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Abstract:

Credit borrower concentration arises when a bank or financial institution lends a large amount of its funds to a few large borrowers. We find that borrower concentration is positively related to non-performing loans and negatively related to financial performance. We also find that the voting power of bank's controlling shareholder is positively related to the borrower concentration. The evidence is consistent with the view that controlling shareholders divert resources away from banks by extending a high volume of loans to a few related parties, which leads to high borrower concentration. Further evidence indicates that some seemingly unrelated large borrowers, as reported in the financial disclosure, are actually related to the controlling shareholders. We also provide evidence that going public mitigates the tunneling activities of controlling shareholders.

Keywords: Borrower Concentration; Related Lending; Banks; Tunneling; China

1. Introduction

Credit borrower concentration arises when a bank or financial institution lends a large amount of its funds to a few large borrowers. Although concentration of borrowers is considered by global banking regulators as an important threat to the safety of banks, and regulations have been established to constrain its possible adverse effects,[1] the academic literature has devoted little attention to this issue. A few studies examine loan concentration across sectors or regions (for example Acharya et al., 2006; Berger et al., 2010), but credit concentration across large borrowers has not been thoroughly investigated.

In this paper, we use a sample of Chinese commercial banks to examine the determinants and consequences of credit concentration across large borrowers. Borrower concentration is generally high in China. For example, during our sample period from 2006 to 2011, the loan to the largest borrower represents on average 21.7% of bank's net capital, and the loans to the largest ten borrowers total on average 88.2% of bank's net capital. These figures are significantly higher than the large exposure limits specified by the Commercial Bank Law or the banking regulator, suggesting that commercial banks in China bear a substantial credit risk due to borrower concentration.[2] The foregoing figures also suggest that some banks have a strong motivation to maintain a high degree of borrower concentration.

Our empirical tests indicate that the degree of borrower concentration is significantly positively associated with non-performing loans, and significantly negatively associated with

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[1] The Basel Committee regarded credit concentration as the cause of a "significant proportion of major bank failures", of which credit borrower concentration is an important type. See "Measuring and Controlling Large Credit Exposures", Basel Committee on Banking Supervision, Basel, 1991.

[2] As explained later, enforcement of the law with respect to loan concentration has not been effective.

operating performance. We also find that when the ownership percentage of the largest

shareholder is high, or when the ownership gap between the largest shareholder and other

blockholders is high, borrower concentration is high. This evidence is consistent with the

tunneling view: Controlling shareholders divert resources away from banks by extending a high

volume of loans to a few related parties, which leads to a high degree of borrower concentration

and is detrimental to banks' interests.

We further conduct a series of tests to corroborate our results. First, we find that although

the correlation between related loans as reported in the bank's financial statements and borrower

concentration is significantly positive, the reported related loans are significantly smaller than

the loans to the top 10 borrowers. Moreover, when we carefully examine the detailed information

on large borrowers, we find that many large borrowers, although not being identified as related

in the financial reports, are actually related parties of large shareholders. Taken together, the

evidence suggests that banks may intentionally avoid reporting related lending because related

lending is subject to strict scrutiny. Second, we find that borrower concentration has incremental

explanatory power in explaining non-performing loans and operating performance, even after

controlling for reported related lending activities. The evidence suggests that borrower

concentration could be used as a better indicator of tunneling than reported related lending.

Third, we provide evidence that stock market listing mitigates borrower concentration, perhaps

due to enhanced governance mechanisms.

Our paper contributes to the literature in the following aspects. First, although the

importance of borrower concentration risk has been well recognized among regulators, there are

few studies on this issue. We utilize hand-collected data and thoroughly examine the

determinants and consequences of borrower concentration. In support of the *tunneling view*, our

findings enhance our understanding of borrower concentration and contribute to future monitoring of relevant risk. Alerted by the financial crisis of 2008, many countries intend to impose stricter limits on borrower concentration. For example, the proposal by the Federal Reserve of the United States to extend the single borrower limit to financial groups[3] met resistance from banks. Japanese regulators have made a similar proposal.[4] Our findings support these proposals by showing that a high degree of borrower concentration is associated with high default risk and low financial performance.

