.07	-0.02	0.00	0.04	-0.12	-0.01	0.23	1.00				
12	RET	0.01	0.03	-0.13	0.08	-0.01	0.10	-0.04	-0.12	0.01	0.26	0.32	1.00			
13	LIQUIDITY	0.01	0.08	-0.28	0.02	0.01	-0.02	0.04	-0.24	-0.03	0.00	0.34	0.31	1.00		
14	DELISTING	0.05	-0.04	-0.17	0.08	-0.10	-0.02	0.14	0.16	0.21	0.12	0.11	0.05	0.18	1.00	
15	VOTINGRIGHT	-0.12	0.00	0.19	-0.02	0.08	0.10	-0.09	-0.25	-0.08	-0.15	-0.02	-0.01	0.02	-0.10	1.00
16	CASHRIGHT	-0.19	-0.15	0.17	-0.01	0.07	0.06	-0.07	-0.23	-0.08	-0.12	-0.01	-0.01	0.01	-0.09	0.75
17	FOLLOWING	-0.09	0.08	0.37	0.07	0.18	0.30	-0.23	-0.24	-0.15	-0.01	-0.08	-0.05	-0.16	-0.25	0.18
18	INSTITUTIONAL_FUND	-0.05	0.01	0.01	0.10	0.09	0.22	-0.13	-0.05	-0.04	0.14	-0.01	0.14	-0.10	-0.12	-0.06
19	INSTITUTIONAL_OTHER	0.06	-0.03	0.19	0.01	-0.01	0.04	-0.04	0.12	0.04	0.00	-0.07	-0.03	-0.09	-0.05	-0.09
20	BIG10	-0.02	0.01	0.19	-0.03	0.01	0.01	-0.01	-0.01	-0.01	0.01	-0.03	-0.05	-0.06	-0.05	0.10
21	SECOND_OWNERSHIP	0.03	0.12	-0.11	0.04	0.08	0.03	-0.02	-0.16	-0.08	0.01	0.04	0.03	0.11	0.03	-0.32
22	NONLISTED	-0.21	-0.48	0.26	-0.04	-0.15	-0.06	0.08	0.34	0.22	-0.07	-0.09	-0.06	-0.09	0.06	0.05
23	FCF	-0.08	-0.08	0.05	-0.02	0.14	0.16	-0.08	0.18	-0.07	0.12	0.00	0.07	-0.03	0.00	0.02
24	DSEO	0.11	0.06	0.14	0.08	0.00	0.00	-0.05	0.06	-0.03	-0.01	0.07	0.01	-0.07	-0.04	-0.05
25	NETBORROWING	-0.01	-0.03	0.02	0.03	-0.03	-0.01	0.01	0.02	0.04	-0.02	0.00	0.01	0.01	0.02	0.01
26	SEQ_CASH	0.08	0.01	0.03	0.02	-0.06	0.00	0.01	0.04	0.10	0.02	0.01	0.03	-0.01	0.00	-0.06
27	TRADE_CREDIT	0.00	0.02	0.03	0.00	0.01	0.00	-0.01	-0.04	0.03	-0.03	-0.01	0.01	0.00	-0.02	-0.02
28	PLEDGE_CASH	0.35	0.16	-0.07	0.04	0.04	0.02	0.00	-0.13	-0.04	0.01	0.10	0.05	0.09	0.06	0.07
29	LEVNONLISTED	-0.09	-0.48	0.23	-0.02	-0.23	-0.04	0.11	0.40	0.38	-0.13	-0.07	0.00	-0.06	0.11	0.05

		16	17	18	19	20	21	22	23	24	25	26	27	28
16	CASHRIGHT	1.00												
17	FOLLOWING	0.15	1.00											
18	INSTITUTIONAL_FUND	-0.04	0.41	1.00										
19	INSTITUTIONAL_OTHER	-0.07	0.17	0.04	1.00									
20	BIG10	0.08	0.12	-0.03	0.04	1.00								
21	SECOND_OWNERSHIP	-0.25	0.01	0.00	0.05	-0.04	1.00							
22	NONLISTED	0.07	-0.09	-0.07	0.02	0.04	-0.10	1.00						
23	FCF	0.00	0.02	0.04	-0.01	0.02	-0.03	0.06	1.00					
24	DSEO	-0.04	0.12	0.09	0.28	0.03	0.04	-0.02	-0.07	1.00				
25	NETBORROWING	0.01	-0.02	-0.01	0.00	0.00	-0.01	0.02	-0.02	-0.01	1.00			
26	SEQ_CASH	-0.04	0.00	0.01	0.02	0.01	0.00	0.02	-0.05	-0.03	-0.04	1.00		
27	TRADE_CREDIT	-0.01	0.03	0.01	0.01	0.01	0.03	-0.13	0.00	-0.01	0.03	0.01	1.00	
28	PLEDGE_CASH	0.04	-0.01	-0.03	-0.03	0.00	0.02	-0.09	-0.06	0.00	0.00	0.14	0.00	1.00
29	LEVNONLISTED	0.00	-0.14	-0.04	0.01	0.01	-0.12	0.52	0.05	-0.00	0.03	0.02	-0.07	-0.07

This table displays the Pearson correlations among the regression variables. All variable definitions are reported in the Appendix. The correlations highlighted in bold are significant at the 5% significance level or lower.

Table 4
The association between share pledging and ownership structure.

	(1)	(2)
	<i>PLEDGE</i>	<i>PLEDGE</i>
	Full sample	Full sample
<i>NSOE</i>	0.356*** (13.81)	
<i>NSOE_STATE</i>		0.315*** (9.72)
<i>NSOE_PRIVATE</i>		0.361*** (14.08)
<i>SIZE</i>	-0.003 (-0.52)	-0.003 (-0.52)
<i>GROWTH</i>	0.009 (1.17)	0.009 (1.17)
<i>LEV</i>	0.201*** (6.63)	0.201*** (6.63)
<i>CASH</i>	-0.112*** (-4.14)	-0.112*** (-4.14)
<i>ROE</i>	-0.084** (-2.61)	-0.084** (-2.61)
<i>LOSS</i>	0.000 (0.03)	0.000 (0.03)
<i>AGE</i>	0.048*** (6.76)	0.048*** (6.76)
<i>TOBINQ</i>	-0.004 (-1.00)	-0.004 (-1.00)
<i>VOLATILITY</i>	0.315*** (4.83)	0.315*** (4.83)
<i>RET</i>	0.007 (1.60)	0.007 (1.60)
<i>LIQUIDITY</i>	-0.003*** (-4.46)	-0.003*** (-4.46)
<i>DELISTING</i>	-0.010 (-0.71)	-0.010 (-0.71)
<i>VOTINGRIGHT</i>	-0.001 (-1.74)	-0.001 (-1.74)
<i>CASHRIGHT</i>	-0.001 (-1.55)	-0.001 (-1.55)
<i>FOLLOWING</i>	-0.023*** (-5.41)	-0.023*** (-5.41)
<i>INSTITUTIONAL_FUND</i>	-0.001 (-0.60)	-0.001 (-0.60)
<i>INSTITUTIONAL_OTHER</i>	0.005*** (4.02)	0.005*** (4.02)
<i>BIG10</i>	-0.013 (-1.53)	-0.013 (-1.53)
<i>SECOND_OWNERSHIP</i>	-0.001 (-1.08)	-0.001 (-1.08)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
N	19,734	19,734
adj. R ²	0.310	0.310

This table reports the OLS regression results of model (1):

$$PLEDGE_t = \beta_0 + \beta_1 NSOE_t + \beta_2 CONTROL_{t-1} + \text{industry fixed effects} + \text{year fixed effects}$$

Please see the Appendix for all variable definitions. The t-values in brackets are based on standard errors adjusted for firm and year clustering. ***, **, and * indicate that the coefficients are significant at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively.

Table 5

The association between share pledging and ownership structure: firm-level variations in financial constraints of privately held firms.

