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Ownership structure and risk-taking: Comparative evidence from private and state-controlled banks in China

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ABSTRACT

This study examines the impact of ownership structure on Chinese banks' risk-taking behaviours. We classify the Chinese commercial banks into three categories based on the types of controlling shareholder, and find that banks controlled by the government (GCBs) tend to take more risks than those controlled by state-owned enterprises (SOECBs) or private investors (PCBs). This is attributed to the severe political intervention and weak incentives to follow prudent bank management practices for GCBs. We also find that the results are more pronounced among banks with concentrated ownership presumably because the large controlling power helps to enhance the monitoring of the management and promotes prudent operating procedures. Our findings have important implications for the ongoing reform in the Chinese banking sector.

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1. Introduction

The Basel Committee on Banking Supervision (BCBS) recently issued a set of "Principles for enhancing sound corporate governance" (BCBS, 2010) in the banking sector to discuss the link between governance quality and bank failure as well as economic development. Poor corporate governance has been found to motivate excessive risk-taking and therefore been blamed as a contributory factor of the recent financial crisis (Laeven & Levine, 2009). The report highlighted some corporate governance challenges including bank ownership structures that are unduly complex, lack transparency, or impede appropriate checks and balances, and pointed out that "Challenges can also arise when insiders or controlling shareholders exercise inappropriate influences on the bank's activities" (2010, p.6). Corporate governance in the banking sector differs from that in the non-financial sectors in terms of transparency, business complexity and regulation (Mehran, Morrison, & Shapiro,

2011), and banks have the ability to take on risk very quickly and in ways that are not readily visible to directors or investors, thus posing a broader risk to the economy than non-financial firms. To date, however, corporate governance studies in the literature have largely focused on non-financial firms. Therefore, the issue of corporate governance and risk-taking in the banking sector is of particular interest. To shed light on this issue in the under-researched emerging markets, we study the role played by the controlling shareholders of Chinese banks by exploring the impact of their nature and the ownership concentration on banks' risk-taking behaviours.

Since 1979, the Chinese authorities have undertaken gradual banking reforms to address the institutional, political and organizational problems faced by its banking industry. The speed of the reforms has accelerated since 2003, and the Chinese banking sector has been dramatically reshaped. The latest round of banking reform measures include financial capital injections, shareholding restructures, the introduction of foreign strategic investors, the listing of banks' share capital on foreign and Chinese exchanges, and the establishment of a system for the boards of directors. These reforms have changed the ownership structure of Chinese banks, and are expected to improve the governance quality and have important implications on their behaviours.

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In China and some other emerging market countries the banking sector operates under a two-tier ownership structure including state-owned banks and privately owned (domestic or foreign) banks. Both theoretical and empirical studies in the literature suggest that the performance and risk-taking behaviour of organizations depend on the identity of the controlling shareholders (i.e., the ultimate owners) (e.g., Barry, Lepetit, & Tarazi, 2011; John, Litov, & Yeung, 2008). In terms of state ownership, political interference usually comes at the expense of corporate profitability because of politicians' deliberate policy of transferring resources to their supporters (Shleifer, 1998; Shleifer & Vishny, 1986). This suggests that state-owned banks might be seen as vehicles for raising capital to finance projects with high social returns, but possibly high-risk and low-profit returns, or to provide finance to favoured groups such as state-owned enterprises (SOEs) (Clarke, Cull, & Shirley, 2005).¹ State-owned banks find it difficult to resist such harmful government interference, whereas private banks are more able to oppose it, and typically employ more sensible prudential lending policies and/or profit-maximizing strategies as a consequence (Shirley & Nellis, 1991; Shleifer & Vishny, 1994). Moreover, lower performance incentives (Shleifer & Vishny, 1997) and "soft" budget constraints (Sheshinski & Lopez-Calva, 2003) in state-owned banks also result in excessive risk-taking and the misallocation of resources.

These theoretical inferences have been supported by some empirical evidence. For example, government-owned banks and large state ownerships are associated with lower efficiency (Bonin, Hasan, & Wachtel, 2005; Fries & Taci, 2005), inferior long-term performance (Berger, Clarke, Cull, Klapper, & Udell, 2005), greater risk-taking (Angkinand & Wihlborg, 2010; Iannotta, Nocera, & Sironi, 2007, 2013), and less prudent lending behaviours (Jia, 2009). However, there are also some contradictory results. State-controlled banks have also been found to be associated with less risk in Russia (Fungáčová & Solanko, 2009) and higher efficiency in India (Bhattacharyya, Lovell, & Sahay, 1997) and Turkey (Isik & Hassan, 2002). Altunbas, Gardener, Molyneux, and Moore (2001) find little evidence that private banks are more efficient than state-owned ones in Germany. Overall, the results are not conclusive and little is known about the role of state controlling shareholders in Chinese banks' risk-taking behaviours.²

Besides the nature of the controlling shareholder, another important dimension of banks' ownership structure is ownership concentration (Iannotta et al., 2007). Opposite effects of ownership concentration on firm performance are predicted from theories from the literature. On the one hand, Shleifer and Vishny (1986) and Admati, Pfleiderer, and Zechner (1994) argue that concentrated ownership can overcome the free-rider problem and enhance firm performance by improving the monitoring of management. An agency problem is created when ownership is dispersed because atomistic shareholders bear the full cost of monitoring while reaping only a fraction of the benefits and therefore have less incentive to monitor the firms. On the other hand, other theoretical studies argue that large shareholders may exercise control rights to pursue private benefits at the cost to the minority shareholders (La Porta, Lopez de Silanes, & Shleifer, 1999; Shleifer & Vishny, 1997). Mixed empirical evidence is also documented in this literature. Concentrated ownership has been found to be associated with higher risks (Laeven & Levine, 2009), higher insolvency risk and greater return volatility (Haw, Ho, Hu, & Wu, 2010). In contrast, ownership concentration has been found to be associated with a lower level of risk-taking in Spanish commercial banks (Garcia-Marco & Robles-Fernández, 2008), better loan quality, lower asset risk and a lower insolvency risk (Iannotta et al., 2007) and a lower non-performing loans ratio and

better capital adequacy ratio (Shehzad, de Haan, & Scholtens, 2010). These differences may partially be attributed to the different settings which embed different institutional features from the various countries and regulatory regimes.

To perform our analysis, we hand collect the ownership information of 108 Chinese commercial banks over the period from 2003 to 2011. We regress the ownership structure characteristics, including the identity of the controlling shareholder and the ownership concentration and their interaction terms, on the bank's risk-taking proxies. We also incorporate other corporate governance characteristics as control variables including the independence of the risk committee chair and the proportion of female directors on the boards. We use three categories of ownership identity to reflect the nature of their largest shareholder: government-controlled banks (GCBs), SOE-controlled banks (SOECBs), and privately controlled banks (PCBs). For the ownership concentration, we use the Herfindahl index based on the ownership shares of the top ten shareholders and the percentage of shares held by the three largest shareholders. Our findings show that SOECBs tend to take less risk than GCBs. Unlike GCBs, SOECBs have greater incentives to pursue profit-maximizing strategies and exercise prudential lending practices. We also find that the effect of controlling shareholders on bank risk-taking depends on the ownership concentration. More specifically, concentrated ownership can reduce risk-taking in SOECBs and PCBs, but increase risk-taking in GCBs presumably because of their different objectives. Finally, consistent with Aebi, Sabato, and Markus (2012), we also find that the presence of the Chief Risk Officer (CRO) on the executive team and a greater number of female directors significantly reduce risk-taking.

