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Does managerial ability affect corporate financial constraints? Evidence from China

Qiubin Huang, Mengyuan Xiong and Ming Xiao

School of Economics and Management, University of Science and Technology Beijing, Beijing, China

ABSTRACT

We study the effect of managerial ability on financial constraints of Chinese listed companies. Our results indicate a negative relationship between managerial ability and corporate financial constraints. Further analyses show that managerial ability helps alleviate financial constraints probably through lowering information asymmetry, reducing agency conflicts and enhancing corporate profitability. In addition, we find evidence that private firms suffer from more severe financial constraints than state- and foreign-owned firms, and the effect of managerial ability in alleviating financial constraints is more pronounced for private firms. Overall, our findings help understand the role and highlight the importance of managerial ability in alleviating financial constraints.

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1. Introduction

Financial resources are essential for firms' investments, capital and daily activities. However, due to information asymmetry and agency problems in the credit market, many firms in developing countries suffer from financial constraints which have been an obstacle to corporate investment and economic growth (Galindo et al., 2007; Dethier et al., 2011; Ullah, 2020; Xu et al., 2020). In the literature, factors that can alleviate financial constraints have been studied, such as ownership structure (Crisóstomo et al., 2014), political connection (Cull et al., 2015), product market competition (Bernini & Montagnoli, 2017) and corporate governance (Bayar et al., 2018). These studies implicitly assume that managers are homogeneous in firms' decisions and activities. However, managers' various characteristics (e.g., education background, psychological features and CEO ability) can exert different influences on firm performance (Chang et al., 2010; Custódio & Metzger, 2014; Yan et al., 2019; Bukalska, 2020). It is therefore of interest and importance to study the effect of managers' characteristics on corporate financial constraints.

CONTACT Mengyuan Xiong xiongmy0214@126.com

In this paper, we aim to investigate whether and how managerial ability affects corporate financial constraints. Although outside investors and creditors usually consider the quality of top management team as a manifestation of firm creditability and attach great importance to it (Chemmanur et al., 2010, Demerjian et al., 2013 and Custódio & Metzger, 2014), the impact of managerial ability on financial constraints remains unexplored in the existing literature. Some studies suggest that superior managers tend to be creditworthy for lenders because they can better communicate with outside investors and creditors by reducing information asymmetry (Custódio & Metzger, 2014) and their firms are more profitable (Chang et al., 2010) and have fewer agency problems (Bui et al., 2018). Therefore, we expect that firms with higher managerial ability face fewer financial constraints.

Based on a sample of 3305 firms listed in the Chinese stock market during 2007–2019, we find that higher managerial ability is associated with lower financial constraints. Further analyses suggest that managerial ability improves financial constraints probably through lowering information asymmetry, reducing agency conflicts and enhancing corporate profitability. In addition, we find evidence that private firms suffer from more severe financial constraints than state- and foreign-owned firms, as noticed by Guariglia et al. (2011) and Cull et al. (2015). And the effect of managerial ability in alleviating financial constraints is more pronounced for private firms. These findings highlight the importance of managerial ability in alleviating financial constraints and provide evidence for firm owners to enhance their management teams.

Our research is related to the studies on determinants of financial constraints. Several studies have shown that political connection (Claessens et al., 2008; Cull et al., 2015), corporate governance (Lin et al., 2011) and firm size and age (Ponikvar et al., 2013; Erdogan, 2019) are important factors for improving financial constraints. Our research contributes to these studies by demonstrating the impact of managerial ability on corporate financial constraints and highlighting the role of firm ownership on the relationship between financial constraints and managerial ability.

Our research also adds to the literature about managerial ability by uncovering the positive role of managerial ability in alleviating financial constraints. Recent studies have started to examined how managerial ability matters for various aspects of firms, such as tax avoidance (Koester et al., 2017), credit risk assessment (Bonsall et al., 2017), investment opportunity (Lee et al., 2018), and risk taking (Curi & Lozano-Vivas, 2020). These studies overall show that managerial ability is favorable to firm development, while the relationship between managerial ability and financial constraints remains unexplored. Given that financial constraints are still faced by many firms in emerging countries, we attempt to be the first to study whether managerial ability is favorable to relieve financial constraints based on a large sample of Chinese firms.

The rest of our paper is organized as follows. Section 2 provides an overview on related literature and then develops our hypotheses. Section 3 introduces our methodology and describes the data. The empirical analyses and robustness checks are presented in Section 4. Section 5 concludes.

2. Literature review and hypotheses

2.1. Related literature

Many researchers have studied various aspects of financial constraints, of which the determinants are closely related to this paper. Therefore, this section mainly focuses on the literature about determinants of corporate financial constraints. We figure out that these determinants can be roughly divided into three kinds: external factors, firm-level variables and manager-specific characteristics.

The external factors mainly refer to macroeconomic conditions and the banking. Korajczyk and Levy (2003) find that macroeconomic conditions affect issue choices of financially unconstrained firms but not of constrained firms. Similarly, Chang et al. (2019) show that financially constrained firms are more likely to issue more equity when their stocks are overvalued, while unconstrained firms prefer debt issuance in response to debt market spreads. As for the banking, Chong et al. (2013) and Leon (2015) find that bank competition improves financing conditions of firms in developing countries, whereas Ryan et al. (2014) document that banks with more market power pose more financing constraints on small and medium-sized enterprises (SMEs) in European countries. Lu et al. (2021) reveal that both the degree of digital financial inclusion and the proportion of local bank branches make Chinese SMEs access to financial resources easier.

Compared to the external factors, more researchers pay attention to firm-level influencing factors of financial constraints, such as firm size, firm age, ownership structure, and political connection. For instance, Claessens et al. (2008) and Cull et al. (2015) find that firms with a good relationship with banks and the government could easily obtain external credits to fund their investment projects. Lin et al. (2011) show that firms with wider divergence of insider control-ownership are less financially constrained. Poncet et al. (2010) find that state- and foreign-owned firms are less financially constrained than private firms in China. Becchetti et al. (2010), Ponikvar et al. (2013) and Erdogan (2019) find that older and larger firms face fewer financial constraints. Overall, these studies identify some firm-level factors that help alleviate financial constraints.

In addition to the external factors and firm-level variables, manager-specific characteristics have recently become a popular explanation for corporate investment and financial policies. For instance, Custódio and Metzger (2014) find that financial expert CEOs are more financially sophisticated so that they can better gain external funds even during the period of tight credit conditions. Mohamed and Shehata (2017) find that optimistic CEOs prefer to finance R&D investment by internal funds, thereby increasing the investment-cash flow sensitivity. These studies reveal the effects of managerial characteristics on financial constraints. However, the impact of managerial ability, which comprehensively reflects the quality of a firm's top management team, on financial constraints remains unclear. Our research aims to fill this gap.

2.2. Hypothesis development

Managerial ability is regarded as corporate invisible human capital which reflects managers' contributions to economic outcomes (Demerjian et al., 2012). Some recent

studies show that high-ability managers could realize more financial returns (Chang et al., 2010), improve earnings quality (Demerjian et al., 2013) and seize better investment opportunity (Lee et al., 2018). Motivated by the literature, we conjecture that managerial ability also plays an important role in corporate financing, and may affect corporate financial constraints through the following ways.