	(1)	(2)	(3)
	<i>PLEDGE</i>	<i>PLEDGE</i>	<i>PLEDGE</i>
	Full sample	Full sample	Full sample
<i>NSOE</i>	0.348*** (14.37)	0.287*** (8.96)	0.339*** (14.25)
<i>NONLISTED</i>	-0.002*** (-4.94)		
<i>NSOE * NONLISTED</i>	0.007*** (3.87)		
<i>LEVNONLISTED</i>		0.015 (0.73)	
<i>NSOE * LEVNONLISTED</i>		0.184*** (4.40)	
<i>DSEO</i>			0.000 (0.02)
<i>NSOE * DSEO</i>			0.124*** (7.95)
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
<i>N</i>	16,143	9251	19,734
adj. <i>R</i> ²	0.369	0.321	0.318

This table reports the OLS regression results of the following model:

$$PLEDGE_t = \beta_0 + \beta_1 NSOE_t + \beta_2 CHAR_{t-1} + \beta_3 NSOE_t * CHAR_{t-1} + \beta_4 CONTROL_{t-1} + industry\ fixed\ effects + year\ fixed\ effects$$

$CHAR_{t-1}$ refers to the following firm-level variations in financial constraints of privately held firms: number of privately held firms controlled by the controlling shareholder of a publicly listed firm ($NONLISTED_{t-1}$) in column (1), weighted average financial leverage for the privately held firms controlled by the controller of a publicly listed firm ($LEVNONLISTED_{t-1}$) in column (2), and past seasoned equity offering by a publicly listed firm ($DSEO_{t-1}$) in column (3). Please see the Appendix for variable definitions. The t-values in brackets are based on standard errors adjusted for firm and year clustering. ***, **, and * indicate that the coefficients are significant at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively.

explicitly or implicitly by the CSRC from raising external equity capital in consecutive years, we use a dummy variable ($DSEO$) indicating whether a publicly listed firm issued seasoned equity offering (SEO) in the prior year as a proxy for the listed firm's lack of external financing capacity.⁷ The key variable of interest is $NSOE \times DSEO$.⁸ Consistent with H2, the coefficient on $NSOE \times DSEO$ is significantly positive, suggesting that the difference in controlling shareholders' share pledging between publicly listed non-SOEs and publicly listed SOEs is greater for publicly listed firms that face difficulty in raising equity capital from the public market. The coefficient on $NSOE \times DSEO$ (0.124) is also economically significant considering that the average difference in $PLEDGE$ between publicly listed non-SOEs and publicly listed SOEs is 0.30. As predicted, the coefficient on $DSEO$ is insignificant, suggesting no evidence that publicly listed SOEs' external capital raising difficulty encourages share pledging by the controlling shareholders of publicly listed SOEs.

4.2. China's four trillion stimulus plan as a shock to privately held non-SOEs' financial constraints

We also test H2 using China's four trillion stimulus plan as an exogenous shock to privately held non-SOEs' financial constraints. In response to the 2008 global financial crisis, the Chinese government launched the four trillion stimulus plan in November 2008 that targeted companies operating in several favored industries, including Construction, Technology, Culture and Environmental investment as well as the post-2008 Sichuan earthquake construction (Liu et al., 2018; Zhang, 2009).⁹ While Cong et al. (2019) show that the

⁷ The 1993 version of China's Company Law barred a listed company from applying for seasoned equity offering if no <12 months has lapsed since the previous issue of shares. In 2001, the CSRC issued a Notice on further improving seasoned equity offering of listed firms that contained a similar requirement. However, this regulation was removed from the 2005 version of Company Law. In 2017, the CSRC again stipulated that when a listed company applies for additional issuance, allotment of shares, and non-public issuance of shares, no <18 months shall have elapsed from the date of adopting the resolution of the board of directors on this issuance to the date when the funds raised from the previous issuance are in place. This rule was modified in November 2018 by reducing the restriction period to 6 months. From 2007 to 2017, there are around 2667 SEOs by publicly listed non-financial firms. 86 of these SEOs happened within 1 year after the previous SEO for the same firm.

⁸ Because a portion of the SEO could be subscribed by the controlling shareholder of the listed firm, we break down the SEO into two dummy variables: SEO from the controlling shareholder ($DSEO_CONTROLLER$) and SEO from other unrelated shareholders ($DSEO_OTHER$). The coefficients on $NSOE \times DSEO_CONTROLLER$ and $NSOE \times DSEO_OTHER$ are both significantly positive (untabulated).

⁹ The central government selected the targeted industries based on the Eleventh Five-Year Plan and mid- to long-term economic planning that aimed to speed up the adjustment of the national economic structure and mode of economic development (Zhang, 2009). Specifically, the industries targeted by the stimulus plan were related to people's livelihood, rural development, infrastructure construction, and environmental protection.

stimulus plan disproportionately favored state-owned firms in the targeted industries, we argue that non-SOEs in the targeted industries should also benefit from the four trillion stimulus plan. The reason is that SOEs often serve as a financing channel for non-SOEs in the same industries (Allen et al., 2019; Ruan, 2018; Du et al., 2016). In addition, Liu et al. (2018) find that the four trillion stimulus plan benefited non-SOEs in the targeted industries and regions due to local governments' strong encouragement of bank lending in the targeted industries following the announcement of the four trillion stimulus plan. Hence, we expect private-held non-SOEs in the targeted industries and regions to face lower financial constraints following the launch of the four trillion stimulus plan, leading to reduced demand for share pledging. In contrast, the four trillion stimulus plan should have a weaker impact on share pledging of publicly listed SOEs in the targeted industries because SOEs had a very low level of share pledging to start with prior to the launch of the stimulus plan. To test this hypothesis, we adopt the following difference-in-difference-in-differences regression model:

$$PLEDGE_{it} = \beta_0 + \beta_1 STIMULUS + \beta_2 NSOE_{it} \times POST2008 + \beta_3 NSOE_{it} \times STIMULUS + \beta_4 POST2008 \times STIMULUS + \beta_5 NSOE_{it} \times STIMULUS \times POST2008 + CONTROL_{i,t-1} + firm\ fixed\ effects + year\ fixed\ effects \quad (2)$$

See the Appendix for all variable definitions. *POST2008* is a dummy variable that equals one for observations after year 2008 and zero otherwise. *STIMULUS* is a dummy variable constructed as follows. For each publicly listed firm (both SOEs and non-SOEs), we first compute the number of privately held firms controlled by the controlling shareholder of a publicly listed firm that operates in the industries targeted by the stimulus plan (denoted as *TARGET_NUM*), i.e., firms located in the Sichuan province or firms in the following targeted industries per Liu et al. (2018): construction, water resources, environment and public facilities management, culture and entertainment, information technology, and scientific research and technical service. Then, we define *STIMULUS* as a dummy variable that equals one if *TARGET_NUM* is greater than the 75th percentile of the sample and zero otherwise. We choose the 75th percentile as a cutoff due to the skewness of *TARGET_NUM*. The coefficient on *NSOE_{it} × STIMULUS × POST2008* is our key variable of interest for H2.¹⁰

The 2008 stimulus plan lasted for about four years only (Liu et al., 2018; Cong et al., 2019). In addition, as noted in Section 3.2, share pledging costs dropped significantly starting from 2013 when the Shanghai Stock Exchange and Shenzhen Stock Exchange allowed financial intermediaries other than banks and trust companies to participate in the share pledging business. Hence, we estimate regression model (2) using only the firm-years over 2007–2012 to avoid any potential regime shift in share pledging after 2012.

Column (1) of Table 6 shows the regression results of model (2). The coefficient on *STIMULUS* is insignificant, suggesting no evidence that, prior to the launch of the 2008 stimulus plan, the extent of share pledging differs for publicly listed SOEs in the targeted industries versus non-targeted industries. The coefficient on *POST2008 × STIMULUS* is also insignificant, suggesting no evidence of a change in share pledging following the launch of the 2008 stimulus plan for publicly listed SOEs in the targeted industries relative to the non-targeted industries. More importantly, we find that the coefficient on *NSOE_{it} × STIMULUS × POST2008* is significantly negative, suggesting that the extent of share pledging is reduced following the launch of the stimulus plan for publicly listed non-SOEs in the targeted industries relative to the non-targeted industries. This finding provides further support for H2.¹¹

The model (2) reported in column (1) is relatively complex due to the addition of a three-way interaction. Hence, we also tabulate the regression results of model (2) for non-SOEs and SOEs separately in columns (2) and (3), respectively. Consistent with our prediction, the coefficient on *STIMULUS × POST2008* is significantly negative for non-SOEs but the coefficient on *STIMULUS × POST2008* is insignificant for SOEs. These two interaction coefficients are significantly different at the 5% two-tailed significance level. These results are consistent with the inference in column (1) of Table 6.