We believe that our study makes an important contribution to the literature in several ways. First, it adds to the literature of banking governance by providing original evidence on the impact of two dimensions of ownership structure (i.e., controlling shareholder type and ownership concentration) on banks' risk-taking. Some related studies either focus on the nature of the bank (Barry et al., 2011; Forssbäck, 2011; Nichols, Wahlen, & Wieland, 2009) or on the degree of ownership concentration (Iannotta et al., 2013; Laeven & Levine, 2009; Sullivan & Spong, 2007). To the best of our knowledge, this is the first study to address how the ownership concentration affects the role of controlling shareholders. Second, this study contributes to the growing literature on emerging markets by exploring the rapidly developing Chinese banking sector from the largest emerging market in the world. The existing Chinese banking literature mainly examines the determinants of banks' (accounting) performance or efficiency (Berger, Hasan & Zhou, 2009; Fu & Heffernan, 2007, 2010; Kumbhakar & Wang, 2007; Lin & Zhang, 2009; Zhang, Jiang, Qu, & Wang, 2013), while our study focuses on the risk-taking behaviour of Chinese banks using three risk measure proxies, i.e., Z-score, non-performing loans, and the capital adequacy ratio. Finally, our findings have important implications for regulators and investors. Our findings suggest that the transfer of bank ownership from the government to marketized SOEs helps to improve the stability of the banking system.

The remainder of the paper is structured as follows. Section 2 introduces the institutional background of the Chinese banking sector. Section 3 develops our predictions on the impact of the controlling shareholders. Section 4 presents the research design. Section 5 provides the empirical results and Section 6 concludes.

2. Institutional background

Over the last thirty years, the Chinese authorities have implemented a series of significant reforms aimed at transforming the country's banking sector from policy-driven, wholly state-owned and monopolistic to market-oriented and competitive. One important aspect of the reform is the ownership restructuring of the Chinese banks through the introduction of foreign strategic investors, getting listed on stock exchanges, and sales of shares to domestic firms. These gradual reforms

¹ Firth, Lin, Liu, and Wong (2009) find evidence that political connections play a role in gaining access to bank finance in China.

² There are a number of studies assessing the efficiency or other performance of the Chinese banking sector (e.g., Fu & Heffernan, 2007; Shin, Zhang, & Liu, 2007; Berger et al., 2009), but they do not explore either banks' risk-taking behaviour or the role of controlling shareholders in banks.

have created a banking sector with multiple categories of banking institutions operating in separate market segments with (generally) clearly delineated functions. According to the China Banking Regulatory Commission (CBRC), Chinese banks are classified into wholly state-owned policy banks, large-scale (state-owned) commercial banks, joint stock commercial banks (JSCBs), city commercial banks (CCBs), rural commercial banks (RCBs), locally incorporated foreign banks, and other financial institutions.

One of the main features of the Chinese banking sector is the dominance of the five largest state-owned commercial banks (SOCBs) (known as the Big Five): the Agricultural Bank of China (ABC), the Bank of China (BOC), the China Construction Bank (CCB), the Industrial and Commercial Bank of China (ICBC) and the Bank of Communications (BOCOM).³ One of the most important targets of the Chinese authorities is to establish sound corporate governance through the restructuring of the SOCBs. Starting in 2003, the Chinese authorities introduced a partial privatization strategy to encourage the Big Four (later the Big Five) to adopt the shareholding ownership structure. Under this strategy, two approaches were initially undertaken. The first was to sell strategic stakes to foreign investors and the second was to list the banks on foreign and Chinese exchanges. Although some portion of the shares of the Big Five have been transferred to domestic institutions, foreign investors and the public through these measures, the ultimate voting control of the banks remains with the state. Therefore, the government continues to exert significant influence over the lending practices and administration of these banks.

There are currently twelve JSCBs with national operating licences, representing the second tier of Chinese banks. Because the JSCBs were established more recently than the SOCBs, they are not burdened with any historical policy lending (in particular to those relating to non-performing loans) and, therefore, tend to be more agile and responsive to market requirements. JSCBs' shares are distributed among the central government, the local government, SOEs, and private and foreign investors.⁴ The ownership structure varies widely across JSCBs. In some, such as China Mingsheng Bank and China Zheshang Bank, the majority of the shares are owned by private investors, while in others the majority are held by the state or SOEs. JSCBs are allowed to offer a wide variety of banking services, including accepting deposits, extending loans, and providing foreign exchange and international transaction services. They also regularly finance small and medium enterprises (SMEs), which tend to be ignored by the Big Five.

Since 1995, city commercial banks (CCBs) have been created through the restructuring and consolidation of urban credit cooperatives (UCCs). They represent the third category of Chinese banks. Most were originally wholly owned or controlled by local government, the aim being to provide financial support for local economic development. However, since the new millennium, CCBs have gradually been transformed into (private) joint-equity corporations with a more diversified set of shareholders, including the treasuries of local governments, SOEs, private enterprises, foreign investors and individuals. However, local government is still the largest shareholder in many CCBs. As of 2011, we find that an average of 17.1% of the shares in CCBs was owned by local governments. Because of their smaller size, the CCBs have struggled to compete with the Big Five and the JSCBs. However, in recent years, they have made significant progress in upgrading their operational and managerial capabilities, as well as promoting innovative products and technologies. They have gradually nurtured their own brands and corporate cultures, and have begun to play a pivotal role in underpinning the development of small and micro-enterprises and the consumer finance business.

³ BOCOM used to be classed as a JSCB. However, it is much larger than the other JSCBs, and its share ownership is spread among different state-owned entities. Therefore, in 2006, the CBRC redefined it as a SOCB. Thus, it joined the other four big state-owned banks (previously known as “the Big Four”) to form “the Big Five”. For consistency, we treat BOCOM as a SOCB rather than a JSCB throughout the entire period of our study.

⁴ SOEs generally invest in JSCBs purely for the expected returns (i.e., dividends and capital gains) and do not engage in management activities.

Starting in 2003, the authorities restructured rural credit cooperatives (RCCs) into rural commercial banks (RCBs). Over the past few years of development, RCBs have gradually been transformed from policy-driven, rural businesses into market-oriented, urban ones. Following rapid expansion in recent years, there were 212 RCBs operating in China at the end of 2011, valued at RMB 4.25 trillion, and accounting for 3.75% of the total banking institution assets in the country (CBRC, 2011).

Prior studies on Chinese bank ownership structure have generally focused on three types of banks in China, namely state-owned commercial banks (SOCBs), joint stock commercial banks (JSCBs) and city commercial banks (CCBs) (e.g., Garcia-Herrero, Gavila, & Santabarbara, 2009; Jia, 2009; Lin & Zhang, 2009). However, there are some problems with this classification. For example, China Everbright Bank and China Mingsheng Bank are both categorized as JSCBs, but their ownership structures are very different. The majority of the shares in the former are held by the central government and SOEs, while the latter is fully owned by private investors. In other words, the issued shares could be held by state and private shareholders, or among private ones only, and therefore the category of JSCBs fails to reflect the difference in the presence or the influence of state shareholders. To address this issue, we classify the banks based on the nature of the largest shareholders, which is defined as the controlling shareholders who tend to dominate the bank's decision-making and control the bank's property by virtue of their superior control rights (See Chen, Firth, & Xu, 2009). We classify the Chinese commercial banks into 3 types, namely GCBs, SOECBs, and PCBs. The GCBs are banks whose largest shareholders are government agencies, such as central or local government, government bureaus, or state asset operating companies. The SOECBs have SOEs as their largest shareholders. The PCBs' largest shareholders are private firms, foreign financial institutions or individuals. Unlike the government agencies, SOEs and private firms are profit-making entities. Our ownership classification better reflects the institutional features of the Chinese banking sector, and in particular captures the influence of the prevailing state-related shareholders in China.