Second, the literature has found that controlling shareholders use related lending as a channel to divert resources from minority shareholders and depositors (La Porta et al., 2003; Laeven, 2001). This related lending is detrimental to banks and distorts the capital allocation process. However, when monitoring related lending, it is often difficult to identify related parties. Moreover, banks could intentionally structure loans to avoid reporting related lending. Our paper finds evidence that some seemingly unrelated large borrowers are, in fact, related to controlling shareholders. Our results indicate that borrower concentration can serve as a simple proxy for tunneling, suggesting that close monitoring of borrower concentration may contribute to investor protection.

Third, though Allen et al. (2005) suggest that informal financing is important in China, Ayyagari et al. (2010) find that the formal banking system contributes to the fast growth of China's economy. Our study examines how banks allocate credit across borrowers and the associated economic consequence. Our paper contributes to the understanding of the banking system in China, the largest emerging market.

The remainder of the paper is organized as follows. Section 2 provides background

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[3] "Banks urge Fed retreat on credit exposure", By Tom Braithwaite, Financial Times, Aug 15, 2012.
[4] "Japan's FSA plans tougher lending limits on banks: Nikkei", Reuters, Oct 16, 2012.

information on China's banking system and a review of prior research. Section 3 discusses our sample and descriptive statistics. Section 4 presents our main empirical analyses of the determinants and economic consequences of borrower concentration. Section 5 includes additional tests. Section 6 concludes.

2. Institutional background and prior literature

2.1. Lending limits to large borrowers

The safety of the banking system is important for the modern economy. Bank regulators worldwide have designed an increasingly complex system to control risk (i.e., Basel I, II and III). Among the variety of risks under consideration, the large credit exposure of a bank to an individual borrower, or a group of related borrowers, is significant. If a creditor with large loans experienced financial difficulties, the bank would incur significant financial losses or even failure. The Asian financial crisis (1997-1998) and the failure of large companies (such as Enron) have illustrated the danger of a high degree of credit concentration.

To control the risk of credit concentration, regulators have established policies on lending limits or large exposure, which set a maximum share of a bank's capital that can be lent to a single borrower or a group of related borrowers.[5] For example, lending limits on loans to a single borrower have been an integral part of United States bank regulation since its inception in 1863. The lending limit for a single borrower was initially set at 10% of net capital and was subsequently changed to 15%.[6] In the United Kingdom, large exposure limits were introduced in 1984, as a result of the rescue of Johnson Matthey Bankers (JMB), and these rules were subsequently adopted by banking regulators in the European Union. According to Morris (2001),

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[5] The usual regulations in Basel I and II focus on risk-adjusted capital requirements. The limit of large exposure represents a direct limit on banks' risk taking. (Schooner and Taylor, 2010)
[6] An additional 10% is allowed if the loan is totally secured by readily marketable collateral.

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most countries have similar lending limits.[7] In January 1991, the Basel Committee issued an article titled "Measuring and Controlling Large Credit Exposures", which discusses the important issues in measuring and controlling large credit exposures. The paper clearly indicates that a "significant proportion of major bank failures have been due to credit risk concentration of one kind or another" and "it is important for supervisors to consider measures limiting banks' exposures to concentrated forms of credit risk in general and large borrowers in particular".

Although regulators realize the importance of controlling concentration risk, especially borrower concentration, academic works seem to focus exclusively on industry or sector concentration. For example, theoretical models of intermediation (see Diamond, 1984; Ramakrishnan and Thakor, 1984) suggest that credit diversification into new sectors makes it less expensive for banks to achieve credibility in their role as screeners and reduces the banks' probability of default. Empirical works do not provide clear support for related theoretical arguments. Acharya et al. (2006) examine the effect on return and risk of credit diversification in industries and sectors. Using a sample of 105 Italian banks, the authors find that diversification does not produce superior performance or greater safety for banks. The authors suggest that concentrated banks can enjoy the benefits of expertise in the industries in which they concentrate while there are diseconomies of diversification for a bank that expands into industries in which it faces a high degree of competition or lacks prior lending experience. Similarly, Berger et al. (2010) and Tabak et al. (2011) find that loan portfolio concentration increases bank performance and reduces default rates. These papers all examine loan concentration in industries (or sectors) and do not examine loan concentration across large borrowers.