4.3. Propensity score matching for publicly listed SOEs versus publicly listed non-SOEs

Other than the nature of ownership, publicly listed SOEs differ from publicly listed non-SOEs on many different dimensions. We have controlled for such firm characteristics when testing H1 and H2. As our OLS regression model assumes the effects of these firm characteristics on share pledging to be linear, we also rerun our relevant regression models using a smaller propensity score matched sample of publicly listed SOEs and publicly listed non-SOEs. The matching variables are the controls including industry and year fixed effects included in regression model (1). Following Dehejia and Wahba (2002) and Chen et al. (2018), we match each non-SOE firm-year with an SOE firm-year with replacement by requiring the propensity score difference to be <0.25 times the standard error of the propensity scores. We obtain similar inferences if we use an alternative cutoff of 0.01 or 0.03 (untabulated).

Table 7 reports the relevant regression results of H1 and H2 in Tables 4–6 for the propensity score matched sample. None of our inferences are significantly affected.

¹⁰ We also define *STIMULUS* based on the proportion of private firms in the industries targeted by the stimulus plan as a fraction of all private firms controlled by the controlling shareholder (denoted as *STIMULUS_PROPORTION*). Specifically, *STIMULUS_PROPORTION* is one if the proportion of private firms in the industries targeted by the stimulus plan as a fraction of all private firms controlled by the controlling shareholder is in the top third of the sample and zero otherwise. We find similar inference using this alternative definition (untabulated).

¹¹ The stimulus plan could also benefit *publicly listed firms* operating in the targeted industries, which in turn could indirectly benefit privately held firms under common ownership control. To investigate this possibility, we define a new variable *STIMULUS_PUBLIC* that equals one for the publicly listed firms operating in the targeted industries, and zero otherwise. Then, we rerun the regressions in columns (2) and (3) of Table 6 but we find that the coefficient on *STIMULUS_PUBLIC × POST2008* is never significant for both non-SOEs and SOEs (untabulated). This evidence suggests that publicly listed firms are not the main channel through which the stimulus plan benefited private held non-SOEs under common ownership control.

Table 6

Share pledging and ownership structure: Using China's four trillion stimulus plan as a shock to privately held non-SOEs' financial constraints.

	(1)	(2)	(3)
	PLEDGE	PLEDGE	PLEDGE
	Full sample	NSOE = 1 sample	NSOE = 0 sample
STIMULUS	-0.014 (-0.90)	0.028 (0.38)	-0.001 (-0.08)
NSOE _t × POST2008	0.111*** (4.87)		
NSOE _t × STIMULUS	0.092 (1.25)		
POST2008 × STIMULUS	-0.014 (-1.39)	-0.113** (-2.22)	-0.010 (-1.04)
NSOE _t × STIMULUS × POST2008	-0.101** (-2.00)		
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
N	6215	2260	3955
adj. R ²	0.775	0.741	0.664
P-value		0.05**	
$[\beta_{POST2008 \times STIMULUS}^2 = \beta_{POST2008 \times STIMULUS}^2]$			

This table reports the OLS regression results of the following model:

$$PLEDGE_t = \beta_0 + \beta_1 STIMULUS + \beta_2 NSOE_t \times POST2008 + \beta_3 NSOE_t \times STIMULUS + \beta_4 POST2008 \times STIMULUS + \beta_5 NSOE_t \times STIMULUS \times POST2008 + CONTROL_{t-1} + \text{firm fixed effects} + \text{year fixed effects}$$

Please see the Appendix for variable definitions. The t-values in brackets are based on standard errors adjusted for firm clustering. ***, **, and * indicate that the coefficients are significant at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively.

5. Where does the money go after share pledging?

Sections 3 and 4 show that an important driver of share pledging by controlling shareholders of publicly listed non-SOEs is the financial constraints of privately held non-SOEs under common ownership. In this section, we attempt to shed light on how controlling shareholders actually deploy the cash proceeds from share pledging. The controlling shareholder of a publicly listed non-SOE could spend the cash proceeds from share pledging in three possible ways: (i) support the publicly listed firms controlled by the controlling shareholder; (ii) support the privately held firms (both existing and newly formed) controlled by the controlling shareholder; or (iii) support the personal consumption needs of the controlling shareholder. It is important to note that the three ways of spending are not mutually exclusive. Channel (ii) is the focus of this study. We do not have data to test channel (iii), but it seems unlikely that channel (iii) is a major use of the cash proceeds from share pledging given the large magnitude of share pledging by controlling shareholders of publicly listed non-SOEs. In addition, a CSRC survey of publicly listed Chinese firms reported in He et al. (2022) shows that only 13.6% of survey respondents use cash proceeds from share pledging for personal consumption. Therefore, we focus on assessing the relative importance of channel (i) versus channel (ii) in the following discussions.

As publicly listed firms are required to disclose detailed information about their businesses, we first test whether controlling shareholders of publicly listed non-SOEs use any of the cash proceeds from share pledging to help the publicly listed firms under common ownership. Prior research (e.g., Jian and Wong, 2010; Jia et al., 2013) shows that when publicly listed Chinese firms experience performance declines, their controlling shareholders often provide financial support to the publicly listed firms. However, this line of research does not examine controlling shareholders' behavior when both the privately held non-SOEs and the publicly listed non-SOEs under common ownership face financial constraints, which is the case in our share pledging setting.

We consider the following three different channels through which a controlling shareholder of a publicly listed firm could transfer a portion of the cash proceeds from share pledging to the publicly listed firm: (1) the net intercorporate loans from the controlling shareholder and its related parties to the listed firm (*NETBORROWING*); (2) seasoned equity offering issued by the listed firm to the controlling shareholder and its related parties (*SEO_CASH*); and (3) the net outstanding trade credits that the listed firm receives from the controlling shareholder and its related parties (*TRADE_CREDIT*). *NETBORROWING_t* is defined as the change of the outstanding intercorporate loans provided by the controlling shareholder of a publicly listed firm to the publicly listed firm, net of the change of intercorporate loans from the latter to the former in year t, divided by the average market capitalization in year t. *SEO_CASH_t* is defined as the cash contributed by the controlling shareholder to the publicly listed firm via a seasoned equity offering in year t, divided by the listed firm's average market capitalization in year t. *TRADE_CREDIT_t* is defined as the net outstanding trade credit that the listed firm receives from the controlling shareholder in year t divided by the listed firm's total revenues in year t.¹² The net outstanding trade

¹² Trade credits from a controlling shareholder to a publicly listed firm (*TRADE_CREDIT_t*) could represent normal business activities rather than cash transfer resulting from share pledging from a controlling shareholder to a publicly listed firm, our construct of interest. Hence, *TRADE_CREDIT_t* could overstate the true degree of cash transfer from a controlling shareholder to a publicly listed firm.

Table 7
Robustness checks: replication of Tables 4–6 using the propensity score matched sample.

Panel A. Replication of Table 4			
	(1)	(2)	
	<i>PLEDGE</i>	<i>PLEDGE</i>	
	PSM sample	PSM sample	
<i>NSOE</i>	0.348*** (12.97)		
<i>NSOE_STATE</i>		0.305*** (9.52)	
<i>NSOE_PRIVATE</i>		0.353*** (13.19)	
Controls	Yes	Yes	
Industry fixed effects	Yes	Yes	
Year fixed effects	Yes	Yes	
N	13,030	13,030	
adj. R^2	0.262	0.263	
Panel B. Replication of Table 5			
	(1)	(2)	(3)
	<i>PLEDGE</i>	<i>PLEDGE</i>	<i>PLEDGE</i>
	PSM sample	PSM sample	PSM sample
<i>NSOE</i>	0.341*** (14.18)	0.268*** (7.56)	0.333*** (13.13)
<i>NONLISTED</i>	-0.002*** (-3.85)		
<i>NSOE * NONLISTED</i>	0.007*** (3.86)		
<i>LEVNONLISTED</i>		-0.013 (-0.39)	
<i>NSOE * LEVNONLISTED</i>		0.213*** (4.30)	
<i>DSEO</i>			-0.000 (-0.01)
<i>NSOE * DSEO</i>			0.116*** (8.61)
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
N	10,217	5355	10,217
adj. R^2	0.325	0.305	0.337
Panel C. Replication of Table 6			
	(1)		
	<i>PLEDGE</i>		
	PSM sample		
<i>STIMULUS</i>	-0.030 (-0.99)		
<i>NSOE_t × POST2008</i>	0.105*** (4.29)		
<i>NSOE_t × STIMULUS</i>	0.101 (1.26)		
<i>POST2008 × STIMULUS</i>	-0.020 (-1.23)		
<i>NSOE_t × STIMULUS × POST2008</i>	-0.101* (-1.87)		
Controls	Yes		
Firm fixed effects	Yes		
Year fixed effects	Yes		
N	4096		
adj. R^2	0.763		

This table reports the OLS regression results of Tables 4–6 for the propensity score matched sample. Please see Section 4.3 for the matching procedures. Please see the Appendix for variable definitions.