3. Hypothesis development

3.1. Government-controlled banks

For historical reasons, a large proportion of Chinese commercial banks are owned or controlled by the state, either directly through central or local government agencies or indirectly through marketized SOEs. These two types of state controls are likely to have different impacts on Chinese banks, in particular on their risk-taking behaviour. When government agencies are the controlling shareholders of a bank, its board of directors and senior officers will generally be appointed or approved by the government.⁵ Moreover, the promotions and rewards granted to this type of bank's senior managers largely depend on how well they carry out the instructions of the central or local government, and less on the creation of bank value (Cao, Lemmon, Tian, & Pan, 2011; Chen et al., 2009). The officials do not bear the consequences of any inappropriate decisions they make. Therefore, senior officers have less incentive to monitor the banks and may not fully comply with prudent bank management practices. The strategies and operations of government-controlled banks are more likely to be subject to political intervention as they generally serve as policy-lending conduits for the government to provide loans to SOEs.⁶ Thus, the incentives to follow prudential risk management rules and to adhere to commercial objectives are weak for GCBs.

⁵ The senior bank officers of government-controlled banks are generally members of the Chinese Communist Party. They are also likely to rank highly in the Chinese government's hierarchy (Martin, 2012).

⁶ According to Article 34 of the Commercial Banking Law, a commercial bank shall conduct its loan business in accordance with the need for the development of the national economy and social progress under the guidance of the state industrial policy.

We find that the total loans issued by Chinese banks grew by 95.3% hitting a record high of RMB 9590 billion in 2009 as part of the Chinese economic stimulus programme and the majority of these bank loans were lent by the state-controlled commercial banks and driven mainly by the policy directives of the central and local governments (CBRC, 2010). As Greenwald and Stiglitz (1993) point out, the granting of enormous policy-directed loans during an economic downturn is likely to increase the riskiness of state-controlled banks. Furthermore, government-controlled commercial banks generally enjoy the advantage of either implicit or explicit financial and regulatory support from the government (Faccio, Masulis, & McConnell, 2006). For example, we find that as part of its efforts to rescue the major state-owned banks, the State Council transferred around 1245 billion Yuan in non-performing loans from the Big Five banks to asset management companies set up by the government during 2003–2005 (Okazaki, 2007). This governmental protection encourages bankers to take excessive risks as the losses and excess costs are invariably covered by the government (Demirgüç-Kunt & Detragiache, 2002).

3.2. SOE-controlled banks

SOE controlling shareholders are different from government controlling shareholders in many respects. First, SOECBs are more empowered and have greater autonomy as there is less interference from the government (Martin, 2012). Unlike the case of government controlled banks, the board of directors and senior officers of SOECBs are appointed by SOE controlling shareholders rather than being directly appointed by the organization department of the Communist Party. Chinese SOEs have become market-oriented and are now responsible for their own gains and losses after the third round of reforms (Delios, Wu, & Zhou, 2006). Thus, SOE controlling shareholders are motivated to appoint good managers and to monitor them to ensure that banks they control operate in a safe and sound manner. Second, SOECBs have strong financial constraints and do not receive as much financial support from the state as government-controlled banks. Therefore, they have greater incentives to pursue profit-maximizing strategies and to exercise prudential lending standards than do GCBs. Finally, SOECBs generally adopt a performance-related compensation system, with the top executives given sufficient incentives to do a good job through monetary rewards. In 2011, for example, the annual report of China CITIC bank, a SOECB, shows an annual CEO remuneration of 49.618 million Yuan, 4.5 times higher than the CEO annual remuneration in ICBC, the biggest government controlled bank.

3.3. Private-controlled banks

The third type of controlling shareholder is a private shareholder. Generally, banks controlled by private shareholders (PCBs) are more profit-motivated than either of the previous two types (GCB and SOECB). Private controlling shareholders are likely to select senior managers with a detailed knowledge of the banking industry and the capability to maximize the wealth of the shareholders. Moreover, unlike SOECBs or GCBs, PCBs can face the threat of a hostile takeover or the possibility of bankruptcy because of the lack of implicit government guarantees. These traits provide a natural incentive for the managers of private banks to install more efficient and prudent operating procedures than may be seen in the state-owned counterparts (Berglöf & Roland, 1998; Sheshinski & Lopez-Calva, 2003). However, PCBs may still allocate loans and resources in ways that deviate from optimal business practices. They may also face pressure from their private shareholders to provide preferential treatment to their companies, families and/or related companies.⁷

⁷ Some of the private shareholders or related companies are SMEs, which generally are hard to appraise, light on assets and quick to capsize when economic winds change. Therefore, they are perceived as higher risk than larger companies such as SOEs (Martin, 2012).

3.4. Ownership concentration

We argue that the degree of ownership concentration also has a significant impact on banks' risk-taking behaviour. Ownership concentration refers to the distribution of the ownership among different institutions and individuals and is related to shareholders' controlling power. Previous literature (e.g., Azofra & Santamaría, 2011; Iannotta et al., 2007; Shehzad et al., 2010) suggests that the ownership concentration could significantly affect a bank's performance and riskiness. According to Shleifer and Vishny (1986) and Edwards and Nibler (2000), concentrated ownership enhances corporate control by improving the monitoring of management. Moreover, dispersed ownership may prevent efficient decision-making (Shehzad et al., 2010) and create a free-rider problem in corporate control (Gorton & Schmid, 1999). However, greater ownership concentration may not reduce a bank's riskiness because the interests of the large shareholders may conflict with those of the minority ones (Gomes & Novaes, 2005).

4. Research design

4.1. Data and sample selection

To investigate the impact of ownership structure on banks' risk-taking, we construct our sample from two sources. We hand-collect the detailed information about the banks' ownership structures and corporate governance, such as the percentage of ownership held by the top ten shareholders or the independence of the risk committee, from the banks' annual reports.⁸ The bank-specific accounting data are extracted from the BankScope database and from the banks' annual reports. After eliminating observations with missing values, our final sample comprises 667 yearly observations covering 108 Chinese commercial banks over the period from 2003 to 2011. The sample includes the five large SOCBs, 12 JSCBs, 84 CCBs, and 7 RCBs, and represents about 74% of the total assets of Chinese banking institutions at the end of 2011. We explore two major dimensions of ownership structure, namely owner identity and ownership concentration. These two categories of ownership measures incorporate both the owners' incentives and the controlling power of shareholders. Table 1 shows the ownership structures of the banks in our sample over the period 2003–2011. Based on the detailed ownership data, we categorize the banks based on the identity of the controlling (largest) shareholder into three types, namely 349 banks controlled by the state (GCBs), 170 banks controlled by the SOEs (SOECBs), and 148 controlled by private shareholders (PCBs).

4.2. Empirical models

We employ three proxies to measure the risk-taking of Chinese banks. The Z-score, proposed by Boyd and Graham (1986), equals the return on assets (ROA) plus the capital to assets ratio (E/A) divided by the standard deviation of asset returns ($\sigma(\text{ROA})$). It measures the distance to default since it is the inverse of the probability that losses exceed bank capital (i.e., $\text{prob}(-\text{ROA} < E/A)$). A higher Z-score indicates that a bank is more stable and less risky. Since the Z-score is highly skewed, we use its natural logarithm to smooth out the skewness (Laeven & Levine, 2009). The Z-score is commonly used in literature to measure bank risk (e.g., Angkinand & Wihlborg, 2010; Barry et al., 2011; Demirgüç-Kunt & Huizinga, 2013; Laeven & Levine, 2009).

⁸ In recent years, most Chinese commercial banks have complied with the People's Bank of China's (PBOC) 2002 Provisional Rules on Information Disclosure of Commercial Banks, which require banks to disclose financial statements and provide information on their corporate governance and risk management activities in the annual reports. The annual reports are either published on the banks' websites or are available upon request.

Table 1

The ownership structure of Chinese banks, 2003–2011.