Firstly, superior managers have acquired the necessary skills, such as effective communication, professional background and financial expertise, to obtain external financing even during the period of tight credit conditions (Custódio & Metzger, 2014). By reducing information asymmetry concerned by their creditors, superior managers can better communicate and establish connections with banks, governments, institutional investors and other funds providers (Kaplan et al., 2012; Graham et al., 2013). Thus, we expect that firms with superior managers are less financially constrained due to less information asymmetry.

Secondly, one factor leading to corporate financial constraints is the firm's poor financial performance, which may cause its external investors and creditors worry about its future repayment capacity (Chemmanur et al., 2010). Such firms usually have difficulties to obtain bank loans (Bose et al., 2019; Erdogan, 2019). Because superior managers can seize more favourable investment opportunities (Lee et al., 2018) and gain more economic profits (Chang et al., 2010), firms with higher managerial ability can better convince their creditors and investors of their credibility and funding utilization efficiency (Chemmanur & Paeglis, 2005). In other words, one way through which superior managers improve their firms' financial constraints is enhancing their firms' profitability.

Thirdly, the agency theory suggests that agents (managers) who control the firms' resources tend to work for their own benefits at the expense of their principals (stakeholders) (Jensen & Meckling, 1976). Due to the potential agency problem, rational outside credit providers would worry about the misuse of funds, especially in markets where minority shareholders are not well protected (Dyck & Zingales, 2004; Riyanto & Toolsema, 2008). Therefore, firms have to pay extra cost on financing to cover potential agency costs, which may in turn exacerbate firms' financial conditions (Marcelin & Mathur, 2014). However, Fama (1980) points out that competition in the professional management market provides incentives for managers to build up reputation capital over their careers. Deceiving the financial resources as rents may worsen their reputation and deteriorate their future values in the labour market (Chemmanur et al., 2010). Therefore, they would probably less engage in rent-seeking activities to maintain their reputation. In other words, firms with superior managers may be less involved in agency conflicts and more likely to obtain financing without extra cost for the conflicts, thereby suffering from fewer financial constraints.

Based on the above analyses, we propose the following hypotheses:

H1: Managerial ability is negatively associated with corporate financial constraints.

H1a: Managerial ability alleviates financial constraints through lowering the information asymmetry with outside investors and creditors.

H1b: Managerial ability alleviates financial constraints through enhancing corporate profitability.

H1c: Managerial ability alleviates financial constraints through reducing agency conflicts.

In addition to the above analyses and hypotheses, we wonder whether managerial ability has heterogeneous effects on financial constraints for firms of different types of ownership, as firm ownership may affect financial constraints differently. For example, Cull and Xu (2003) show that the inborn connection with Chinese government helps SOEs obtain the preferential treatment in economic resource allocation, including credits and funds support. For foreign-owned firms, they are less financially constrained because they are able to absorb foreign financial resources (Héricourt & Poncet, 2009). As a result, managerial ability may play little or no role in mitigating corporate financial constraints for SOEs and foreign-owned firms. In contrast, private firms (neither state- nor foreign-owned firms) without connections to the government and other affiliations have more chance to suffer from severe financial constraints (Cull et al., 2015). This requires the managers of private firms to put more efforts into addressing financial constraints for the sake of survival and further development. Thus, we propose the following hypothesis:

H2: The relationship between managerial ability and corporate financial constraints is more pronounced for private firms than SOEs and foreign-owned firms.

3. Research design

In this section, we illustrate the methodology and sample to explore the impact of managerial ability on corporate financial constraints. We first elaborate the ways in Section 3.1 to capture financial constraints and managerial ability, which are our key variables but not directly observable. We then introduce the model to study the impact of managerial ability on financial constraints in Section 3.2. In Section 3.3, we describe the sample and data.

3.1. Measures of key variables

3.1.1. Measuring managerial ability

Managerial ability, which is not directly observable, has been the interest for many researchers. Recently, Demerjian et al. (2012) propose to quantify managerial ability on the basis of managers' relative efficiency in generating revenues. They introduce a two-step approach, the Data Envelopment Analysis combined with Tobit regression (for short, DEA-Tobit), to obtain scores for managerial ability of individual companies. They show that the scores are strongly correlated to manager fixed effects and some corporate performance indicators, and thus outperforms previous proxies for managerial ability. Some other studies also support the effectiveness of the DEA-Tobit approach (e.g., Demerjian et al., 2013; Bui et al., 2018; Lee et al., 2018). Therefore, we adopt the DEA-Tobit approach to capture managerial ability of Chinese firms and illustrate the details of the approach in Appendix A.

3.1.2. Measuring financial constraints

When facing severe financial constraints, a firm will probably support its existing investment projects by selling assets to increase internal funds or simply cut

investment to avoid the depletion of free cash flow (Myers & Majluf, 1984). In other words, financially constrained firms mainly rely on their internal cash flows to support their investment expenditure and therefore tend to exhibit high investment-cash flow sensitivity. Thus, a natural way to capture a firm's financing constraints is to estimate its investment-cash flow sensitivity (hereafter ICFS), where the methodology has been formally developed by Fazzari et al. (1988).

Many studies have provided consistent evidence for this methodology (e.g., Kashyap et al., 1994; Campello et al., 2010) and adopt ICFS to capture financial constraints (e.g., Laeven, 2003; Custódio & Metzger, 2014; Cull et al., 2015; Bukalska, 2020). In particular, the ICFS methodology has also been widely used in studies based on Chinese listed firms (e.g., Meng et al., 2020; Huang et al., 2020). Cull et al. (2015) suggest that ICFS is a good candidate for capturing Chinese firms' financial constraints because the Chinese capital market is relatively immature and bank credit is still an important channel for corporate financing. Thus, ICFS is free of the weakness when applied for firms in developed economies.[1]

Therefore, we use the ICFS model developed by Fazzari et al. (1988) to capture Chinese firm's financial constraints:

$$\frac{Inv_{i,t}}{K_{i,t-1}} = \alpha_0 + \alpha_1 \frac{CFlow_{i,t}}{K_{i,t-1}} + \alpha_2 \frac{Sale_{i,t}}{K_{i,t-1}} + \alpha' Controls_{i,t} + ProvinceFE + YearFE + IndustryFE + \varepsilon_{i,t}, \quad (1)$$

where *Inv* indicates the capital expenditure on investment, *K* indicates the net value of fixed assets, *CFlow* is the net operating cash flow, *Sale* is the firm's total sales. The coefficient of interest is α_1, which captures the effect of internal funds on a firm's investment expenditure and would be significantly positive if the firm faces financial constraints.