For panel A and B, the t-values in brackets are based on standard errors adjusted for firm and year clustering. For panel C, the t-values in brackets are based on standard errors adjusted for firm clustering. ***, **, and * indicate that the coefficients are significant at the 0.01, 0.05, and 0.10 levels (two-tailed), respectively.

credit is defined as the sum of accounts payable, notes payable and advance payments minus the sum of accounts receivable, notes receivable and prepayments between the listed firm and the controlling shareholder (including the latter's related parties).

To test whether controlling shareholders of publicly listed firms use the cash proceeds from share pledging to support the publicly listed firms, we employ the following OLS regression model:

$$CASHINFUSION_t = \beta_0 + \beta_1 PLEDGE_CASH_t + \beta_2 NSOE_t + \beta_3 NSOE_t \times PLEDGE_CASH_t + \beta_4 PLEDGE_CASH_{t-1} + \beta_5 NSOE_t \times PLEDGE_CASH_{t-1} + \beta_6 CONTROL_{t-1} + \text{industry fixed effects} + \text{year fixed effects} \quad (3)$$

See the Appendix for all variable definitions. *CASHINFUSION* refers to *NETBORROWING*, *SEO_CASH*, or *TRADE_CREDIT*. As data on the cash proceeds from share pledging are not publicly available, *PLEDGE_CASH* is the estimated amount of cash proceeds that the controlling shareholder receives from share pledging in a year divided by the average market capitalization in the same year. See the Appendix for a detailed construction of *PLEDGE_CASH*. We include *PLEDGE_CASH* in both years *t* and *t-1* to allow for the possibility that it takes time for the controlling shareholder to transfer the cash proceeds from share pledging to the publicly listed firm. Our variables of interest are *PLEDGE_CASH_t*, *PLEDGE_CASH_{t-1}*, *NSOE_t*, *NSOE_t* × *PLEDGE_CASH_t*, and *NSOE_t* × *PLEDGE_CASH_{t-1}*. If controlling shareholders of publicly listed SOEs use a significant portion of the cash proceeds from share pledging to support the publicly listed SOEs under common ownership, we should expect the coefficient on *PLEDGE_CASH_t* or *PLEDGE_CASH_{t-1}* or both to be significantly positive. More importantly, if controlling shareholders of publicly listed non-SOEs are more likely than controlling shareholders of publicly listed SOEs to use the cash proceeds from share pledging to support their publicly listed firms under common ownership, we should expect the coefficient on *NSOE_t* × *PLEDGE_CASH_t* or *NSOE_t* × *PLEDGE_CASH_{t-1}* or both to be significantly positive.

The selection of the controls of model (3) primarily follows the propping literature, which documents that controlling shareholders occasionally channel resources to publicly listed firms, and the business group literature, which documents how cash flows are allocated within a business group. First, prior studies document that controlling shareholders may prop up listed firms' earnings via cash-based related party transactions to save the firm from being delisted (Jian and Wong, 2010; Fang et al., 2017; Jia et al., 2013). Accordingly, we include delisting risk as a control variable (*DELISTING*). Second, some business group studies (e.g., Gopalan et al., 2007) document that intragroup loans are used to support financially weaker firms. Therefore, we control for *SIZE*, *LEV*, *CASH*, and *FCF*. Third, the business group literature also documents that within a group, cash may flow to firms with greater investment opportunities (e.g., Buchuk et al., 2014). Accordingly, we include Tobin's Q (*TOBINQ*), sales growth (*GROWTH*) and firm performance (*ROE*). Finally, we include auditor quality (*BIG10*), voting rights (*VOTINGRIGHT*) and cash rights (*CASHRIGHT*) of the controlling shareholder and institutional ownership (*INSTITUTIONAL_FUND*, *INSTITUTIONAL_OTHER*) to capture the effects of corporate governance. All the control variables are lagged by one year except for *DELISTING*. We include industry and year fixed effects.

Table 8 shows the regression results of model (3). For brevity, we have omitted the coefficients on all control variables. The coefficients on *PLEDGE_CASH_t* and *PLEDGE_CASH_{t-1}* are insignificant. Hence, there is no evidence that controlling shareholders of publicly listed SOEs use a significant portion of the cash proceeds from share pledging to support the publicly listed SOEs. In addition, we find no evidence that the coefficients on *NSOE_t* × *PLEDGE_CASH_t* and *NSOE_t* × *PLEDGE_CASH_{t-1}* are significantly positive. The only

Table 8

Association between controlling shareholders' propping of publicly listed firms and cash proceeds from share pledging.

	(1)	(2)	(3)
	<i>NETBORROWING</i>	<i>SEO_CASH</i>	<i>TRADE_CREDIT</i>
<i>NSOE</i>	-0.001** (-2.52)	-0.000 (-0.70)	0.005** (2.49)
<i>PLEDGE_CASH_t</i>	0.003 (0.12)	0.015 (1.67)	-0.002 (-0.10)
<i>NSOE * PLEDGE_CASH_t</i>	-0.000 (-0.01)	0.044** (2.70)	-0.005 (-0.20)
<i>PLEDGE_CASH_{t-1}</i>	0.009 (0.69)	0.001 (0.27)	-0.016 (-1.15)
<i>NSOE * PLEDGE_CASH_{t-1}</i>	-0.015 (-1.09)	0.003 (0.48)	0.015 (1.04)
Controls	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
N	18,731	18,731	18,653
adj. R ²	0.003	0.048	0.04

This table reports the OLS regression results of the following model:

$$CASHINFUSION_t = \beta_0 + \beta_1 PLEDGE_CASH_t + \beta_2 NSOE_t + \beta_3 NSOE_t * PLEDGE_CASH_t + \beta_4 PLEDGE_CASH_{t-1} + \beta_5 NSOE_t * PLEDGE_CASH_{t-1} + \beta_6 CONTROL_{t-1} + \text{industry fixed effects} + \text{year fixed effects}$$

Please see the Appendix for all variable definitions. The t-values reported in brackets are based on standard errors adjusted for firm and year clustering. *, **, and *** denote significance at 10%, 5%, and 1% levels (two-tailed), respectively.

Table 9
Spending of the cash proceeds from share pledging.

Panel A: Descriptive statistics for firm-years with Δ PLEDGE > 0				
	PLEDGE TO UNLISTED		PLEDGE TO LISTED	N with Δ PLEDGE > 0
NSOE	1650 (49%)		1720 (51%)	3370
SOE	274 (33%)		564 (67%)	838