	State control (Obs. 349)				SOE control (Obs. 170)				Private control (Obs. 148)				ALL (Obs. 667)			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Largest shareholder	0.2730	0.2230	0.042	1	0.2279	0.1549	0.0644	0.87	0.1802	0.1687	0.0481	0.9075	0.2409	0.1993	0.042	1
Second shareholder	0.1085	0.0761	0	0.5	0.1287	0.0563	0.0459	0.2667	0.0959	0.0454	0.0054	0.2267	0.1109	0.0665	0	0.5
Third shareholder	0.0679	0.0338	0	0.1935	0.0795	0.0382	0.0125	0.2	0.0728	0.035	0.0049	0.1778	0.0720	0.0355	0	0.2
Ownership of top three shareholders	0.4495	0.2255	0.0707	1	0.4362	0.1789	0.1616	0.9785	0.3490	0.1653	0.1269	0.9194	0.4238	0.2058	0.0707	1
HHI	0.1593	0.2138	0.0033	1	0.1166	0.1251	0.0141	0.7598	0.0936	0.1549	0.0097	0.8237	0.1338	0.1842	0.0033	1
Total ownership by all block holders	0.5401	0.2379	0	1	0.5253	0.2258	0.0644	1	0.4623	0.2315	0	0.9075	0.5191	0.2352	0	1
No. of blockholders	4.0516	2.3825	0	10	4.0647	1.8024	1	9	4.3378	2.5270	0	10	4.1184	2.2867	0	10

Notes: This table shows the percentage of a bank's share capital owned by the largest, second largest, third largest, and largest three shareholders. HHI is the Herfindahl index, which is based on the ownership held by the ten largest shareholders of the bank. Blockholders are defined as shareholders that hold 5% or more of the shares of a bank.

We also use the non-performing loan ratio and the capital adequacy ratio (CAR) by following Demirgüç-Kunt, Detragiache, and Tresselt (2006), Shehzad et al. (2010), and Delis and Kouretas (2011). The non-performing loan ratio, calculated as the ratio of non-performing loans to total loans, reflects the quality of a bank's assets.⁹ Because non-performing loans cause losses for banks, a higher non-performing loan ratio is associated with higher credit risk (Delis & Kouretas, 2011). The capital adequacy ratio (CAR) is the ratio of a bank's capital to its risk-weighted assets. The level of bank equity provides a cushion against its portfolios' losses and financial distress, therefore, the CAR is closely related to a bank's insolvency risk (see Berger & Mester, 1997; Hughes & Mester, 2012; Mester, 1997). Moreover, lower capitalization also reflects more severe agency problems between shareholders and managers, and implies higher-risk bank strategies (Shehzad et al., 2010).

To examine the impact of ownership structure and risk management-related governance factors on the risk-taking of banks in China, we use the following model¹⁰:

$$BRT_{it} = \alpha + \beta_1 SOECB_{it} + \beta_2 PCB_{it} + \gamma CONC_{it} + \sum_k \delta_k CONTROL_{it}^k + \varepsilon_{it} \quad (1)$$

where the dependent variable BRT is one of the three bank risk-taking measures: the natural logarithm of the Z-score (LnZ-score), the non-performing loan ratio (NPL), or the risk-weighted CAR. The dummy variable SOECB is set equal to 1 for SOE-controlled banks where the controlling shareholders are SOEs and 0 otherwise. PCB is set equal to 1 for private-controlled banks where the controlling shareholders are private entities or individuals, and 0 otherwise. The government controlled banks (GCBs) serve as the benchmark and omitted category. Because they can obtain political and financial support in the event of a financial crisis, we hypothesize that GCBs would take more risks than other types of banks. We therefore expect the coefficients on SOECB and PCB to be significantly positive in the regression models of Z-score and CAR regressions, and significantly negative in the regression model of non-performing loan ratios. CONC denotes one of the two measures of ownership concentration, namely the ownership Herfindahl–Hirschman index (HHI) or the top three shareholders' concentration ratio (CR3). The HHI equals the sum of the squared ownership shares of the ten largest shareholders of the bank (Demsetz & Lehn, 1985; Hou, Lee, Stathopoulos, & Tong, 2013). The higher is the

value of the Herfindahl index, the more concentrated is the ownership of the bank. The CR3 variable is defined as the sum of the percentage of shares owned by the largest three shareholders and is used as an alternative ownership concentration measure for robustness checks (Demsetz & Villalonga, 2001; Omran, 2009).

CONTROL denotes a set of control variables including governance, bank-specific, and macroeconomic variables that may affect a bank's risk-taking behaviour. We incorporate a dummy variable to capture whether the bank's chief risk officer (CRO), who oversees all relevant bank risk, is a member of the executive team and, if so, we expect them to have greater authority and influence to reduce the amount of risk a bank takes (Aebi et al., 2012; Mongiardino & Plath, 2010). We define the risk management committee independence based on whether the committee chair is an independent board member (Aebi et al., 2012; Ellul & Yerramilli, 2013), and expect the independent status could enhance the transparency of the bank's risk management information. We also use the proportion of female directors on a bank's board to explore whether a higher representation of female directors could reduce the amount of risk a bank takes (e.g., Almazan & Suarez, 2003; Berger, Kick & Schaeck, 2014; Fields, Fraser, & Subrahmanyam, 2012; Pathan, 2009).

With regard to other control variables, bank size is measured by the natural logarithm of the bank's total assets (Delis & Kouretas, 2011; Laeven & Levine, 2009). Large banks could be less risky due to their greater ability to diversify risk across product lines or could be more risky due to the implicit assumption that they are "too-big-to-fail" (Brown & Dinç, 2011; Demirgüç-Kunt & Huizinga, 2013). The cost-to-income ratio, defined as the ratio of total expenses to operating income (interest and non-interest income), reflects operations both on and off the balance sheet. It is expected to be negatively related to a bank's risk because less efficient banks are likely to take on greater risk to generate profits (Agoraki, Delis, & Pasiouras, 2011; Boyd, Gianni, & Jalal, 2006). The ratio of total loans to total deposits assesses the extent to which customer loans are financed by customer deposits, and is related to the bank's liquidity. As diversification may be related to a bank's risk level, we control for the banks' diversification activities using Laeven and Levine's (2007) asset diversity measure (as defined in the Appendix). Berger et al. (2009) and Hasan and Xie (2012) suggest that foreign strategic investment improves the corporate governance of Chinese banks and reduces their risk-taking. We use a dummy variable to capture whether a bank has foreign strategic investment and expect that it will help the bank to control its risk. At the macroeconomic level, we include the real GDP growth rate to control for the general economic environment in China over the sample period, and a dummy variable of financial crisis (years 2008–2011) to capture the impact of the recent financial crisis (Aebi et al., 2012; DeYoung, Peng, & Yan, 2013). The Appendix presents a summary of the variable definitions and data sources. In addition to the OLS regression estimation, we also use the two-step system generalized method of moment (GMM) estimation to address the possible endogeneity problems as a robustness check.

⁹ According to the five-category loan classification system that was adopted by Chinese banks in 2002, performing loans include normal and special mention loans and non-performing loans consist of sub-standard, doubtful and loss loans.

¹⁰ The models are estimated by using ordinary least squares (OLS). However, we also employ the system Generalised Method of Moments (GMM) to address potential endogeneity problems in robustness checks. Details of the GMM estimation results are given in Section 5.2.

We also argue that the role played by the various types of controlling shareholders in banks' risk-taking behaviours is conditional on their power and their incentives as reflected by the ownership concentration, i.e., the types of controlling shareholder affect the relation between risk-taking and the degree of ownership concentration. To explore this issue, we use the following regression model:

$$BRT_{it} = \alpha + \beta_1 SOECB_{it} + \beta_2 PCB_{it} + \gamma_1 CONC_{it} + \gamma_2 CONC_{it} \times SOECB_{it} + \gamma_3 CONC_{it} \times PCB_{it} + \sum_k \delta_k CONTROL_{it}^k + \varepsilon_{it} \tag{2}$$

where two interaction terms are incorporated in the model as the products of the ownership concentration (CONC) with the ownership type dummy variables SOECB and PCB, respectively. Other variables are as defined previously. If the coefficients of the interaction terms, γ_2 and γ_3 , are statistically significant, this will suggest that the impacts of ownership concentration on risk-taking varies across ownership type.