Controls refer to a set of control variables that probably matter for corporate investment. Similar to Cull et al. (2015), we include firm-level basic characteristics (firm age and size), ownership (state-owned ownership and foreign ownership), external funds growth (loan growth), growth opportunities (sales growth and Tobin's Q), and industry and year fixed effects. We also include province fixed effects in Eq. (1) to account for the geographic imbalance in economic development, as suggested by Guariglia et al. (2011). Variable definitions are shown in Appendix B.

3.2. Empirical model

To investigate the effect of managerial ability on financial constraints, we include *MA* and its interaction term $\frac{CFlow}{K} \times MA$ to Eq. (1) following the way of Cull et al. (2015) and Mohamed and Shehata (2017). The model is shown below:

$$\frac{Inv_{i,t}}{K_{i,t-1}} = \beta_0 + \beta_1 \frac{CFlow_{i,t}}{K_{i,t-1}} + \beta_2 \frac{Sale_{i,t}}{K_{i,t-1}} + \beta_3 MA_{i,t} + \beta_4 \frac{CFlow_{i,t}}{K_{i,t-1}} \times MA_{i,t} + \beta' Controls_{i,t} + ProvinceFE + YearFE + IndustryFE + \varepsilon_{i,t}, \quad (2)$$

Table 1. Descriptive statistics.

Variables	Obs.	Mean	Min	Max	Std.Dev
Inv/K	25,543	0.521	0.006	6.939	0.948
CFlow/K	25,543	0.436	−15.914	20.399	3.263
Sale/K	25,543	10.431	0.304	188.732	25.192
MA	25,543	−0.004	−0.347	0.329	0.133
Size	25,543	21.980	14.937	28.520	1.314
Age	25,543	1.950	0.000	3.219	0.920
SOE	25,543	0.106	0.000	1.000	0.308
Foreign	25,543	0.043	0.000	1.000	0.202
Loan growth	25,543	0.619	−7.363	27.977	3.559
Tobin's Q	25,543	2.043	0.178	9.855	1.769
Sales growth	25,543	0.198	−0.510	2.783	0.425

Source: Authors' calculation.

where *MA* indicates managerial ability scores obtained through the DEA-Tobit approach developed by Demerjian et al. (2012). In Eq. (2), the coefficient of interest is β_4, which captures the impact of managerial ability on financial constraints. We expect β_4 to be negative if managerial ability alleviates corporate financial constraints.

3.3. Sample and data

The initial sample of our study comprises 3631 Chinese listed firms from 2007 to 2019. The sample begins from 2007 as the new Chinese Accounting Standards took effect in 2007. We exclude 57 financial institutions as their capital structures and business models are less comparable with non-financial firms. We also exclude 268 firms with missing financial data or under special treatment. As a result, our final dataset involves an unbalanced panel of 3305 firms with 25543 firm-year observations. Data are obtained from the Wind database.

Our variables are winsorized at their 1st and 99th percentiles to reduce the potential disturbance of outliers and their descriptive statistics are presented in Table 1. The mean of *Inv/K* and *CFlow/K* is 0.521 and 0.436, respectively. This suggests that the firms' internal cash flows, on average, are not enough to support their capital expenditure on investment. *Sale/K* ranges from 0.304 to 188.732, indicating a considerable variation in the ratios of sales to fixed assets. The mean of *MA* for our sample firms is −0.004, a bit lower than that (−0.0008) for US listed firms (Lee et al., 2018). The means of *SOE* and *Foreign* suggest that about 10.6% and 4.3% of our sample belong to SOEs and foreign-owned firms, respectively. The standard deviations of *loan growth* and *Tobin's Q* are relatively high, indicating the apparent differences in loan growth and growth opportunities among our sample firms.

4. Results

This section reports and discusses the empirical results to verify our hypotheses proposed in Section 2. We perform a set of tests in Section 4.1 to confirm that the ICFS model is appropriate for capturing Chinese firms' financial constraints. In Section 4.2, we not only investigate the impact of managerial ability on financial constraints but also explore their potential mechanisms. Furthermore, we examine whether the relationship between managerial ability and financial constraints varies with firm

Table 2. The sensitivity tests of the ICFS model.

	Inv/K				
	(1) basic characteristics	(2) ownership	(3) external funds growth	(4) growth opportunities	(5) fixed effects
CFlow/K	0.026***	0.026***	0.042***	0.041***	0.026***
	(5.66)	(5.67)	(8.41)	(8.09)	(5.58)
Sale/K	0.014***	0.014***	0.011***	0.010***	0.017***
	(21.40)	(21.42)	(15.31)	(14.91)	(14.55)
Size	−0.018***	−0.017***	−0.016***	0.001	−0.030
	(-3.49)	(-3.33)	(-3.31)	(0.18)	(-1.52)
Age	−0.185***	−0.182***	−0.178***	−0.175***	−0.354***
	(-24.24)	(-23.79)	(-23.74)	(-23.16)	(-14.73)
SOE		−0.050***	−0.043***	−0.039***	−0.033
		(-3.28)	(-2.88)	(-2.63)	(-1.07)
Foreign		0.035	0.035	0.033	0.038
		(1.16)	(1.16)	(1.11)	(0.55)
Loan growth			0.055***	0.054***	0.038***
			(10.87)	(10.51)	(7.65)
Tobin's Q				0.022***	−0.005
				(4.83)	(-0.61)
Sales growth				0.127***	0.052**
				(5.99)	(2.43)
Constant	1.010***	0.996***	0.980***	0.511***	1.445***
	(8.91)	(8.79)	(8.83)	(4.01)	(3.41)
Province/ Industry FE	Included	Included	Included	Included	
Year FE	Included	Included	Included	Included	Included
Firm FE					Included
Obs.	25543	25543	25543	25543	25543
adj. R^2	0.221	0.222	0.254	0.258	0.240

Note: This table presents estimation results of the ICFS model under different specifications. We present the *t*-statistics in parentheses and cluster standard errors by firms. ***, ** and * denote the significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

ownership. To address potential endogeneity concerns, we perform several robustness checks in Section 4.3.

4.1. Assessing the sensitivity of the ICFS model

We estimate Eq. (1) with different model specifications to examine the sensitivity of the ICFS model, as done in Cull et al. (2015) and summarize the results in Table 2. Column (1) of Table 2 shows the results when we only control for two firm-level basic characteristics (*AGE* and *SIZE*) in the model. We notice that the coefficient of *CFlow/K* is 0.026, being statistically significant at the 1% level. This positive coefficient suggests that the firms overall are financially constrained.

In Column (2), the model includes two more ownership variables (*SOE* and *Foreign*), where the coefficient of *SOE* is significantly negative while that of *Foreign* is insignificant. These results imply that SOEs have a relatively conservative investment style (i.e., lower investment to fixed assets ratio) than foreign-owned firms and private firms. In Column (3), the model also includes a loan growth variable to account for the impact of external financing capacity on corporate investment. As expected, we find a significantly positive coefficient of *Loan growth*, suggesting that external financial support promotes investment spending. In addition, as ICFS may also be

driven by new investment opportunities even when firms are not financially constrained (Fazzari et al., 1988), we use *Tobin's Q* and *Sales growth* as proxies for growth opportunities and add them to our model. The results shown in Column (4) suggest that more growth opportunities result in higher investment spending. Column (5) shows the results when we control for year and firm fixed effects instead of province, industry and year fixed effects. The results are comparably the same as those shown in Column (4). More importantly, the significantly positive impact of cash flow on investment remains unchanged irrespective of model specifications (see Columns 1-5 of Table 2).