Panel B: OLS regression results of PLEDGE TO UNLISTED and PLEDGE TO LISTED				
	(1)	(2)	(3)	(4)
	PLEDGE_UNLISTED using a cutoff of 0%	PLEDGE_LISTED using a cutoff of 0%	PLEDGE_UNLISTED using a cutoff of 0.1%	PLEDGE_LISTED using a cutoff of 0.1%
$NSOE_t$	0.143*** (9.59)	0.119*** (6.63)	0.180*** (9.70)	0.083*** (5.76)
$\Delta SIZE_{t-1}$	0.060** (2.68)	0.088*** (4.38)	0.093*** (3.20)	0.055*** (4.06)
$\Delta GROWTH_{t-1}$	-0.001 (-0.31)	-0.010** (-2.38)	-0.005 (-1.12)	-0.006 (-1.47)
ΔLEV_{t-1}	-0.039 (-0.75)	0.011 (0.41)	-0.101 (-1.36)	0.073** (2.56)
$\Delta CASH_{t-1}$	-0.086** (-2.28)	0.024 (0.50)	-0.078* (-2.21)	0.016 (0.42)
ΔROE_{t-1}	-0.005 (-0.39)	-0.029* (-1.93)	-0.003 (-0.18)	-0.030*** (-3.32)
$\Delta LOSS_{t-1}$	-0.006 (-1.53)	-0.010 (-1.74)	0.002 (0.40)	-0.018*** (-3.77)
$\Delta TOBINQ_{t-1}$	0.002 (0.23)	0.001 (0.11)	0.002 (0.39)	0.000 (0.04)
$\Delta VOLATILITY_{t-1}$	-0.087* (-2.12)	-0.080 (-0.64)	-0.060 (-1.23)	-0.107 (-0.97)
$\Delta LIQUIDITY_{t-1}$	-0.005** (-3.12)	0.000 (0.21)	-0.004** (-2.40)	-0.000 (-0.67)
$\Delta DELISTING_{t-1}$	-0.027* (-2.01)	-0.006 (-0.49)	-0.029* (-1.97)	-0.004 (-0.29)
$\Delta OWNERSHIP_{t-1}$	0.002 (1.60)	0.002** (2.97)	0.002 (1.79)	0.002** (2.24)
$\Delta CASHRIGHT_{t-1}$	-0.001 (-1.30)	0.001 (1.13)	-0.000 (-0.59)	0.000 (0.33)
$\Delta BIG10_{t-1}$	0.008 (1.54)	-0.003 (-0.47)	0.012** (2.34)	-0.006 (-0.90)
$\Delta FOLLOWING_{t-1}$	-0.003 (-1.13)	0.001 (0.21)	-0.006 (-1.63)	0.004 (1.10)
$\Delta INSTITUTIONAL_FUND_{t-1}$	0.001 (0.73)	0.002 (1.78)	0.001 (0.47)	0.002** (2.47)
$\Delta INSTITUTIONAL_OTHER_{t-1}$	-0.001 (-1.45)	0.001 (1.09)	-0.001 (-0.97)	0.001 (0.75)
$\Delta SECOND_OWNERSHIP_{t-1}$	0.002 (1.37)	-0.001 (-0.59)	0.001 (0.69)	-0.000 (-0.09)
N	17,612	17,612	17,612	17,612
adj. R ²	0.076	0.063	0.094	0.045
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Panel C: OLS regression results of LEVERAGE_CHANGE for privately held firms				
	(1)	(2)	(3)	(4)
	LEVERAGE_CHANGE	LEVERAGE_CHANGE	LEVERAGE_CHANGE	LEVERAGE_CHANGE
	NSOE	SOE	NSOE	SOE
PLEDGE_CASH	-0.010*** (-2.60)	0.001 (0.19)	-0.004** (-2.46)	0.001 (0.51)
LEV _{t-1}			-0.747*** (-13.74)	-0.574*** (-19.77)
ROA			-0.309*** (-3.09)	-0.428*** (-8.03)
N	1050	4166	945	3935
adj. R ²	0.003	0.019	0.415	0.374

(continued on next page)

Table 9 (continued)

Panel C: OLS regression results of <i>LEVERAGE_CHANGE</i> for privately held firms				
	(1)	(2)	(3)	(4)
	<i>LEVERAGE_CHANGE</i>	<i>LEVERAGE_CHANGE</i>	<i>LEVERAGE_CHANGE</i>	<i>LEVERAGE_CHANGE</i>
	NSOE	SOE	NSOE	SOE
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
P-value for <i>PLEDGE_CASH</i> : NSOE vs SOE	0.03**		0.05*	

This table investigates how the cash proceeds from share pledging is spent. See Section 5 for details of the sample selection procedures.

Panel A reports descriptive statistics of *PLEDGING TO UNLISTED* and *PLEDGING TO LISTED* for publicly listed SOEs and publicly listed non-SOEs with $\Delta PLEDGE > 0$ separately.

Panel B reports the OLS regression results of the following model:

$$PLEDGING\ TO\ UNLISTED\ or\ PLEDGING\ TO\ LISTED = \beta_0 + \beta_1 NSOE_t + \beta_2 CONTROLS + industry\ fixed\ effects + year\ fixed\ effects$$

Panel C reports the OLS regression results of the following model using a sample of privately held firms:

$$LEVERAGE_CHANGE_t = \beta_0 + \beta_1 PLEDGE_CASH_{t-1} + firm\ fixed\ effects + year\ fixed\ effects$$

LEVERAGE_CHANGE is change in leverage in year t and is defined as follows:

$$LEVERAGE_CHANGE = \frac{Total\ liabilities_t}{Total\ assets_t} - \frac{Total\ liabilities_{t-1}}{Total\ assets_{t-1}}$$

Please see the Appendix for all variable definitions. *PLEDGE_CASH* is scaled by total asset of the privately held firm instead of average market capitalization in order to be consistent with the scaler for the dependent variable.

For panel B, the t-values in brackets are based on standard errors adjusted for firm and year clustering. For panel C, the t-values in brackets are based on standard errors adjusted for firm clustering only because this sample covers only six years over 2008–2013. *, **, and *** denote significance at 10%, 5%, and 1% levels (two-tailed), respectively.

exception is the significantly positive coefficient on $NSOE_t \times PLEDGE_CASH_t$ in the regression of *SEO_CASH*. However, the magnitude of this coefficient is only 0.044, suggesting that only RMB4.4 is transferred to the listed firm for every RMB100 cash proceed received from share pledging, an economically insignificant amount. Overall, we find no evidence that controlling shareholders of publicly listed non-SOEs use a significant portion of the cash proceeds from share pledging to support the publicly listed non-SOEs under common ownership. This finding is consistent with the conclusion from He et al. (2022).

One potential concern of regression model (3) is measurement error in *PLEDGE_CASH*. To address this concern, we follow Dou et al. (2019) by estimating the following two models that sidestep this measurement error concern:

$$PLEDGING\ TO\ UNLISTED\ or\ PLEDGING\ TO\ LISTED = \beta_0 + \beta_1 NSOE_t + \beta_2 CONTROLS + industry\ fixed\ effects + year\ fixed\ effects \quad (4)$$

See the Appendix for all variable definitions. *PLEDGING TO UNLISTED* is a dummy variable that equals one if a firm-year satisfies the following two conditions: (1) the number of shares pledged by the controlling shareholder increases in the year, after adjusting for share split and share dividend (i.e., $\Delta PLEDGE > 0$); and (2) there is no cash infusion from the controlling shareholder to the publicly listed firm in the year (i.e. the values of *NETBORROWING*, *SEO_CASH*, *TRADE_CREDIT*, and the controlling shareholder's share purchase of the publicly listed firm are never positive). *PLEDGING TO LISTED* is a dummy variable that equals one if a firm-year satisfies the following two conditions: (1) the number of shares pledged by the controlling shareholder increases in the year, after adjusting for share split and share dividend (i.e., $\Delta PLEDGE > 0$); and (2) there is a positive cash infusion from the controlling shareholder to the publicly listed firm in the year, using any of the following four channels: *NETBORROWING*, *SEO_CASH*, *TRADE_CREDIT*, or the controlling shareholder's share purchase of the publicly listed firm. Our key variable of interest is *NSOE*. We follow regression model (1) in the selection of control variables. Because the dependent variables in regression model (4) are related to the change of share pledging in a year, the control variables are expressed in the change form.

As both *PLEDGING TO UNLISTED* and *PLEDGING TO LISTED* are defined without requiring information of the cash proceeds from share pledging, regression model (4) avoids the measurement error concern noted above. The price of this alternative model specification is that we cannot precisely measure the relationship between a controlling shareholder's cash proceeds from share pledging and the controlling shareholder's support to the publicly listed firm under common ownership. Instead, *PLEDGING TO UNLISTED* captures situations where a controlling shareholder never uses any cash proceeds from share pledging to support the publicly listed firm under common ownership. *PLEDGING TO LISTED* captures situations where a controlling shareholder uses any cash proceeds from share pledging to support the publicly listed firm under common ownership, even if the dollar value of the cash transfer to the publicly listed firm is immaterial. Hence, *PLEDGING TO UNLISTED* and *PLEDGING TO LISTED* capture two extremes of a controlling shareholder's use of cash proceeds from share pledging.