Finally, we explore whether the ownership of the largest shareholder has a non-monotonic impact on the bank's risk-taking activity. On the one hand, a controlling shareholder with a greater proportion of shares in a bank would have a stronger incentive and more power to monitor the management and thus reduce the amount of risk the bank takes. On the other hand, the dominant shareholder makes it possible to expropriate funds from its controlled bank and increase the risks of the bank. In addition, some studies in the literature argue that ownership concentration above a certain level would allow larger shareholders to become entrenched and expropriate the wealth of minority shareholders (e.g., Chen, Firth, & Rui, 2006; Gul, Kim, & Qiu, 2010; Loderer & Martin, 1997; Wei, Xie, & Zhang, 2005). Therefore, there could be a non-linear relation between ownership concentration (ownership held by the largest shareholder) and bank risk-taking. To explore such possibilities, we use the following regression model:

$$BRT_{it} = \alpha + \beta_1 GCO_{it} + \beta_2 SOECO_{it} + \beta_3 PCO_{it} + \beta_4 GCO_{it}^2 + \beta_5 SOECO_{it}^2 + \beta_6 PCO_{it}^2 + \sum_k \delta_k CONTROL_{it}^k + \varepsilon_{it} \tag{3}$$

where GCO, SOECO and PCO represent the percentage of shares held by the controlling shareholders in GCBs, SOECBs, and PCBs respectively. If

the coefficients of the square terms of each the ownership variables, β_4 , β_5 and β_6 , are statistically significant, this would suggest a non-linear effect of ownership of controlling shareholders.

4.3. Descriptive statistics

Table 2 shows summary statistics for the variables that are used in the study. The mean (median) of Z-score is 14.73 (12.24) which is comparable with the figure given by Zhang, Wang, and Qu (2012). The mean (median) NPL ratio is 2.62% (1.46%), with a large degree of variation across banks. The capital adequacy ratio ranges from 52.15% to -21.70%, with an average of 11.52%. Regarding the ownership variables, the average value of the state-controlled banks is 0.5232, indicating that the state is the largest single shareholder in about 52.32% of cases. In our sample, 25.49% and 22.18% of banks are controlled by SOEs and private companies, respectively. 29.53% of our sample banks have a strategic foreign investment. The mean (median) of the Herfindahl index is 0.1393 (0.0700). The mean (median) of the percentage of shares owned by the top three shareholders is 42.4% (37.46%), indicating a strong ownership concentration in the Chinese banking sector. With regard to the control variables, we find that 12.14% of the banks in our sample have a CRO in their executive team. This figure is comparable to the figure reported in Aebi et al. (2012) using U.S. data. About 17.69% of the banks in our sample have an independent risk committee. The proportion of the female directors are about 10%, which are slightly higher than those of U.S. bank holding companies as reported in Pathan and Faff (2013). Finally, only 4.4% of banks in our sample are listed on stock exchanges (Table 2).

5. Empirical analysis

5.1. OLS estimation results

Table 3 presents the regression results from using the natural logarithm of the Z-score as the dependent variable (a higher value of the Z-score indicates less risk-taking). All the models are estimated by ordinary least squares (OLS) techniques with clustering at the bank level. Robust standard errors are used to correct potential heteroskedasticity and potential time series autocorrelation within each bank. Column 1 reports the results of Eq. (1). The coefficients on

Table 2 Summary sample statistics.

	Mean	Median	STDEV.	Min.	Max.
Z-score	14.7296	14.2411	5.4247	0.0400	36.6580
Non-performing loan ratio (NPL ratio)	0.0262	0.0146	0.0359	0.0000	0.3066
Capital adequacy ratio (CAR)	0.1152	0.1162	0.0508	-0.2170	0.5215
Bank size (LnTA)	4.8673	4.6654	0.7927	3.3287	7.1760
Cost/income (EFFICIENCY)	0.6048	0.5986	0.0935	0.32038	1.0738
Asset diversity (ADIV)	0.6468	0.6359	0.1864	-0.0553	1.0000
Loans/deposits (TL/TD)	0.6478	0.6667	0.1178	0.2062	0.9259
Listed bank (LIST)	0.0439	0.0000	0.0778	0.0000	1.0000
Economic growth (GDP)	0.1070	0.1040	0.0170	0.0920	0.1420
Post-global financial crisis (Post-GFS)	0.6192	1.0000	0.4859	0.0000	1.0000
Government-controlled banks (GCBs)	0.5232	1.0000	0.4998	0.0000	1.0000
SOE-controlled banks (SOECBs)	0.2549	0.0000	0.4369	0.0000	1.0000
Private controlled banks (PCBs)	0.2218	0.0000	0.4158	0.0000	1.0000
Foreign strategic investment (FSI)	0.2953	0.0000	0.4565	0.0000	1.0000
Ownership ratio of the government-controlled ownership (GCO)	0.2730	0.0700	0.2230	0.042	1
Ownership ratio of the SOE-controlled shareholders (SOECO)	0.2279	0.0000	0.1549	0.0644	0.87
Ownership ratio of the Privately controlled shareholders (PCO)	0.1802	0.0000	0.1802	0.1687	0.0481
Ownership Herfindahl index (HHI)	0.1339	0.0731	0.1842	0.0033	1.0000
Ownership concentration ratio (CR3)	0.4240	0.3746	0.2061	0.0070	1.0000
CRO on executive team (CRO)	0.1214	0.0000	0.3268	0.0000	1.0000
Independent risk committee (IRMC)	0.1769	0.0000	0.3819	0.0000	1.0000
% female directors (FEMALE)	0.0977	0.0800	0.0927	0.0000	0.4286

Note: all variables are defined in the Appendix.

Table 3
The impact of ownership structure on the Z-score.

Dependent variable (LnZ-score)	(1)	(2)	(3)	(4)
Constant	5.0929*** (16.19)	4.9384*** (16.85)	5.1047*** (17.39)	4.7383*** (18.83)
Ln(TA)	-0.2851*** (-3.85)	-0.2555*** (-3.55)	-0.2853*** (-3.96)	-0.2780*** (-3.76)
EFFICIENCY	-1.4722*** (-6.57)	-1.4991*** (-6.79)	-1.470*** (-6.78)	-1.4745*** (-6.63)
ADIV	0.2113 (1.04)	0.2103 (0.99)	0.2108 (1.06)	0.1462 (0.90)
TL/TD	0.1702 (0.86)	0.2595 (1.29)	0.1663 (0.87)	0.0995 (0.48)
GDP growth	-5.6249*** (-4.95)	-5.504*** (-4.85)	-5.6229*** (-5.36)	-5.7084*** (-5.63)
FSI	-0.0105 (-0.09)	-0.0165 (-0.14)	-0.0089 (-0.07)	-0.0314 (-0.25)
LIST	0.2855* (1.70)	0.2630 (1.51)	0.2845* (1.66)	0.4106** (2.11)
Post-GFS	0.2048*** (3.36)	0.2402*** (3.34)	0.2084*** (3.23)	0.1255*** (2.59)
SOECB	0.0368** (2.53)	0.0432* (1.69)	0.0587*** (2.97)	0.0603** (2.10)
PCB	0.0303* (1.92)	0.0218 (1.42)	0.0197 (1.48)	0.0113 (1.36)
HHI	-0.2764** (-2.05)	-0.2357* (-1.86)		
CR3			-0.3182* (-1.80)	-0.2451* (-1.69)
IRMC	0.0649 (0.99)	0.0532 (0.80)	0.0665 (0.95)	0.0929 (1.51)
CRO	0.2243** (2.49)	0.2246** (2.52)	0.2258** (2.50)	0.1754** (2.62)
FEMALE	0.5199** (2.01)	0.5129* (1.95)	0.5236** (1.99)	0.4835* (1.79)
HHI*SOECB		0.8675* (1.74)		
HHI*PCB		0.5877** (1.99)		
CR3*SOECB				0.6879** (2.32)
CR3*PCB				0.4168** (2.02)
No. of observations	667	667	667	667
R ²	0.2070	0.2141	0.2081	0.2336
F-statistics	10.67	9.46	10.63	9.52

Notes: This table reports the results from ordinary least squares (OLS) with clustering at the bank level. All variables are defined in the Appendix. Numbers in parentheses are t-statistics, computed using heteroskedasticity-robust standard errors.