In Appendix C, we perform three more tests to examine the validity of the ICFS model applied for Chinese firms. The results from these tests suggest that our finding based on the ICFS model is not driven by firms with persistent negative cash flows and holds when we change the definition of investment. Besides, the finding is also supported when we use alternative measure of financial constraints, i.e., the SA index developed by Hadlock and Pierce (2010). To sum up, the above analyses suggest that Chinese firms are overall confronted with financial constraints and ICFS appears to be a suitable measure to capture Chinese firms' financial constraints.

4.2. Impact of managerial ability on corporate financial constraints

4.2.1. Baseline results

To examine the impact of managerial ability on corporate financial constraints, we estimate Eq. (2) by stepwise inclusion of control variables and firm fixed effects. Table 3 summarizes the results. We find that both coefficients of *CFlow/K* and *MA* are significantly positive while the coefficient of $MA \times CFlow/K$ is significantly negative irrespective of model specifications. For instance, in Column (1) of Table 3, the coefficients of *CFlow/K*, *MA* and $MA \times CFlow/K$ are 0.031, 0.387 and −0.061, respectively. These results suggest that both cash flow and managerial ability matter for corporate investment, and firms with higher managerial ability are confronted with fewer financial constraints. In other words, managerial ability can help alleviate financial constraints. The finding holds for different model specifications (Columns (2)-(5)) and thereby supports our first hypothesis.

4.2.2. Mechanism analyses

In Section 2.1, we discuss three possible mechanisms through which managerial ability affects financial constraints. To verify these mechanisms, we examine the mediation effects of information asymmetry, corporate profitability and agency conflicts using the analytical framework of Baron and Kenny (1986) and May et al. (2021). Specifically, we examine if managerial ability significantly affects the mediating variable (e.g., information asymmetry). If yes, we proceed to examine if the impact of managerial ability on corporate financial constraints becomes weaker when we include the mediating variable interacted with *CFlow/K* to Eq. (2). Table 4 documents the results.

Firstly, we adopt the analyst forecasts' dispersion[2] (denoted as *Dispersion*) as a proxy for information asymmetry following Chemmanur et al. (2010) and Custódio

Table 3. Impact of managerial ability on corporate financial constraints.

	Inv/K				
	(1)	(2)	(3)	(4)	(5)
CFlow/K	0.031***	0.031***	0.048***	0.047***	0.031***
	(6.01)	(6.01)	(8.58)	(8.35)	(5.76)
MA	0.387***	0.390***	0.353***	0.280***	0.407***
	(7.83)	(7.87)	(7.30)	(5.72)	(5.48)
MA × *CFlow/K*	−0.061**	−0.060**	−0.071**	−0.071**	−0.050**
	(-2.07)	(-2.06)	(-2.45)	(-2.44)	(-1.99)
Sale/K	0.013***	0.013***	0.010***	0.010***	0.017***
	(20.20)	(20.21)	(14.45)	(14.26)	(14.24)
Size	−0.016***	−0.015***	−0.015***	0.000	−0.027
	(-3.23)	(-3.06)	(-3.11)	(0.01)	(-1.38)
Age	−0.186***	−0.184***	−0.180***	−0.176***	−0.348***
	(-24.42)	(-23.97)	(-23.87)	(-23.21)	(-14.58)
SOE		−0.052***	−0.045***	−0.041***	−0.036
		(-3.44)	(-3.00)	(-2.74)	(-1.14)
Foreign		0.034	0.033	0.032	0.047
		(1.11)	(1.10)	(1.06)	(0.68)
Loan growth			0.055***	0.054***	0.039***
			(10.88)	(10.56)	(7.65)
Tobin's Q				0.020***	−0.007
				(4.38)	(-0.97)
Sales growth				0.115***	0.035
				(5.38)	(1.60)
Constant	0.983***	0.969***	0.959***	0.541***	1.396***
	(8.75)	(8.62)	(8.72)	(4.27)	(3.29)
Province/Industry FE	Included	Included	Included	Included	
Year FE	Included	Included	Included	Included	Included
Firm FE					Included
Obs.	25543	25543	25543	25543	25543
adj. R^2	0.225	0.225	0.258	0.261	0.243

Note: This table presents the estimation results of managerial ability's role in financial constraints by stepwise inclusion of controlled variables denoting ownership, external funds, growth opportunities, and firm fixed effects. The *t*-statistics are shown in parentheses, and standard errors are clustered by firms. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

and Metzger (2014). As investors and creditors generally and regularly depend on analysts to analyze and evaluate corporate financial information, higher dispersion of the analyst forecasts usually implies severe information asymmetry and ineffective communication. We find that the coefficient of MA is −1.097, which is significant at the 1% level (see Column (1) of Table 4). This suggests that analyst forecasts' dispersion (information asymmetry) is lower for firms with higher managerial ability. Column (2) of Table 4 shows that the coefficient of *Dispersion* × *CFlow/K* is significantly positive while that of *MA* × *CFlow/K* becomes insignificant. These results suggest that the impact of managerial ability on corporate financial constraints is mediated by information asymmetry. This finding supports our hypothesis (H1a) that managerial ability alleviates financial constraints through lowering the information asymmetry with outside investors and creditors.

Secondly, we use return on assets (*ROA*) as a proxy for corporate profitability to evaluate its mediation effect in the link between managerial ability and financial constraints. As expected, managerial ability has a positive effect on corporate profitability (see Column (3) of Table 4). More importantly, Column (4) of Table 4 shows that the coefficient of *ROA* × *CFlow/K* is significantly negative while that of *MA* × *CFlow/K* becomes insignificant. This suggests that the effect of managerial ability on

Table 4. The mechanisms between managerial ability and financial constraints.