We tabulate the descriptive statistics of *PLEDGING TO UNLISTED* and *PLEDGING TO LISTED* for publicly listed SOEs and publicly listed non-SOEs separately in Panel A of Table 9. The number of firm-years with an increase in share pledging (i.e., $\Delta PLEDGE > 0$) is 3370 for publicly listed non-SOEs and 838 for publicly listed SOEs. The value of *PLEDGING TO UNLISTED* (*PLEDGING TO LISTED*) equals one for 49% (51%) of the 3370 publicly listed non-SOE observations with positive $\Delta PLEDGE$. In other words, for 49% of the publicly listed non-SOEs with positive $\Delta PLEDGE$, their controlling shareholders never transfer any cash proceeds from share pledging

to the publicly listed non-SOEs. This evidence suggests the economic significance of channels (ii) and (iii) noted at the beginning of this section. For the remaining 51% of the publicly listed non-SOEs with positive $\Delta PLEDGE$, their controlling shareholders transfer some cash proceeds from share pledging to the publicly listed non-SOEs, but we do not know the exact amount of the transfer due to lack of data. In contrast, the value of $PLEDGING\ TO\ UNLISTED$ ($PLEDGING\ TO\ LISTED$) equals one for only 33% (67%) of the 838 publicly listed SOE observations with positive $\Delta PLEDGE$.

Panel B of Table 9 shows the regression results of model (4). The result for $PLEDGING\ TO\ UNLISTED$ is shown in column (1) and the result for $PLEDGING\ TO\ LISTED$ is shown in column (2). To shed further light on the materiality of cash transfer from controlling shareholders to publicly listed firms under common ownership, we also redefine $PLEDGING\ TO\ LISTED$ using a higher threshold: a dummy variable that equals one if a firm-year satisfies the following two conditions: (1) the number of shares pledged by the controlling shareholder increases in the year, after adjusting for share split and share dividend (i.e., $\Delta PLEDGE > 0$); and (2) there is a material positive cash infusion from the controlling shareholder to the publicly listed firm in the year, using one of the following four channels: $NETBORROWING$, SEO_CASH , $TRADE_CREDIT$, or the controlling shareholder's share purchase of the publicly listed firm. We use a materiality threshold of 0.1% for each of the four channels noted above. This regression result is shown in column (3) and (4) of Table 9, Panel B. As expected, the coefficient on $NSOE$ becomes larger for the regression of $PLEDGING\ TO\ UNLISTED$ and the coefficient on $NSOE$ becomes smaller for the regression of $PLEDGING\ TO\ LISTED$. However, the coefficient on $PLEDGING\ TO\ LISTED$ is still significantly positive, suggesting that a portion of the cash proceeds from controlling shareholders' share pledging is funnelled to the publicly listed non-SOEs under common ownership.

Overall, the results in both Panels A and B of Table 9 suggest that a portion of the cash proceeds from share pledging is transferred to support publicly listed non-SOEs, but we do not know the precise amount of the transfer. However, as noted in Panel A of Table 9, almost half of the publicly listed non-SOEs never transfer any cash proceeds from share pledging to publicly listed non-SOEs, suggesting that a major purpose of share pledging by controlling shareholders of publicly listed non-SOEs is to relieve the financial constraints of privately held non-SOEs under common ownership.

To provide direct evidence that controlling shareholders of publicly listed non-SOEs use share pledging to help alleviate the financial constraints of privately held firms under common ownership (e.g., by making additional equity capital infusion), we also estimate the regression model shown in Panel C of Table 9, which examines the association between changes in financial leverage for privately held firms and $PLEDGE_CASH$ in the same year for publicly listed non-SOEs versus publicly listed SOEs. The sample for this test is limited to privately held firms included in the Chinese Industrial Enterprise Database (CIED) (see Section 3) over the period 2008–2013. We start from 2008 because our share pledging data start from 2007. We end in 2013 because the CIED data stop in 2013. As shown in Panel C of Table 9, the final regression sample is small due to significant missing values on the required financial variables. Consistent with our prediction, we find in the first column that the coefficient on $PLEDGE_CASH$ is significantly negative for publicly listed non-SOEs, consistent with the hypothesis that the cash proceeds from controlling shareholders' share pledging (e.g., in the form of additional equity capital infusion) help reduce the financial leverage of the privately held firms under common ownership. In contrast, we do not find a similar effect for publicly listed SOEs in the second column. The last two columns further include lagged leverage to control for potential mean reversion of financial leverage and contemporaneous ROA to control for the mechanical impact of net income on financial leverage (Faulkender et al., 2012).

6. The impact of share pledging on shareholder value of publicly listed non-SOEs

Our final analysis examines whether share pledging by controlling shareholders of publicly listed non-SOEs hurts shareholder value of publicly listed non-SOEs, as argued by Dou et al. (2019) for the case of Taiwan.¹³ We do not perform this analysis for publicly listed SOEs because SOEs are not our focus of interest and more importantly we could not find an exogenous instrument for the endogenous $PLEDGE$ for SOEs. We use the following regression model following Dou et al. (2019):

$$TOBIN_Q_t = \beta_0 + \beta_1 PLEDGE_t + CONTROL_{t-1} + firm\ fixed\ effects + year\ fixed\ effects \quad (5)$$

See the appendix for all variable definitions. We control for common determinants of Tobin's Q following the prior literature (e.g., Dou et al., 2019; Li et al., 2019a; Villalonga and Amit, 2006).

To control for the endogeneity of $PLEDGE$, we follow He et al. (2022) by using the launch of the share pledging exchange market in 2013, which facilitates share pledging by natural person shareholders, as an exogenous instrumental variable. Specifically, prior to the launch of the exchange market in 2013, share pledging by legal person shareholders was much easier than share pledging by natural person shareholders due to the dominance of commercial banks in the share pledging market due to regulatory restrictions.¹⁴ The 2013 regulatory reform allowed securities firms to enter the share pledging business. As securities firms are not subject to banking regulations, this reform has significantly reduced share pledging costs for natural person shareholders. In addition, we have no reason to suspect that this 2013 regulatory change affects Tobin's Q through channels other than $PLEDGE$. As a result, we argue that

¹³ Dou et al. (2019) identify two key channels through which share pledging hurts shareholder value of publicly listed firms: (i) share pledging increases the stock price crash risk resulting from margin calls of pledged shares; and (ii) share pledging reduces insiders' risk taking appetites that are suboptimal to shareholder value maximization.

¹⁴ According to China's relevant banking regulations, bank loans issued to legal person shareholders are treated as industrial loans while bank loans issued to natural person shareholders are treated as retail loans. As Chinese commercial banks are allowed to issue industrial loans only, natural person shareholders were difficult to pledge shares for loans from commercial banks prior to 2013.

$NATURAL_PERSON \times POST2013$ can serve as an exogenous instrument for $PLEDGE$.

Table 10 reports the regression results of model (5). Column (1) of Table 10 shows the OLS regression results of model (5). The coefficient on $PLEDGE$ is insignificant. In contrast, when we control for the endogeneity of $PLEDGE$ using the two-stage-least-square (2SLS) regression approach in columns (2) and (3) of Table 10, we find different results. Specifically, the coefficient on $NATURAL_PERSON \times POST2013$ is significantly positive in column (3), suggesting that our instrumental variable $NATURAL_PERSON \times POST2013$ satisfies the relevance condition of the 2SLS regression approach. More importantly, the coefficient on $PLEDGE$ in column (2) becomes significantly negative, suggesting that controlling shareholders' share pledging hurts shareholder value of publicly listed non-SOEs. This finding is consistent with Dou et al. (2019) who focus on Taiwan and several studies that document various side effects of share pledging for publicly listed Chinese firms (Liu and Tian, 2021; Hu et al., 2021; Zhou et al., 2021).

7. Conclusion

Prior research shows that privately held firms in emerging market economies lack access to finance and such financial constraints negatively affect their investment and growth. As ownership of privately held firms and publicly listed firms by a common controlling shareholder is a prevalent phenomenon in emerging markets, we examine whether common controllers have an incentive to pledge

Table 10

The effect of share pledging on firm value.