* Indicates estimations that are significant at 10% level.
** Indicates estimations that are significant at 5% level.
*** Indicates estimations that are significant at 1% level.

SOECB and PCB are significantly positive, indicating that banks controlled by SOEs and private investors tend to take less risk than banks controlled by government agencies. The coefficient on HHI (Herfindahl index) is significantly negative as -0.2764 suggesting that higher ownership concentration could promote risk-taking. Furthermore, we find that the coefficient on CRO to be significantly positive indicating that CROs at the executive level help banks to improve their risk control. The coefficient on board gender diversity (FEMALE) is significantly positive suggesting that including more female directors on boards could help to restrain risk-taking behaviours. Our findings support those of *Almazan and Suarez (2003)* and *Farrell and Hersch (2005)*. The independence of the risk committee (IRMC) is found to have no impact on the Z-score. Regarding other control variables, the coefficients are significant and negative for bank size (LnTA) and the cost to income ratio (EFFICIENCY) showing that larger and more inefficient banks tend to take more risks. The coefficients are significant and positive for Post-global financial crisis (Post-GFS) and listing status of banks indicating that banks tend to take less risk after the global financial crisis and

after obtaining a listing (presumably because of the market discipline and scrutiny).

As reported in regression 2, the coefficients on HHI*SOECB and HHI*PCB are both significantly positive, showing that concentrated ownership in SOECBs and PCBs enhances risk control. This is in line with the literature that blockholders help to enhance governance quality (e.g., *Shehzad et al., 2010*; *Shleifer & Vishny, 1986*). Since the coefficient on PCB becomes insignificant in regression 2, it is worth noting that the impact of private controlling shareholders to reduce risks is only documented among banks with concentrated ownership. In regressions 3 and 4, we use the ownership ratio of the top three shareholders (CR3) to replace HHI as robustness checks and find that the results remain consistent.

Table 4 presents the results of the regressions with the non-performing loan ratio (the NPL ratio) as the dependent variable (a lower value of the NPL ratio indicates less risk-taking). The coefficients on SOECB (-0.0105) and PCB (-0.0104) are negative and statistically and economically significant as shown in regression 1. For a typical bank with the median level of non-performing loan (1.46%), the NPL ratio

Table 4
The impact of ownership structure on the non-performing loan ratio.

Dependent variable (NPL ratio)	(1)	(2)	(3)	(4)
Constant	-0.1185*** (-3.52)	-0.1076*** (-3.86)	-0.1511*** (-3.09)	-0.1505*** (-3.23)
Ln(TA)	0.0189** (2.03)	0.0077* (1.79)	0.0172** (2.14)	0.0150 (2.14)
Efficiency	0.1193*** (5.19)	0.1213*** (5.39)	0.1268*** (4.77)	0.1304*** (4.80)
ADIV	-0.0066 (-0.49)	0.0037 (-0.31)	-0.0109 (-0.79)	-0.0083 (-0.132)
TL/TD	0.0216 (1.25)	0.0167 (0.97)	0.0168 (1.02)	0.0173 (1.01)
GDP growth	0.1869** (2.29)	0.1773** (2.13)	0.2344** (2.13)	0.2171** (2.47)
FSI	-0.0011 (-0.20)	-0.0021 (-0.43)	-0.0056 (-0.87)	-0.0048 (-0.79)
LIST	-0.0174** (-2.24)	-0.0170** (-2.26)	-0.0223** (-2.33)	-0.0231** (-2.40)
Post-GFS	-0.0045* (-1.68)	-0.0049* (-1.69)	-0.0038* (-1.93)	-0.0043* (1.70)
SOECB	-0.0105*** (-2.69)	-0.0051 (-1.24)	-0.0123*** (-2.98)	0.0054 (0.60)
PCB	-0.0104* (-1.92)	-0.0039 (-0.89)	-0.0107** (-2.20)	0.0076 (0.63)
HHI	0.0495* (1.78)	0.0789** (2.18)		
CR3			0.0298** (1.97)	0.0347* (1.80)
IRMC	-0.0153*** (-3.09)	-0.0142*** (-3.14)	-0.0173*** (-2.83)	-0.0172*** (-2.83)
CRO	-0.0092** (-2.31)	-0.015** (-2.55)	-0.0094** (-2.36)	-0.0089** (-2.45)
FEMALE	-0.0381* (-1.76)	-0.0299 (-1.55)	-0.0423* (-1.82)	-0.0376* (-1.73)
HHI*SOECB		-0.0887** (-2.00)		
HHI*PCB		-0.1086*** (-2.75)		
CR3*SOECB				-0.0370* (-1.83)
CR3*PCB				-0.0486** (-2.28)
No. of observations	667	667	667	667
R ²	0.3456	0.3874	0.3129	0.3219
F-statistics	5.38	4.81	4.96	4.32

Notes: This table reports the results from ordinary least squares (OLS) with clustering at the bank level. All variables are defined in the Appendix. Numbers in parentheses are t-statistics, computed using heteroskedasticity-robust standard errors.

* Indicates estimations that are significant at 10% level.
** Indicates estimations that are significant at 5% level.
*** Indicates estimations that are significant at 1% level.

decreases by around 70% to 0.41% when the controlling shareholder in GCBs is replaced by either a SOE or private company. This is consistent with our prediction that the SOECBs and PCBs rather than GCBs tend to take less risk. The coefficients on ownership concentration measures, HHI and CR3, are significantly positive across all models. The results are also economically significant suggesting that banks with concentrated ownership tend to pursue risk-taking activities.

When we incorporate the interaction terms of controlling shareholders' identity and ownership concentration in regressions 2 and 4, the significant and negative coefficients show that a higher degree of ownership concentration further reduces the non-performing loans of SOECBs and PCBs, leading to higher asset quality. Since the coefficients on SOECB and PCB become insignificant in regressions 2 and 4, the impact of private and SOE controlling shareholders to reduce risk-taking is only pronounced in banks with concentrated ownership. Finally, the coefficients on IRMC, CRO and FEMALE are negative and significant showing that the independence of the risk committee, the presence of the CRO on the executive team, and a greater number of

women on the board all help improve banks' risk management and reduce their non-performing loans.

Table 5 presents the results based on the third risk measure of risk-taking, namely the capital adequacy ratio (CAR). A higher value of CAR indicates less risk-taking. The coefficients on SOECB are significantly positive in regressions 1, 3, and 4, while the coefficients on PCB are not significant. This indicates lower risk-taking in SOECBs, but not in PCBs, when compared with the GCBs. The coefficients on HHI and CR3 are statistically significant and negative showing that concentrated ownership helps to increase CAR. When the interaction terms of the controlling shareholder identity and ownership concentration are incorporated in regressions 2 and 4, the coefficients for HHI*SOECB and CR3*SOECB are significant and positive while these for SOECB itself become insignificant. This shows that the positive impact of SOE controlling shareholders on increasing CAR and reduced risks are only pronounced among banks with concentrated ownership. Similarly, we find that the coefficients for HHI*PCB are positive and statistically significant at the 5% level, suggesting that the PCBs with concentrated ownership tend to take less risk than those with dispersed ownership.