	(1) *Dispersion*	(2) *Inv/K*	(3) *ROA*	(4) *Inv/K*	(5) *AgencyC*	(6) *Inv/K*
MA	−1.097***	2.156	4.424***	−2.807	−0.446***	0.346***
	(-10.28)	(0.61)	(26.26)	(-1.28)	(-19.24)	(6.94)
CFlow/K	−0.001**	−0.176	0.000	0.589***	0.000***	0.040***
	(-2.46)	(-0.70)	(1.17)	(5.29)	(22.67)	(6.49)
MA × CFlow/K		0.211		−0.055		−0.068**
		(0.27)		(-0.03)		(-2.33)
Dispersion		0.062				
		(0.75)				
Dispersion × CFlow/K		0.208*				
		(1.79)				
ROA				1.469**		
				(2.20)		
ROA × CFlow/K				−0.026*		
				(-1.95)		
AgencyC						0.144***
						(8.41)
AgencyC × CFlow/K						0.017**
						(2.13)
Sale/K	0.000	−0.046	0.001**	−0.078**	−0.000**	0.010***
	(1.54)	(-1.29)	(2.03)	(-2.37)	(-1.97)	(14.45)
Size	−0.060***	0.289	−0.009	−0.613	−0.076***	0.009*
	(-4.55)	(1.20)	(-0.35)	(-0.90)	(-19.80)	(1.73)
Age	0.043**	−0.454*	−0.161***	1.070	−0.020***	−0.173***
	(2.53)	(-1.81)	(-7.70)	(1.22)	(-5.63)	(-22.87)
SOE	−0.053	0.105	0.034	−0.188	−0.030***	−0.036**
	(-1.28)	(0.37)	(0.82)	(-0.52)	(-4.72)	(-2.45)
Foreign	−0.055	0.537	0.053	−1.265	−0.005	0.037
	(-0.84)	(1.07)	(0.66)	(-0.78)	(-0.35)	(1.25)
Loan growth	−0.000	0.797***	−0.001*	0.795***	−0.000	0.053***
	(-0.89)	(23.40)	(-1.74)	(17.99)	(-0.36)	(10.53)
Tobin's Q	0.004	−0.046	0.074***	0.193	0.005	0.015***
	(0.38)	(-0.25)	(2.62)	(1.25)	(1.20)	(3.40)
Sales growth	−0.000***	−0.037***	0.001***	−0.037***	−0.000***	0.121***
	(-4.81)	(-7.42)	(3.82)	(-3.97)	(-6.58)	(5.68)
Constant	1.883***	−4.460	0.820	16.987	1.685***	0.353***
	(5.81)	(-0.79)	(1.31)	(1.29)	(17.51)	(2.74)
Province/ Industry/ Year FE	Included	Included	Included	Included	Included	Included
Obs.	15225	15225	25543	25543	25541	25541
adj. R^2	0.036	0.999	0.266	0.986	0.211	0.266

Note: Columns (1) - (2) report the results of the mediation effect of information asymmetry proxied by analyst forecasts' dispersion. Columns (3) – (4) report the results of the mediation effect of financial performance indicated by return on assets. Columns (5) - (6) report the results of the mediation effect of agency problems captured by the ratio of entertainment and travel cost expenses to sales. The *t*-statistics are reported in parentheses, and standard errors are clustered by firms. ***, ** and * denote the statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

financial constraints is mediated by corporate profitability. Therefore, our hypothesis (H1b) that managerial ability alleviates financial constraints through enhancing corporate profitability is supported.

Thirdly, we investigate whether agency cost also mediates the effect of managerial ability on corporate financial constraints. Agency cost is proxied by the ratio of management entertainment and travel expenditures to sales (denoted as *AgencyC*) following Cull et al. (2015). The significantly negative coefficient of *MA* shown in Column (5) of Table 4 indicates that managerial ability can help reduce agency cost. As shown in Column (6) of Table 4, the coefficient of *AgencyC* × *CFlow/K* is significantly positive, indicating that agency conflicts lead to severe financial

constraints. In addition, the coefficient of $MA \times CFlow/K$ becomes smaller in magnitude and less significant than that shown in Column (4) of Table 3. These results together suggest that agency cost, to some extent, mediates the relationship between managerial ability and financial constraints. This finding supports our hypothesis (H1c) that managerial ability alleviates financial constraints through reducing agency conflicts.

Overall, the above analyses suggest that managerial ability helps alleviate financial constraints probably through lowering information asymmetry, reducing agency conflicts and enhancing corporate profitability.

4.2.3. The effect of firm ownership

Previous studies have highlighted the important roles of state and foreign ownerships in alleviating financial constraints (e.g., Cull & Xu, 2003; Héricourt & Poncet, 2009; Ullah., 2019). As our sample is comprised of firms with different types of ownership, it is interesting and necessary to investigate whether firm ownership also matters for the impact of managerial ability on financial constraints. Therefore, we separate our sample firms into three groups: foreign-owned firms, SOEs and private firms (neither state-owned nor foreign-owned firms), and re-estimate Eqs. (1) and (2) for these three subsamples.

Columns (1), (3) and (5) of Table 5 display the results to examine whether the ICFS is different for firms with different ownership types. As shown in Table 5, the coefficient of *CFlow/K* is 0.02 with $t = 0.91$ (see Column (1)), 0.024 with $t = 1.57$ (see Column (2)) and 0.045 with $t = 8.44$ (see Column (3)) for foreign-owned firms, SOEs and private firms, respectively. These results suggest that private firms suffer from the most severe financial constraints while SOEs and foreign-owned firms face much fewer financial constraints, probably because SOEs usually enjoy some financial supports from the government (Cull et al., 2015) whereas foreign-owned firms may use foreign funds bypassing domestic legal barriers (Chen & Luo, 2014).

Columns (2), (4) and (6) of Table 5 report the results to explore the effect of managerial ability for firms with different types of ownership. The results suggest that the negative effect of managerial ability on ICFS is more pronounced for private firms than SOEs and foreign-owned firms[3]. As foreign-owned firms are not financially constrained, it makes sense to find that managerial ability does not play a role in relieving financial constraints. For SOEs and private firms, the coefficient of $MA \times CFlow/K$ is significant at the 10% and 5% levels, respectively. This suggests that managerial ability plays a greater role in mitigating financing constraints confronted by private firms. Our finding is in accordance with Bin et al. (2020) who argue that state ownership tends to attenuate managers' motivations in improving financial conditions while private firms require their managers to put more efforts into dealing with financial constraints. It is because private firms have no preferential access to financing resources compared with SOEs.

Overall, the above analyses support our hypothesis (H2) that the impact of managerial ability on corporate financial constraints is more pronounced in private firms than in SOEs and foreign-owned firms.

Table 5. The effect of firm ownership.

	Foreign-owned firms		SOEs		Private firms	
	(1)	(2)	(3)	(4)	(5)	(6)
CFlow/K	0.020	0.020	0.024	0.039**	0.045***	0.051***
	(0.91)	(0.87)	(1.57)	(2.43)	(8.44)	(8.37)
MA		0.302		−0.079		0.328***
		(1.24)		(-0.77)		(6.03)
MA × CFlow/K		0.003		−0.152*		−0.065**
		(0.03)		(-1.78)		(-2.08)
Sale/K	0.016***	0.016***	0.008***	0.009***	0.010***	0.010***
	(4.20)	(4.05)	(4.00)	(4.14)	(13.77)	(13.08)
Size	0.011	0.008	0.000	−0.004	0.003	0.002
	(0.31)	(0.24)	(0.03)	(-0.28)	(0.47)	(0.37)
Age	−0.156***	−0.156***	−0.082***	−0.076***	−0.185***	−0.187***
	(-4.58)	(-4.56)	(-3.36)	(-3.10)	(-22.71)	(-22.85)
Loan growth	0.045**	0.044**	0.043**	0.042**	0.055***	0.056***
	(2.02)	(1.99)	(2.38)	(2.39)	(10.27)	(10.31)
Tobin's Q	0.024	0.021	0.035*	0.035**	0.022***	0.020***
	(1.47)	(1.27)	(1.95)	(2.02)	(4.57)	(4.10)
Sales growth	0.142	0.130	0.166**	0.175**	0.117***	0.102***
	(1.37)	(1.22)	(2.31)	(2.47)	(5.28)	(4.56)
Constant	0.014	0.065	0.103	0.160	0.523***	0.548***
	(0.02)	(0.09)	(0.31)	(0.50)	(3.65)	(3.84)
Province/ Industry/ Year FE	Included	Included	Included	Included	Included	Included
Obs.	1093	1093	2719	2719	21731	21731
adj. R^2	0.348	0.348	0.202	0.209	0.265	0.267

Note: This table presents the results for the effect of managerial ability on ICFS for firms with different ownerships. The *t*-statistics are reported in parentheses, and standard errors are clustered by firms. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

4.3. Robustness checks

There might be several reasons leading to endogeneity in our analyses for the impact of managerial ability on financial constraints.