	(1)	(2)	(3)
	<i>TOBINQ</i>	<i>TOBINQ</i>	<i>PLEDGE</i>
<i>PLEDGE</i>	-0.068 (-1.16)	-2.334** (-2.07)	
<i>NATURAL_PERSON * POST2013</i>			0.052*** (4.16)
<i>SIZE</i>	-0.907*** (-11.99)	-0.815*** (-15.04)	0.040*** (6.40)
<i>GROWTH</i>	0.028 (0.68)	-0.010 (-0.36)	-0.017*** (-3.65)
<i>CASH</i>	0.148 (0.60)	0.140 (1.18)	-0.001 (-0.04)
<i>ROE</i>	0.437 (1.55)	0.372*** (3.02)	-0.030 (-1.17)
<i>LOSS</i>	0.161* (2.00)	0.174*** (3.40)	0.005 (0.47)
<i>AGE</i>	0.447*** (5.25)	0.758*** (4.67)	0.124*** (11.78)
<i>LEV</i>	0.645*** (3.20)	0.573*** (4.92)	-0.032 (-1.36)
<i>VOLATILITY</i>	0.244 (0.52)	0.488* (1.95)	0.099** (2.13)
<i>DELISTING</i>	-0.082 (-0.67)	-0.157** (-2.10)	-0.035** (-2.52)
<i>VOTINGRIGHT</i>	-0.004 (-1.44)	-0.003 (-1.63)	0.000 (0.13)
<i>CASHRIGHT</i>	-0.002 (-0.98)	-0.002 (-1.15)	0.000 (0.21)
<i>FOLLOWING</i>	0.075*** (4.08)	0.058*** (3.08)	-0.007** (-2.07)
<i>INSTITUTIONAL_FUND</i>	0.034*** (6.87)	0.034*** (9.00)	0.000 (0.02)
<i>INSTITUTIONAL_OTHER</i>	0.018** (2.72)	0.015*** (3.22)	-0.001 (-1.23)
<i>BIG10</i>	-0.076* (-2.01)	-0.054 (-1.51)	0.009 (1.29)
<i>N</i>	10,186	10,186	10,186
F value			17.3
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

This table shows the regression results of the following model:

$$TOBINQ_t = \beta_0 + \beta_1 PLEDGE_t + CONTROL_{t-1} + \text{firm fixed effects} + \text{year fixed effects}$$

Column (1) shows the OLS regression results. Columns (2) and (3) show the results using the two-stage-least-square (2SLS) regression approach. Please see the Appendix for all variable definitions. The t-values reported in brackets are based on standard errors adjusted for firm and year clustering. *, **, and *** denote significance at 10%, 5%, and 1% levels (two-tailed), respectively.

their liquid shares of publicly listed firms as one means to help alleviate the financial constraints of their privately held firms. We further examine whether controlling shareholders' share pledging reduces shareholder value of publicly listed firms, representing a negative spillover resulting from privately held firms' financial constraints.

We test our hypothesis using publicly listed Chinese firms over 2007–2017. Because privately held SOEs face lower financial constraints, we use share pledging by controlling shareholders of publicly listed SOEs as a benchmark. Consistent with our hypothesis, we find that the average difference in controlling shareholders' share pledging between publicly listed non-SOEs and publicly listed SOEs is both statistically and economically significant. The difference in the extent of share pledging for the two types of publicly listed firms is driven by the differential financial constraints facing privately held non-SOEs versus privately held SOEs. In addition, we show that a material portion of the cash proceeds that controlling shareholders of publicly listed non-SOEs receive from share pledging is used to support privately held non-SOEs rather than publicly listed non-SOEs. Furthermore, we use a 2SLS regression approach to show that share pledging by controlling shareholders of publicly listed non-SOEs hurts shareholder value of publicly listed non-SOEs, consistent with the hypothesis that the financial constraints of privately held non-SOEs create a negative spillover on publicly listed non-SOEs under common ownership through the channel of share pledging.

The findings from our study have important implications for future policy debates on the costs of privately held firms' financial constraints. While most of the prior literature on privately held firms' financial constraints focuses on the direct consequences of financial constraints on the privately held firms per se, our findings suggest that future policy makers need to incorporate the negative externalities that privately held firms' financial constraints impose on the rest of the economy.

Our study also has important implications for the share pledging literature. Prior research has documented the negative consequences of share pledging by controlling shareholders of publicly listed firms on shareholder value, prompting an ongoing debate on whether securities regulators should regulate share pledging by substantial shareholders of publicly listed firms. The findings from our study suggest that one important root cause of publicly listed firms' share pledging is the financial constraints of privately held firms, which is beyond the reach of securities regulators. Hence, any effective remedies for excessive share pledging require the cooperation of multiple government agencies, which is a challenge due to the conflicting objectives and priorities of different government agencies.

Our study also provides an important new insight on how common controllers of business groups prioritize the interests of individual business entities under common ownership when all group members become distressed in the same time. Our empirical results suggest that controlling shareholders of publicly listed non-SOEs have a strong incentive to support their privately held firms via share pledging of publicly listed firms at the expense of minority shareholder interests in the publicly listed firms. We believe this type of minority shareholder expropriation deserves more attention as they typically fall out of the scope of many corporate governance restrictions that tend to focus on minority investor expropriation via real transactions such as excessive executive compensation, intercorporate loans or related party transactions.

Data availability

Data will be made available on request.

Appendix A. Variable definitions

AGE_{t-1} : firm age at the end of fiscal year t-1, defined as the natural logarithm of the number of years since a listed firm's IPO.

$BIG10_{t-1}$: a dummy variable that equals 1 if the audit firm of a publicly listed firm is among the top 10 audit firms based on the annual revenue in year t-1 and 0 otherwise.

$CASH_{t-1}$: cash holding at the end of fiscal year t-1, defined as cash, cash equivalents, and investment securities, divided by total assets.

$CASHRIGHT_{t-1}$: defined as cash flow right owned by the controlling shareholder at the end of fiscal year t-1, expressed as a percentage of the publicly listed firm's total number of shares outstanding. Cash flow right is defined as the sum of the products of the controlling shareholder's ownership along the control chain (Claessens et al., 2002).

$DELISTING_{t-1}$: a dummy variable that equals 1 if a publicly listed firm is designated as the special treatment status (ST) by the stock exchange in fiscal year t-1 and 0 otherwise.

$DSEO_{t-1}$: a dummy variable that equals 1 if a publicly listed firm issued seasoned equity offering (SEO) for cash in the prior year and 0 otherwise.

$FOLLOWING_{t-1}$: defined as natural logarithm of one plus the number of analysts following at the end of the fiscal year t-1.

FCF_{t-1} : operating cash flows minus CAPEX divided by total assets in year t-1. CAPEX is defined as cash paid to acquire fixed assets, intangible assets, and other long-term assets.

$GROWTH_{t-1}$: annual growth of revenues during the fiscal year t-1, defined as total sales in fiscal year t-1 divided by the total sales in fiscal year t-2.

$INSTITUTIONAL_FUND_{t-1}$: defined as percentage of a publicly listed firm's shares owned by all mutual fund investors at the end of fiscal year t-1. This definition is limited to the top 10 shareholders and top 10 tradable shareholders of a publicly listed firm.

$INSTITUTIONAL_OTHER_{t-1}$: defined as percentage of a publicly listed firm's shares owned by all institutional investors other than mutual funds at the end of fiscal year t-1, including qualified foreign institutional investor, securities firms, insurance firms, security fund investors, trust firms, finance companies of enterprise groups and banks. This definition is limited to the top 10 shareholders and top 10 tradable shareholders of a publicly listed firm.

LEV_{t-1} : leverage at the end of fiscal year t-1, defined as total liabilities divided by total assets.

LEVERAGE_CHANGE_t: change in leverage of a privately held firm in year *t* and is calculated as follows:

$$LEVERAGE_CHANGE = \frac{Total\ liabilities_t}{Total\ assets_t} - \frac{Total\ liabilities_{t-1}}{Total\ assets_{t-1}}$$

LEVNONLISTED: weighted average financial leverage (total liabilities divided by total assets) for the privately held firms controlled by the controller of a publicly listed firm. To calculate this variable, we match the names of the privately held firms in our sample with the company names from the Chinese Industrial Enterprise Database (CIED). The value of *LEVNONLISTED* is set to zero if the controlling shareholder of a publicly listed firm does not have any privately held firms before the match. If none of the privately held firms for a publicly listed firm can be matched with the firms in the CIED database, we remove the corresponding publicly listed firm from the final sample. For the controlling shareholder of each publicly listed firm, if more than one privately held firm is matched, *LEVNONLISTED* is calculated as the weighted average of the leverage ratio of the matched firms, using total assets as the weight. Even if a privately held firm is matched with CIED, the financial information in CIED could be missing for certain years because (1) the CIED survey data stops at 2013 and (2) the CIED has some missing data during its survey period. To solve this issue, we impute the missing financial data with the assumption that the financial leverage of the privately held firms is stable within a rolling two-year window. Specifically, if financial information is available for year *t* but unavailable for year *t* + 1 or year *t* + 2, we use the values of year *t* for year *t* + 1 and year *t* + 2. Accordingly, our sample period for this test covers 2007–2016.¹⁵

LIQUIDITY_{t-1}: daily average Amihud ratio during fiscal year *t*-1. The Amihud ratio is defined as absolute stock return on day *t* divided by the trading volume (in Billion RMB) on day *t* (Amihud, 2002). We require at least 10 trading days for the purpose of computing this variable.