Although both industry and borrower concentration are related to the concept of loan

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[7] The only two exceptions that have no lending limits are Australia and New Zealand. However, these countries have other measures to control credit concentration risk.

diversification, they are significantly different. First, banks with a high degree of industry concentration may not have a high degree of borrower concentration. This is because an industry may have a large number of firms and banks have sufficient choices to diversify borrowers within the industry. Second, when banks focus on a few industries, they bear the relevant industry risks. However, when banks lend loans to a few large borrowers, they bear the risks associated with these large borrowers. The risk that an industry as a whole will experience financial difficulties is generally much lower than is the case for an individual borrower. This makes industry concentration a less risky choice than borrower concentration. Third, when a bank focuses on one industry, it can obtain industry expertise and apply it to other companies in the same industry. However, when a bank focuses on a few large borrowers, it can only obtain related information for the specific borrowers. Such information may not apply to other borrowers. Fourth, as La Porta et al. (2003) indicate, large borrowers are typically related parties of the large shareholders of the lending bank. The researchers also indicate that large shareholders can employ related lending to expropriate the interests of minority shareholders. There are no similar concerns regarding expropriation related to industry concentration. Because of the above difference and the lack of research on borrower concentration, we believe an investigation of borrower concentration is warranted.

2.2. The institutional background of China

China's economy has grown rapidly in the past 30 years and it has become the second largest in the world. The financial assets of the banking sector represented approximately 250% of China's GDP in 2012, indicating the importance of the sector to China's economy. Prior to 1978, China had a planned economy in which all banks were controlled by the state and acted

within a single administrative hierarchy (Lin and Zhang, 2009). Since 1978 (and especially after 1998), the government has substantially reformed the banking system. Except for three policy banks, banks have been restructured as profit-oriented entities. Private or even foreign investors have been introduced into the banks' ownership structures. Presently, China has over 160 commercial banks, including the four largest state-owned banks.[8] Sixteen commercial banks have undertaken IPOs and are listed on the stock market.

Similar to other countries, China's regulators have recognized the risk of borrower concentration. In "China's Law of Commercial Banks" issued in 1995 and a regulation released by PBC and CBRC in 1996, there is an explicit limit on large exposure. The largest loan to a single borrower cannot exceed 10% of net capital, the largest loan to a company group cannot exceed 15% of net capital, and the largest ten loans cannot exceed 50% of net capital.[9] Although regulators have issued regulations on large exposure, many banks have loan concentration exceeding the specified limits. (Many media reports on loan concentration can be found in financial websites, such as Sina.com or China daily.)

In this paper, we use Chinese banks to analyze the borrower concentration problem for the following four reasons. First, similar to other countries, China has limits on large exposure, which means that findings on China could be applicable to other countries. Second, China's banks are required to disclose detailed information on their largest ten borrowers, which makes our investigation feasible. Other countries do not typically require the disclosure of information on credit concentration.[10] Third, the problem of borrower concentration is severe in China, which facilitates obtaining meaningful results. Fourth, the importance of China's economy and

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[8] The four largest banks are the Bank of China (BOC), the Agriculture Bank of China (ABC), the Construction Bank of China (CBC), and the Industrial and Commercial Bank of China (ICBC). These four banks have more assets and branches than the remaining banks and are called the "Big Four" (see discussions in Lin and Zhang 2009).

[9] On October 26, 2010, PBC and CBRC cancelled the regulation on the limit to the top 10 borrowers.

[10] We have randomly examined financial statements for a sample of banks in the United States, United Kingdom, and Japan, and cannot find similar information disclosed in their financial statements.

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China's banking sector suggests that understanding the behavior of Chinese banks could be of interest to both regulators and investors around the world.

2.3. Understanding borrower concentration

Traditional arguments (such as Diamond, 1984) suggest that banks should be as diversified as possible. Diversification across borrowers has the potential to reduce default risk and the cost of monitoring borrowers. However, as in our sample, banks often maintain a high degree of borrower concentration despite regulations on large exposure. To understand the high borrower concentration, we propose two different views based on prior literature.[11]

The first is the *monitoring view*; that is, banks maintain a high degree of borrower concentration to maintain close relationships with a few important borrowers. Banks can obtain more information from those borrowers and closely monitor their operations (Dass and Massa, 2011). The *monitoring view* is consistent with findings in Acharya et al. (2006), who find that for high-risk banks, diversification reduces bank returns while producing riskier loans, while for low-risk banks, diversification also produces an inefficient return-risk tradeoff. Acharya et al. (2006) attribute their results to the deterioration in the effectiveness of bank monitoring associated with loan diversification. Berger et al. (2010) also examine the effect of loan diversification on bank performance. Using loan portfolio information from Chinese banks, the authors provide robust evidence that diversification is associated with reduced profit and efficiency. Tabak et al. (2011) obtain similar results for Brazilian banks. Although the diversification examined in these papers is primarily across industries, the basic rationale can be applied to diversification across borrowers.