The first one is the potential measurement errors of our key variables. We use Tobin's Q to capture the growth opportunities in the baseline ICFS model. However, the immature Chinese capital market and financial system may give rise to the measurement errors of Tobin's Q, and generate spurious ICFS (Cummins et al., 2006). Following Laeven (2003) and Meng et al. (2020), we resort to the Euler equation[4] to validate the relationship between managerial ability and financial constraints. We estimate it with a general method of moments (GMM) to address possible endogeneity. As shown in Column (1) of Table 6, the effect of managerial ability on financial constraints remains significant. To deal with the potential measurement error of managerial ability scores, we take the decile ranks of managerial ability scores by year and industry as an alternative proxy for managerial ability (denoted as *RankMA*) following Lee et al. (2018) and re-estimate Eq. (2). The results shown in Column (2) of Table 6 suggest that our finding in Section 4.2.1 is robust to the new proxy for managerial ability.

Another endogeneity concern is the reverse causality that superior managers may be more likely to identify firms with good financial conditions before working for the firms. To tackle this concern, we adopt the average managerial ability scores across the firms within the same industry (*AVG_MA*) as an instrumental variable of *MA*

Table 6. Robustness checks.

	(1) Euler equation	(2) RankMA	(3) 2SLS-stage1	(4) 2SLS-stage2
CFlow/K	0.063	0.079***	0.001***	0.051***
	(1.54)	(6.17)	(2.70)	(8.37)
MA	−0.600	0.017***		−1.074**
	(-0.24)	(8.58)		(-2.16)
MA × *CFlow/K*	−0.633**	−0.005***		−0.107**
	(-2.56)	(-3.06)		(-2.38)
AVG_MA			0.998***	
			(20.89)	
Lag1_Inv/K	0.764**			
	(2.13)			
$(Lag1\_Inv/K)^2$	−0.066			
	(-1.32)			
Tobin's Q		0.020***	0.008***	0.034***
		(4.47)	(12.02)	(6.03)
Other Controls	Included	Included	Included	Included
Province/ Industry/ Year FE	Included	Included	Included	Included
Obs.	19131	25275	25543	25543
adj. R^2		0.262	0.131	0.261
AR (1) P-value	0.001			
AR (2) P-value	0.404			
Hansen P-value	0.707			

Note: This table presents several robustness checks to address endogeneity. Column (1) shows the results of the Euler equation estimated by the GMM approach. Columns (2) presents the regression results when we use *RankMA* as an alternative proxy to capture managerial ability. Columns (3)-(4) report results of 2SLS analysis, using *AVG_MA* as an instrumental variable for managerial ability. *t*-statistics are reported in parentheses, and standard errors are clustered by firms. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

and conduct a two-stage least-squares analysis (2SLS). We find a significantly positive coefficient of *AVG_MA* on individual *MA* in the 1st stage (see Column (3) of Table 6) and a significantly negative coefficient of the interaction term instrumented *MA* × *CFlow/K* (see Column (4)). The results again suggest that managerial ability is negatively associated with financial constraints.

Overall, the finding that managerial ability helps alleviate financial constraints remains robust after we account for endogeneity.

5. Conclusion

Financial constraints are still faced by many firms in developing countries, which have been an obstacle to corporate investment and economic growth (Galindo et al., 2007; Dethier et al., 2011; Ullah, 2020). Against this background, this paper attempts to study whether and how managers can help improve financial constraints. Based on a sample of 3305 Chinese listed firms during 2007-2019, we uncover that private firms suffer more severe financial constraints than SOEs and foreign-owned firms, as noticed by Guariglia et al. (2011) and Cull et al. (2015). Besides, the effect of managerial ability in alleviating financial constraints is more pronounced for private firms. Furthermore, we find that corporate profitability, information asymmetry and agency conflicts are three channels through which managerial ability improves financial constraints. These findings are beneficial to understand how managerial ability helps improve financial constraints.

Our findings have important policy implications for firm owners and governmental authority. For firm owners, it is worthy to hire high-ability managers with higher compensation or better incentives as they are more able to relieve corporate financial constraints. For governmental authority, more plans on inclusive loans to medium, small and micro enterprises are still needed as these enterprises usually suffer more severe financial constraints than SOEs. For future studies, one may proceed to examine whether the governmental inclusive loans plans and related capital market reforms are effective in mitigating corporate financial constraints. A limitation of our research is that we perform the tests only based on Chinese firms so that we are not able to account for some institutional differences at the country level. Future research may proceed to explore the relationship between managerial ability and financial constraints for firms from different countries and take institutional differences into account.

Notes

1. We notice that a few studies fail to identify the appearance of ICFS for firms listed in the US (Gatchev et al., 2010), even during the global financial crisis when firms were likely to suffer from credit crunch and financing difficulties (Chen & Chen, 2012). These findings cast doubt on the usefulness of the ICFS methodology for firms in developed countries due to their well-developed capital markets, which lower the cash flow sensitivities of corporate investments (Brown & Petersen, 2009).
2. Analyst forecasts' dispersion is defined as standard deviation across analysts for a firm's yearly earnings forecasts. See Appendix D for detailed calculation.
3. To address the concern about the bias caused by those politically connected private firms, we perform an additional test for other private firms in Appendix E.
4. The construction of Euler equation is described in Appendix D.

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ORCID

Qiubin Huang http://orcid.org/0000-0001-6474-1842
Mengyuan Xiong http://orcid.org/0000-0003-4812-7417

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Appendix A. The DEA-Tobit model for managerial ability

Following Demerjian et al. (2012), we first employ the Data Envelopment Analysis (DEA) approach to generate a measure of total firm efficiency (Θ) from Eq. (A1):

$$\max\theta = \frac{Sales}{\nu 1 COGS + \nu 2 SG\&A + \nu 3 R\&D + \nu 4 PPE + \nu 5 GW + \nu 6 Intan}, \tag{A1}$$

where Sales refers to total sales; COGS denotes the cost of goods sold; SG&A is selling, general and administrative expenses; R&D represents research and development cost; PPE reflects the under depreciated portion of property, plant, and equipment; GW reflects acquired goodwill; Intan is other acquired and capitalized intangibles. In addition, the flow variables Sales, COGS, SG&A, and R&D are measured over year t, while the stock variables PPE, GW, and Intan are calculated at the beginning of year t. Based on an output variable (Sales) and the other six input variables, DEA evaluates all points with respect to their deviation from the frontier, and the values of Θ are between 0 and 1. Demerjian et al. (2012) also take the net operating leases as an input to increase the input comparability among firms that either lease or buy their revenue-generating equipment. Notice that Chinese listed companies usually buy rather than lease fixed assets, we do not include the operating leases in our model. Ultimately, we estimate Eq. (A1) by industry to ensure the comparability of the peer firms regarding their business models and cost structures.