LOSS_{t-1}: a dummy variable that equals 1 if a publicly listed firm reports a loss for fiscal year *t*-1 and 0 otherwise.

NATURAL_PERSON: the ratio of a controlling shareholder's ownership held in the natural person shareholder form over the controlling shareholder's total share ownership in year 2012.

NETBORROWING_t: change of the net outstanding intercorporate loans over average market capitalization in year *t*. The net outstanding intercorporate loans are calculated as the total value of intercorporate loans provided by the controlling shareholder of a publicly listed firm (including the parties acting in concert) to the publicly listed firm, net of the loans or repayment from the latter to the former, divided by the average market capitalization. Market capitalization is calculated as the market value of tradeable shares plus book value of non-tradable shares.

NONLISTED_{t-1}: number of privately held firms in which the controlling shareholder of a publicly listed firm directly owns at least 50% in year *t*-1. The definition of *NONLISTED* differs for publicly listed SOEs and non-SOEs. For publicly listed non-SOEs' controlling shareholders, *NONLISTED* refers to the privately held firms that are directly controlled by the controlling shareholders. If a controlling shareholder controls a publicly listed firm via a holding firm, *NONLISTED* refers to the privately held firms that are directly controlled by the holding firm. For publicly listed SOEs' controlling shareholders, *NONLISTED* is defined as follows: (i) if a government entity (typically the State-Owned Assets Supervision and Administration Commission (SASAC)) directly controls the listed SOE, *NONLISTED* is zero¹⁶; (ii) if a government agency controls the publicly listed firm indirectly through a holding company, *NONLISTED* includes the privately held SOEs that are directly controlled by the holding company. Holding company is defined as the privately held SOE directly controlled by a government agency or asset management platform. An asset management platform refers to a state capital investment and operation company.

NSOE_t: a dummy variable that equals 1 if the largest shareholder of a publicly listed firm is an individual (including parties in concert) or an entity controlled by the individual, and 0 otherwise.

NSOE_STATE_t: a dummy variable that equals 1 if a publicly listed non-SOE has at least one large (defined as 5% ownership or higher) minority shareholder that is an SOE or a government agency, and 0 otherwise.

NSOE_PRIVATE_t: a dummy variable that equals 1 if a publicly listed non-SOEs does not have any large (defined as 5% ownership or higher) minority shareholder that is an SOE or a government agency, and 0 otherwise.

PLEDGE_t: number of shares pledged by the controlling shareholder (including parties acting in concert) divided by its ownership in the publicly listed firm at the end of the fiscal year *t*. The shares owned by the parties acting in concert with the controlling shareholder are included in both the numerator and denominator of *PLEDGE*.

PLEDGE_CASH_t: estimated cash proceeds that the controlling shareholder of a publicly listed firm receives from share pledging in year *t* and it is defined as follows:

$$PLEDGE_CASH_t = \frac{Number\ of\ pledged\ shares\ in\ year\ t * average\ market\ price * pledging\ rate}{average\ market\ capitalization}$$

Where:

Number of pledged shares in year t denotes the total number of shares pledged (or released if negative) by the controlling shareholder of a publicly listed firm during year *t*.

Average market price is the average stock price in year *t* if *number of pledged shares in year t* is positive and the average stock price in year *t*-1 if *number of pledged shares in year t* is negative. A negative number of pledged shares means that the controlling shareholder

¹⁵ However, our inferences are qualitatively similar if we do not perform this imputation (untabulated).

¹⁶ Even though the SASAC directly controls many publicly listed or privately held SOEs, these SOEs operate independently of each other. Hence, it is not appropriate to include these SOEs as part of *NONLISTED*.

pays back the loan to the lender. Since most of pledging-related loans are due in one year, we use the stock price in year $t-1$ to estimate the loan amount that the controlling shareholder owner pays back.

Average market capitalization is the average market capitalization of the publicly listed firm in a year.

Pledging rate: amount of cash a borrower can get as a fraction of the market value of the pledged shares. For example, if *Pledging rate* is 50% and the share price is \$100, then the borrower can get \$50 from the lender by the share pledging. According to the industry sources (e.g., Minsheng Securities, 2018; Ouyang and Liu, 2018), the pledging rates for the stocks on the two main boards, the stocks on the SME board and the stocks on the ChiNext board are around 50%, 40% and 30%, respectively. Hence, we use these rates in our calculation.

PLEDGING TO LISTED: a dummy variable that equals one if a firm-year satisfies the following two conditions: (1) the number of shares pledged by the controlling shareholder increases in the year, after adjusting for share split and share dividend; and (2) there is a positive cash infusion from the controlling shareholder to the publicly listed firm in the year, using any of the following four channels: *NETBORROWING*, *SEO_CASH*, *TRADE_CREDIT*, or the controlling shareholder's share purchase of the publicly listed firm.

PLEDGING TO UNLISTED: a dummy variable that equals one if a firm-year satisfies the following two conditions: (1) number of shares pledged by the controlling shareholder increases in the year, after adjusting for share split and share dividend; and (2) there is no cash infusion from the controlling shareholder to the publicly listed firm in the year (i.e. the values of *NETBORROWING*, *SEO_CASH*, *TRADE_CREDIT*, and the controlling shareholder's share purchase of the publicly listed firm are never positive).

POST2008: a dummy variable that is one for the years after 2008 and zero otherwise.

POST2013: a dummy variable that is one for the years after 2012 and zero otherwise.

RET_{t-1}: stock return during fiscal year $t-1$, defined as the logarithm of one plus the compounded dividend inclusive annual return.

ROE_{t-1}: ROE at the end of fiscal year $t-1$, defined as net income divided by total shareholder equity.

SECOND.OWNERSHIP_{t-1}: defined as total percentage of a publicly listed firm's shares owned by the second largest shareholder of the listed firm (including parties acting in concert) at the end of fiscal year $t-1$.

SEO_CASH_t: cash contributed by the controlling shareholder of a publicly listed firm (including parties acting in concert) to the listed firm via seasoned equity offering in year t , divided by the listed firm's average market capitalization in year t .

SIZE_{t-1}: natural logarithm of total assets of a publicly listed firm at the end of the fiscal year $t-1$.

STIMULUS: a dummy variable constructed as follows: for each publicly listed firm (both SOEs and non-SOEs), we first compute the number of privately held firms controlled by the controlling shareholder of a publicly listed firm that operates in the industries targeted by the stimulus plan (denoted as *TARGET_NUM*), i.e., firms located in the Sichuan province or firms in the following targeted industries per Liu et al. (2018): construction, water resources, environment and public facilities management, culture and entertainment, information technology, and scientific research and technical service. Then, we define *STIMULUS* as a dummy variable that equals one if *TARGET_NUM* is greater than the 75th percentile of the sample and zero otherwise.

TOBINQ_{t-1}: Tobin's Q at the end of fiscal year $t-1$, defined as the sum of the market value of tradable shares and the book value of debt and non-tradable shares divided by total assets.

TRADE_CREDIT_t: net outstanding trade credit that a publicly listed firm receives from the controlling shareholder in year t divided by the listed firm's total revenues in year t . The net outstanding trade credit is defined as the sum of accounts payable, notes payable and advance payments minus the sum of accounts receivable, notes receivable and prepayments between the listed firm and the controlling shareholder (including the latter's related parties).

VOLATILITY_{t-1}: stock return volatility measured as of the end of fiscal year $t-1$, defined as standard deviation of monthly stock return from the beginning of fiscal year $t-2$ to the end of fiscal year $t-1$. To calculate the volatility, we require at least 5 valid monthly returns.

VOTINGRIGHT_{t-1}: number of a publicly listed firm's shares controlled by the controlling shareholder (including parties acting in concert) as a percentage of the total number of shares outstanding at the end of fiscal year $t-1$.

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