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[11] An alternative view is that banks are taking excessive risks. We do not discuss this view in the text since there is no plausible reason to explain the purpose of this behavior. Also, our empirical results do not support this view. If the high concentration of borrowers is just high risk, then firms with concentrated borrowers should have high operating performance, which is against our empirical results.

The second is the *tunneling view*; that is, a high degree of concentration across borrowers is due to a large amount of harmful related lending. Utilizing a sample of Mexican banks, La Porta et al. (2003) find that on average 20 percent of the top 300 loans of Mexican banks are made to related borrowers. For larger loans, the percentage could be even higher. In a representative case discussed in the paper,[12] the authors find that related parties obtained twelve of the largest twenty loans outstanding. The authors find that related lending has lower interest rates but higher default rates than other types of loans, suggesting that controlling shareholders use related lending as a channel to expropriate the interests of minority shareholders. Laeven (2001) examines the use of related lending in Russia and reaches similar conclusions. In China, bank ownership is concentrated among a few large shareholders. As a developing country, China has an underdeveloped legal system and weak investor protection (Allen et al., 2005), which provides controlling shareholders with substantial latitude to expropriate minority shareholders. Previous studies find that the expropriation of minority shareholders by large shareholders is pervasive in China (Jian and Wong, 2010; Jiang et al., 2010). Therefore, it is reasonable to conjecture that large shareholders of commercial banks may divert a large volume of funds to companies that they control, which will lead to a high concentration of borrowers.

To distinguish between the *monitoring view* and the *tunneling view*, we can examine the association between borrower concentration and bank performance. If the *monitoring view* holds, then borrower concentration should be associated with low risk and high operating performance. Conversely, if the *tunneling view* dominates, then borrower concentration should be associated with high risk and low operating performance. Moreover, controlling shareholders can only engage in tunneling behavior when they can dominate the firm's decision making. Therefore, the *tunneling view* predicts a positive relationship between the level of control exercised by large

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[12] The case discussed is BancoSerfin, which is the third largest bank in Mexico.

shareholders and concentration. We empirically examine these relationships to test which view

has more predictive power in China.

3.   Sample, variables, and descriptive statistics

3.1. Sample

   Our sample is an unbalanced panel including 118 Chinese commercial banks during the

period 2006-2011, totaling 366 bank-year observations.[13] We hand collect financial and

corporate governance information from the websites of the commercial banks or the Financial

Times (in Chinese), a publicly available data source in which the China Banking Regulatory

Commission (CBRC hereafter) requires banks to disclose relevant information.[14] Economic data

come from the China Stock Market and Accounting Research (CSMAR) database. To be

included in our sample, a bank must report required information such as large borrowers,

ownership, financial performance and other variables.

   Table 1 describes the sample distribution across the years under analysis. There are 46, 61,

53, 61, 74 and 71 observations in 2006, 2007, 2008, 2009, 2010 and 2011, respectively, and the

total number of observations is 366, representing 40.26% of the total population of bank-year

observations.[15] The distribution does not exhibit severe temporal clustering.

<div align="center">[Insert table 1 here]</div>

3.2. Variable definitions

   Our main variable of interest is borrower concentration. Chinese commercial banks are

required by the regulator (i.e., the CBRC) to disclose their ten largest loans in their annual

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[13] Because of the difficulty of collecting necessary data, some banks only show in our sample once (29 banks) or twice (28 banks). To ensure the robustness of our results, we delete banks that appear only once or twice and reanalyze the data. Our conclusions do not change.

[14] The website is http://www.financialnews.com.cn/.

[15] Because the majority of banks are not publicly listed, their financial information may not be accessible or may be incomplete for our analyses. However, our sample includes most large banks and is representative of the banking industry. The total assets of our sample banks are on average 83.8% of the total assets of the whole commercial bank population.

reports. We utilize the disclosed information to construct two variables: LC1 is the loan to the largest borrower, and LC10 represents the loans to the top 10 borrowers. These two variables are both deflated by the net capital of the bank. We use net capital as our deflator because the CBRC, similar to other regulators, establishes limits on large loan exposure using net capital. We use the largest related loans as a percentage of net capital (R1) and the top 10 related loans as a percentage of net capital (R10) to measure the related transactions between banks and their related borrowers.