Table 6 reports the results of Eq. (3) that examines how the ownership ratio of various types of controlling shareholder affects the banks' risk taking behaviours. For each of the risk measures, we run two types of OLS regressions, one (regressions 1, 3 and 5) intended to capture the linear impact, and one (columns 2, 4 and 6) intended to capture the non-linear impact by including squared terms GCO^2 , $SOECO^2$, and PCO^2 . The coefficients on GCO are significantly positive in the regression of NPL ratio (regression 3) and negative in the regression of CAR (regression 5), suggesting that the higher the ownership ratio of the government controlling shareholders, the higher the risks taken by the banks. In regressions 4 and 6, the coefficients on the quadratic terms (GCO^2) are statistically significant and positive, while the coefficients on the level terms (GCO) become insignificant. The results suggest that when the government-controlled ownership is at a low level, the controlling shareholder does not significantly affect the bank's risk taking behaviours. However, a further increase in government ownership concentration may create control ambitions and the capability for the controlling shareholder to expropriate minority shareholders by taking extra risks. In addition, we find that the coefficients on SOECO are statistically significant but not the coefficients of $SOECO^2$, suggesting a linear relationship between SOE ownership concentration and bank risk taking. Higher ownership concentration increases the incentive and power for a SOE controlling shareholder to monitor management and reduce bank risk-taking: the larger is the ownership of the SOE controlling shareholder, the less risk the banks take. Regarding private controlling ownership, we find that the coefficients on the quadratic terms (PCO^2) are statistically significant and positive only in the Z-score model, suggesting that high levels of private controlling ownership help banks to control their risks in terms of the Z-score. Finally, the results also show that a higher foreign ownership could reduce banks' risk-taking.

5.2. Robustness checks

This section intends to address the concern of endogeneity. We first argue that our setting is unlikely to be subject to the endogeneity problem because the type of controlling shareholders of Chinese banks is exogenously determined by the Chinese regulatory authorities according to the agenda of the reform and relevant policies. However, as a robustness check we apply the system generalized method of moments (GMM) to further mitigate the concern about endogeneity. The system GMM estimation results for Eq. (1) are presented in Table 7. The results show that SOE controlled banks tend to take less risk than government controlled banks and concentrated ownership leads to more risk-taking behaviours. Private controlled banks also tend to control the risk by reducing the non-performing loans.

Table 5 The impact of ownership structure on the capital adequacy ratio.

Dependent variable (CAR)	(1)	(2)	(3)	(4)
Constant	0.3898*** (8.76)	0.3653*** (10.01)	0.4182*** (6.97)	0.4068*** (7.20)
Ln(TA)	-0.0249*** (-3.77)	-0.0201*** (-4.11)	-0.0308** (-3.20)	-0.0267** (-3.22)
Efficiency	-0.1382*** (-4.51)	-0.1425*** (-4.66)	-0.1455*** (-4.29)	-0.1516*** (-4.37)
ADIV	0.0320** (2.04)	0.0559*** (-2.70)	0.0362* (2.21)	0.0359* (2.26)
TL/TD	-0.0698*** (-3.43)	-0.0687*** (-3.25)	-0.0645*** (-3.39)	-0.0571*** (-2.92)
GDP growth	-0.5659*** (-5.19)	-0.541*** (-5.29)	-0.6111 (-5.05)	0.5843*** (-4.99)
FSI	0.0088 (1.39)	0.0079 (1.26)	0.0128* (1.71)	0.0113 (1.60)
LIST	0.0283*** (2.83)	0.0246*** (2.73)	0.337*** (2.82)	0.0340*** (2.90)
Post-GFS	0.0092* (2.10)	0.0105** (2.41)	0.0126** (2.24)	0.0908* (1.85)
SOECB	0.0139** (2.03)	0.0028 (0.41)	0.0126** (1.97)	0.0197* (1.76)
PCB	0.0032 (0.65)	-0.0032 (-0.72)	0.0038 (0.86)	-0.0156 (-1.30)
HHI	-0.0645** (-1.98)	-0.0749** (-2.02)		
CR3			-0.0366* (-1.73)	-0.0371* (-1.80)
IRMC	0.0122* (1.79)	0.0102 (1.63)	0.0137* (1.78)	0.0120 (1.55)
CRO	0.0172** (2.94)	0.0182*** (2.99)	0.0171*** (3.04)	0.0167*** (3.11)
FEMALE	0.0496* (1.87)	0.0422* (1.70)	0.0528* (1.86)	0.0486* (1.82)
HHI*SOECB		0.1389** (2.30)		
HHI*PCB		0.0989** (2.13)		
CR3*SOECB				0.0729*** (2.79)
CR3*PCB				0.0492 (1.53)
No. of observations	667	667	667	667
R ²	0.3416	0.3643	0.3290	0.3406
F-statistics	6.01	7.29	5.64	5.33

Notes: This table reports the results from ordinary least squares (OLS) with clustering at the bank level. All variables are defined in the Appendix. Numbers in parentheses are t-statistics, computed using heteroskedasticity-robust standard errors.

- * Indicates estimations that are significant at 10% level.
- ** Indicates estimations that are significant at 5% level.
- *** Indicates estimations that are significant at 1% level.

Table 6

The impact of ownership ratios of controlling shareholders on banks' risk-taking behaviour.

Models	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables	Ln(Z-scores)		NPL ratio		CAR	
Constant	4.8039*** (16.15)	4.7862*** (15.08)	−0.0975*** (−3.52)	−0.0709*** (−3.22)	0.3379*** (9.14)	0.3152*** (12.06)
Ln(TA)	−0.2019*** (−3.68)	−0.1947*** (−3.70)	0.0048 (1.23)	−0.0013 (−0.38)	−0.0140*** (−3.16)	−0.0103*** (−3.41)
Efficiency	−1.5083*** (−7.12)	−1.4994*** (−7.07)	0.1283*** (4.93)	0.1241*** (5.46)	−0.1470*** (−4.20)	−0.1433*** (−4.53)
ADIV	0.0916 (0.62)	0.0956 (0.57)	−0.0019 (−0.16)	0.0046 (0.42)	0.0288* (1.89)	0.0214 (1.54)
TL/TD	0.1425 (0.74)	0.2362 (1.09)	0.0135 (0.80)	0.0102 (0.59)	−0.0548*** (−2.86)	−0.0511** (−2.40)
GDP growth	−5.0587*** (−4.27)	−5.1367*** (−4.37)	0.1495* (1.86)	0.0054*** (3.71)	−0.4963*** (−4.44)	−0.5045*** (−4.73)
Post-GFS	0.1128*** (2.75)	0.0943* (1.90)	−0.0056** (−2.12)	−0.0045* (−1.66)	0.0067* (1.74)	0.0058 (1.52)
GCO	−0.2163 (−0.95)	−0.5366 (−1.03)	0.0614* (2.42)	−0.0704 (−1.57)	−0.0601** (−2.05)	0.0424 (0.79)
SOECO	0.3653* (2.03)	1.1357* (1.86)	−0.0508** (−2.05)	−0.0743** (2.04)	0.0385* (1.92)	0.0351 (0.56)
PCO	0.0688 (0.37)	−0.8191 (−1.40)	−0.084 (−0.38)	−0.0485 (−0.84)	−0.0292 (−1.11)	0.0353 (0.67)
FSO	0.6060* (1.76)	0.7266* (1.92)	−0.0351 (−1.32)	−0.0969 (−1.08)	0.0799** (2.32)	0.0727** (2.18)
GCO ²		0.1896 (0.26)		0.1621** (2.22)		−0.1359* (−1.80)
SOECO ²		1.8186 (1.34)		0.0785 (1.50)		−0.0241 (−0.27)
PCO ²		1.2565** (2.07)		0.0263 (0.43)		0.0471 (0.89)
IRMC	0.0678 (0.98)	0.0669 (1.09)	−0.0157*** (−2.83)	−0.0108*** (−2.98)	0.0117 (1.58)	0.0077 (1.32)
CRO	0.1871** (2.45)	0.1978*** (2.62)	−0.0079* (−1.85)	−0.0074* (−1.93)	0.0143** (2.17)	0.0143*** (2.27)
FEMALE	0.5289** (2.01)	0.5489** (2.09)	−0.0367* (−1.72)	−0.0239 (−1.25)	0.0500* (1.87)	0.0393 (1.58)
No. of observations	667	667	667	667	667	667
R ²	0.1989	0.2095	0.3306	0.3908	0.3292	0.3567
F-statistics	12.16	10.23	4.78	5.3	6.46	9.39

Notes: This table reports the results from ordinary least squares (OLS) with clustering at the bank level. All variables are defined in the Appendix. Numbers in parentheses are t-statistics, computed using heteroskedasticity-robust standard errors.