Notice that the measure of total efficiency (Θ) is driven by both firm- and manager-specific characteristics. To parse out total firm efficiency and managerial ability, Demerjian et al. (2012) suggest regressing Θ on six firm characteristics that affect firm efficiency: firm size (TA), market share (Mshare), cash availability (Cash), life cycle (AGE), operational complexity (Concentration), and foreign operations (ForeignOperation) as shown in Eq. (A-2):

$$\begin{aligned}\theta_{it} = \beta 0 + \beta 1 TA_{it} + \beta 2 Mshare_{it} + \beta 3 Cash_{it} + \beta 4 Age_{it} + \beta 5 Concentration_{it} \\ + \beta 6 ForeignOperation_{it} + \lambda + \varepsilon_{it}\end{aligned}, \tag{A2}$$

where *TA* is the natural logarithm of a firm's assets at the end of year *t*; *Mshare* is the share of firm sales to industry total sales; *Cash* is a dummy variable for available cash, which equals 1 when a firm has nonnegative free cash flow and otherwise 0; *Age* is the number of years for which the firm has been listed, *Concentration* indicates the diversification of a firm's operations, measured by the Herfindahl-Hirschman Index of business segment sales within the firm; ForeignOperation is a dummy variable which equals 1 if the firm reports a nonzero value of foreign currency adjustment and otherwise 0; λ indicates year fixed effects and ε is the error term. We estimate Eq. (A2) by industry with the Tobit regression technique and cluster standard errors by firm and year to control cross-sectional and intertemporal correlations. After this step, the residual ε is used as a proxy for managerial ability.

Appendix B. Variables definition

Table B. Variables definition.

Variables		Definitions
Dependent variables		
Inv/K		The ratio of capital expenditure on investment over lagged fixed assets
Independent variables		
CFlow/K		The ratio of net operating cash flows over lagged fixed assets
Sale/K		Total sales revenue over lagged fixed assets
MA		The managerial ability score obtained from Eq. (2).
Control variables		
Basic characteristics	*Age*	Natural logarithm of the number of years listed plus one
	Size	Natural logarithm of lagged total assets
Ownership	*SOE*	A dummy variable which equals 1 if the firm is state-owned and otherwise 0
	Foreign	A dummy variable which equals 1 if the firm's ownership is foreign or "Hong Kong, Macao, and Taiwan." and otherwise 0
External funds	*Loan growth*	The ratio of loan growth over lagged fixed assets
Growth opportunities	*Sales growth*	Sales growth rate
	Tobin's Q	The ratio of assets' market value to book value

Source: Authors' calculation.

Appendix C. Assessing the validity of the ICFS model

Here we perform three more tests to examine the validity of the ICFS model for capturing financial constraints of Chinese firms as some studies document that cash flows have become insignificant for predicting investment of firms in developed countries (e.g., Gatchev et al., 2010; Chen & Chen, 2012).

Brown and Petersen (2009) find that the decline in ICFS of US firms can largely be explained by the rising R&D and the equity market developments. First, more firms (especially those with persistent negative cash flows) turn to the equity market as the primary source of funding, thereby attenuating the impact of internal cash flows on investment. Second, the classical ICFS model has focused on the sensitivity between physical investment and cash flows while R&D investment has gradually increased in the past years. The changing composition of corporate investment leads to the decline in ICFS.

No doubt, these two reasons may also affect the validity of the ICFS model for capturing financial constraints of Chinese firms. We address these concerns following the ways of Brown and Petersen (2009) and Cull et al. (2015). First, we re-estimate the ICFS model (see Eq. (1)) for firms without persistent negative cash flows. We find that the coefficient of CFlow/K on Inv/K increases to 0.065 (see Column (1) of Table C1) compared with the baseline results

Table C1. The decline in ICFS of our sample firms.

	(1) *CFlow* > 0	(2) Total investment
CFlow/K	0.065***	0.043***
	(9.07)	(7.02)
Sale/K	0.007***	0.013***
	(6.73)	(14.16)
Size	0.014***	−0.005
	(2.84)	(-0.78)
Age	−0.168***	−0.178***
	(-23.25)	(-19.28)
SOE	−0.042***	−0.024
	(-3.00)	(-1.22)
Foreign	−0.018	0.056
	(-0.73)	(1.41)
Loan growth	0.103***	0.060***
	(10.73)	(9.54)
Tobin's Q	0.018***	0.028***
	(4.11)	(4.75)
Sales growth	0.113***	0.117***
	(5.08)	(4.55)
Constant	0.230*	0.711***
	(1.87)	(4.51)
Province/Industry/Year fixed effect	Included	Included
Obs.	20289	20893
adj. R^2	0.298	0.267

Note: This table reports the estimation results of the decline in ICFS. Column (1) presents the estimation results for firms with positive cash flows. Columns (2) presents the estimation results by taking total investment as the dependent variable, defined by physical plus R&D investment over lagged K. Variables definition refers to the Appendix B. t-statistics are reported in parentheses, and standard errors are clustered by firms. ***, ** and * denote the significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

shown in Column (4) of Table 2. Second, we re-estimate the ICFS model by taking the total investment as the dependent variable, which is proxied by physical plus R&D investment over lagged K. We find that the coefficient of CFlow/K on Inv/K slightly increases to 0.043 (see Column (2) of Table C1) compared with the baseline results shown in Column (4) of Table 2. These two findings are in line with theoretical expectation and thereby support the validity of the ICFS model applied for Chinese firms.

To further examine whether the ICFS model is valid for Chinese firms, we compare the results derived from the ICFS model with those based on the SA index. The SA index is constructed based on firm age and size by Hadlock and Pierce (2010) as young and small firms are typically financially constrained:

$$SA_{i,t} = 0.043 \times Size_{i,t}{}^2 - 0.040 \times Age_{i,t} - 0.737 \times Size_{i,t}, \tag{B1}$$

where Size is the natural logarithm of total assets, Age is the natural logarithm of the number of years listed plus one. The larger value of absolute SA indicates that a firm suffers from more severe financial constraints.

We calculate the SA score to measure the magnitude of a firm's financial constraints. In each fiscal year, we divide the full sample into four sub-samples based on the quartile of SA score by industry ([0, 25%), [25%, 50%), [50%, 75%), [75%, 100%]). Firms in the top quartile are regarded as the most financially constrained and those in the bottom quartile are the least financially constrained. We re-estimate the ICFS model (see Eq. (1)) for firms in each group. The results show that the coefficient of CFlow/K is insignificant when the SA score is less than the 25th percentile and becomes larger and more significant as SA scores increase (see Table C2). The results suggest that the financial constraints captured through the ICFS model

Table C2. The consistence of ICFS model with SA index.

	(1) SA-[0,25%)	(2) SA-[25%,50%)	(3) SA-[50%,75%)	(4) SA-[75%,100%]
CFlow/K	0.014	0.032***	0.038***	0.076***
	(1.53)	(3.45)	(3.78)	(7.04)
Sale/K	0.015***	0.014***	0.009***	0.006***
	(9.60)	(9.63)	(7.10)	(4.91)
Size	−0.051	−0.113***	−0.116***	−0.054***
	(-1.63)	(-3.09)	(-2.90)	(-4.76)
Age	−0.223***	−0.166***	−0.137***	−0.099***
	(-17.10)	(-10.80)	(-8.13)	(-5.68)
SOE	−0.134***	0.019	−0.023	−0.017
	(-4.01)	(0.52)	(-0.85)	(-0.74)
Foreign	0.012	0.080	0.098	0.068
	(0.22)	(1.47)	(1.46)	(1.04)
Loan growth	0.027**	0.051***	0.054***	0.062***
	(2.14)	(5.21)	(5.55)	(6.44)
Tobin's Q	0.013	0.044***	0.047***	0.021**
	(1.43)	(4.92)	(4.65)	(2.16)
Sales growth	0.055	0.048	0.055	0.196***
	(1.32)	(1.26)	(1.25)	(4.64)
Constant	1.747***	2.744***	2.743***	1.589***
	(2.59)	(3.66)	(3.28)	(6.23)
Province/Industry/Year FE	Included	Included	Included	Included
Obs.	6285	6422	6345	6491
adj. R^2	0.242	0.300	0.253	0.310

Note: This table presents the estimation results by classifying firms into four subsamples based on the severity of financial constraints measured by the SA index. Variables definition refer to Appendix B. t-statistics are reported in parentheses, and standard errors are clustered by firms. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.

are consistent with the SA approach. This finding provides further support for the validity of the ICFS model used for Chinese firms.

Appendix D. Construction of related indexes and equations

1. Euler equation.

Following Bond and Meghir (1994), we construct the Euler equation as follows:

$$\frac{Inv_{i,t}}{K_{i,t-1}} = \gamma_0 + \gamma_1 \frac{CFlow_{i,t}}{K_{i,t-1}} + \gamma_2 MA_{i,t} + \gamma_3 \frac{CFlow_{i,t}}{K_{i,t-1}} \times MA_{i,t} + \gamma_4 \frac{Inv_{i,t-1}}{K_{i,t-2}} + \gamma_5 \left(\frac{Inv_{i,t-1}}{K_{i,t-2}}\right)^2 + \beta' Controls_{i,t} + ProvinceFE_{i,t} + YearFE_{i,t} + IndustryFE_{i,t} + \varepsilon_{i,t}, \quad \text{(C1)}$$

where we include the lagged Inv/K and its square term, and exclude Tobin's Q to eliminate the bias caused by measurement errors of Tobin's Q. Variables definitions are shown in Table B1.

1. Calculation of analyst forecasts' desperation.

Following Hope (2003) and To et al. (2018) We calculate analyst forecasts' desperation as follows:

$$Dispersion_t = \frac{\sqrt{\frac{1}{n-1}\sum_{k=1}^{n}\left(ForecastedEPS_{k,t} - \frac{1}{n}\sum_{k=1}^{n} ForecastedEPS_{k,t}\right)^2}}{\left|\frac{1}{n}\sum_{k=1}^{n} ForecastedEPS_{k,t}\right|}, \quad \text{(C2)}$$

where ForecastedEPSk,t indicates the earnings forecast of analyst k for a firm in year *t*.

Appendix E. The concern of politically connected private firms

Some private firms are keen to appoint officials as board members to build political connections (informal relationship with governments) (Cull et al., 2015; Chai & Mirza, 2019), which can bring preferential support such as corporate bailouts (Faccio et al., 2006) and bank loans (Claessens et al., 2008) and mitigate the effect of favoritism in SOEs' official access. However, we notice that China's Central Organization Department drafted a policy in 2013 (the No.18 Document) which broke firms' political affiliation. This policy forced government officeholders to resign immediately from running private businesses or being part of the board of directors (Qin & Zhang, 2019). In this appendix, we try to address the concern about the bias in our main findings caused by those politically connected private firms and explore potential policy implications of the No.18 Document.

To this end, we re-estimate our model for the subsample of private firms for the periods of 2007–2019 and 2014–2019. The results are shown in Columns (1) and (2) of Table E1, respectively. We find that for both periods, the findings remain comparably the same as those shown in Section 4.2 and therefore relieve the concern about the bias caused by those politically connected private firms.

Besides, we find that the coefficient of CFlow/K is larger and the coefficient of MA × CFlow/K is larger in magnitude and more significant for the sample during 2014-2019 than the results for the sample during 2007–2019 (see Table E1). These results suggest that after the enactment of the No.18 Document, private firms face more severe financial constraints due to the loss of political connections, and these firms' managers play more role in improving financial constraints. The finding has important implications for the anti-corruption campaign initiated by Xi government since the 18th National Congress of the Communist Party of China. For instance, a series of reforms regarding firms' political connections (such as the No. 18 Document) in the recent decade helps reduce rent-seeking activities and promote entrepreneurship. Our finding provides evidence to these reforms by showing that the loss of political connections amplifies the active role of managerial ability in improving corporate financial constraints.

Table E1. The concern of politically connected private firms.

	(1) 2007-2019	(2) 2014-2019
CFlow/K	0.051***	0.067***
	(8.37)	(9.07)
MA	0.328***	0.288***
	(6.03)	(4.33)
MA × CFlow/K	−0.065**	−0.120***
	(-2.08)	(-3.04)
Sale/K	0.010***	0.009***
	(13.08)	(9.87)
Size	0.002	0.016**
	(0.37)	(2.10)
Age	−0.187***	−0.142***
	(-22.85)	(-13.85)
Loan growth	0.056***	0.057***
	(10.31)	(8.49)
Tobin's Q	0.020***	0.024***
	(4.10)	(3.96)
Sales growth	0.102***	0.074***
	(4.56)	(2.80)
Constant	0.548***	0.163
	(3.84)	(0.98)
Province/Industry/Year FE	Included	Included
Obs.	21731	13094
adj. R^2	0.267	0.288

Note: This table presents the results of managerial ability's role in financial constraints for other private firms. Columns (1) and (2) present the regression results for the whole sample period (i.e., 2007-2019) and after the forced de-politicization (i.e., 2014-2019), respectively. Variables definition is shown in Appendix B. t-statistics are reported in parentheses, and standard errors are clustered by firms. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' calculation.