* Indicates estimations that are significant at 10% level.

** Indicates estimations that are significant at 5% level.

*** Indicates estimations that are significant at 1% level.

Overall, the GMM results are generally consistent with the main findings.¹¹

6. Conclusion

The “Principles for enhancing sound corporate governance” (BCBS, 2010) issued by the Basel Committee on Banking Supervision (BCBS) highlighted the possible inappropriate influence from the controlling shareholders of banks and the serious consequence of excessive risk-taking of banks on the economy. The ongoing reform in the banking sector in China also largely focuses on the ownership structure in order to improve the efficiency and prudence of Chinese banks. To shed light on this interesting yet under-researched issue, our study examines how ownership structure and risk management-related corporate governance influence the risk-taking behaviour of Chinese banks. Based on the type of controlling shareholder, we classify Chinese commercial banks into government-controlled banks (GCBs), SOE-controlled banks (SOECBs), and privately controlled banks (PCBs). Our empirical results show that SOECBs and PCBs take less risk when

compared with GCBs. The results support our argument that the incentives to engage in prudent lending practices and to adhere to commercial objectives are weak for banks controlled by the government. We also find that the effect to reduce risks by the SOE and private controlling shareholders is more pronounced among banks with concentrated ownership.

Our findings should have relevance for the work of policy makers. Market-oriented SOEs seem to be more efficient controlling shareholders for firms in countries with weak institutional environments (Stiglitz, 1999). Therefore, an important policy implication of this study is that the Chinese government should continue to transfer its bank ownership to marketized SOEs as this helps to improve the stability of the Chinese banking system. Secondly, because concentrated ownership has been found to further promote risk control in SOECBs and PCBs, Chinese banking regulators should be cautious about the dispersed ownership of banks. In the weak governance environment of China, investors with dispersed ownerships could find it difficult to exert an impact on bank management. Finally, this study finds evidence that listing banks on the stock market could enhance their governance procedures and reduce the level of risk-taking. Chinese authorities should encourage banks to list on the stock exchanges, which exert effective discipline over bank management and in turn restrains bankers from taking excessive risks.

¹¹ The untabulated GMM estimation results for Eqs. (2) and (3) remain consistent with our main findings and are available upon request.

Table 7
Robustness checks with generalized method of moment (GMM) estimates.

Dependent variables	Ln(Z-scores)	NPL ratio	CAR
Constant	1.8184 (0.86)	0.2456** (2.04)	0.0158 (0.11)
Ln(TA)	-0.0567 (-0.16)	-0.3174* (-1.78)	0.0671** (2.49)
Efficiency	-0.9491*** (-3.92)	0.1718 (1.20)	-0.0729 (-1.26)
ADIV	0.7500 (0.99)	-0.0645 (-1.30)	-0.0015 (-0.04)
TL/TD	2.5832* (1.67)	-0.2354 (-1.10)	-0.1531** (-1.97)
GDP growth	-7.0498** (-1.98)	0.2182 (1.09)	-0.0901 (-0.34)
FSI	0.0685 (0.16)	-0.0039 (-0.22)	-0.0654 (-1.36)
LIST	0.8512** (2.29)	-0.0443** (-2.13)	0.3619 (1.08)
Post-GFS	-1.518 (-1.39)	-0.0050 (-0.76)	0.0063 (0.73)
SOECB	0.4813** (2.27)	-0.0404** (-2.20)	0.1375*** (3.07)
PCB	1.2715 (1.35)	-0.0750** (-2.08)	-0.1202 (-1.94)
HHI	-0.3268 (-0.89)	0.1462** (2.22)	-0.2382*** (3.67)
IRMC	-0.7489 (-1.39)	-0.1014 (-0.49)	-0.0078 (-0.35)
CRO	0.2986* (1.80)	-0.0431* (-1.74)	0.0536** (1.99)
FEMALE	0.5614 (0.29)	-0.2902*** (-4.73)	0.3015*** (2.86)
AR(1)/AR(2)	0.136/0.497	0.329/0.828	0.136/0.497
Sargan/Hansen tests	0.673/0.969	0.982/0.948	0.908/0.548

Notes: This table reports the results from two step system generalized method of moments (GMM). All variables are defined in the Appendix. Numbers in parentheses are z-statistics, Sargan and Hansen are the p value of the Sargan and Hansen test statistics of over-identifying restrictions. AR(1)/AR(2) reports the p value of the first- and second-order autocorrelation test statistics.

* Indicates estimations that are significant at 10% level.
** Indicates estimations that are significant at 5% level.
*** Indicates estimations that are significant at 1% level.

Appendix A. Definition of variables and data source

Variables	Definition
Z-score	$\frac{ROA+E/TA}{\sigma(ROA)}$, where ROA is return on assets, E/TA is the ratio of equity to total assets and $\sigma(ROA)$ is the standard deviation of return on assets.
Non-performing loan ratio (NPL ratio)	Ratio of non-performing loans to total loans
Capital adequacy ratio (CAR)	Risk-weighted capital adequacy ratio
Bank size (LnTA)	Log of total assets of a bank
Cost/income (EFFICIENCY)	Ratio of total costs to total income
Asset diversity (ADIV)	$1 - \frac{ \text{Net loans} - \text{Other earning assets} }{\text{Total earning assets}}$
Loans/deposits (TL/TD)	Ratio of total loans to total funding
Listing status (LIST)	A dummy variable equal to 1 if a bank has been listed at the end of the year and 0 otherwise
Economic growth (GDP %)	Annual growth rate of GDP
Post-global financial crisis (Post-GFS)	A dummy variable equal to 1 for the period following the start of the global financial crisis (2008–2011) and 0 otherwise
Government-controlled banks (GCBs) (Omitted)	A dummy variable equal to 1 if the biggest shareholder is a state bureau or a state asset operating company and 0 otherwise.
SOE-controlled banks (SOECBs)	A dummy variable equal to 1 if the biggest shareholder is a state-owned enterprise (SOE) and 0 otherwise
Privately controlled banks (PCBs)	A dummy variable equal to 1 if the biggest shareholder is a private firm or individual and 0 otherwise
Foreign strategic investment (FSI)	A dummy variable equal to 1 if a bank has foreign strategic investment and 0 otherwise
Government-controlled ownership (GCO)	The percentage of shares owned by a state bureau or a state asset operating company if that owner is the largest shareholder
SOE-controlled ownership (SOECO)	The percentage of shares owned by a SOE if that owner is the largest shareholder
Privately controlled ownership (PCO)	The percentage of shares owned by a private company (or an individual) if that owner is the largest shareholder
Foreign strategic ownership (FSO)	The percentage of shares owned by foreign strategic investors
Ownership Herfindahl index (HHI)	Herfindahl index based on the ownership held by the ten largest shareholders of the bank.
Ownership concentration ratio (CR3)	The percentage of shares owned by the top three shareholders
CRO on the executive team (CRO)	A dummy variable equal to 1 if the Chief Risk Officer (CRO) is a member of the executive team and 0 otherwise.
Independent risk management committee (IRMC)	A dummy variable equal to 1 if the chair of the committee is an independent director and 0 otherwise.
% female directors (FEMALE)	The proportion of female directors on the board

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