We employ the non-performing loan ratio (NPL) to measure a bank's lending quality. A high value of the NPL ratio indicates high lending risk, or low loan quality. The ratio of impaired loans to gross loans is a standard proxy for a bank's asset risk or loan quality (Choudhry et al., 2010; Iannotta et al., 2007). Tabak et al. (2011) also use non-performing loans as a proxy for bank risk when investigating the effects of loan portfolio concentration on the risk faced by Brazilian banks. We use return on assets (ROA) and operating income on assets (OROA) to measure banks' financial performance. The difference between these two measures is that OROA can mitigate the bias caused by non-operating items. These two measures are often used as proxies for banks' operating performance (see for example Iannotta et al., 2007; Andres and Vallelado, 2008; Haw et al., 2010; Choudhry et al., 2010). Together NPL, ROA and OROA can measure banks' levels of risk and operating efficiency.

Haw et al. (2010) suggest that concentrated ownership is a necessary condition for tunneling behavior on the part of large shareholders. When the largest shareholder holds controlling ownership in the bank, it can more effectively affect the bank's lending decisions for its own benefit. We include the percentage of shares held by the largest shareholder (FIRST). We also calculate the percentage of shares held by the largest shareholder divided by the percentage of

shares held by the second through tenth shareholders (HCR). FIRST represents the voting power

of the largest shareholder, while HCR compares the relative voting power of the largest

shareholder to that of other block shareholders. If other block shareholders have more shares or

voting rights, they are more likely to constrain the expropriation behavior of the largest

shareholder. To mitigate the effects of outliers, we include the binary versions of these two

variables in our regressions[16]: FD equals 1 if a bank's FIRST value is above the sample median

in that year, 0 otherwise; HCRD equals 1 if a bank's HCR value is above the sample median in

that year, 0 otherwise. We include STATE to reflect whether a bank's largest shareholder is the

government or a state-owned enterprise. For detailed variable definitions, please refer to

Appendix A.

3.3. Descriptive statistics

Table 2 reports some statistics for our sample. The mean (median) values of LC1 and LC10

are 21.7% (7.5%) and 88.2% (48.9%), respectively. The evidence suggests that a large

proportion of banks (approximately 50% of observations) have exceeded the limits on large

borrower concentration. The maximum of LC1 (LC10) in our sample is 4.405 (8.930), indicating

that the loans to the largest borrower (top 10 borrowers) account for 440.5% (893%) of net

capital, which is much larger than the legal limits. From table 2, we can infer that the

enforcement of banking regulation has not been effective.[17] However, a more interesting

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[16] The use of continuous versions of these two variables does not affect our conclusions.

[17] The following are possible reasons that some banks may exceed the loan concentration limit: First, China has weak legal enforcement and a loose bank governance environment (Allen et al., 2005). Although the Commercial Bank Law has set a clear limit for the loan concentration, it does not specify the corresponding penalty for the violation; hence, the banking regulator has no effective method to control banks in violation. For example, in 2009, the largest client of Hankou Bank borrowed loans equal to 33.28% of the net capital (LC1). The Hankou Bank, however, received a fine of only 300,000 RMB. Second, the banking regulator has no incentive to remedy the loan concentration problem. In China, the government plays an important role in credit resource allocation. When the government intends to pursue higher economic growth using credit resources, the banking regulator has to cooperate and loosen the regulation of credit. For example, an official of the Banking Regulatory Committee pointed out that the 4 trillion stimulus plan of China after the 2008 financial crisis significantly increased loan concentration (Wang 2013).

follow-up question is why banks have such strong incentives to maintain a high degree of borrower concentration. In this study, we examine the economic consequences and determinants of borrower concentration to understand banks' incentives to maintain a high degree of concentration.

The mean ROA and OROA values are 0.9% and 1.2 %, respectively, indicating that on average, commercial banks in China earned a profit during the sample period. The values of these performance variables are quite similar to those reported in Berger et al. (2010). The mean (median) of non-performing loans to assets (NPL) is 1.7% (1.2%), which is slightly lower than that in Berger et al. (2010). The difference could be due to different sample periods. The sample period in Berger et al. (2010) is 1996-2006, earlier than that in our sample.

On average, the largest shareholder owns 23.2% of the total shares, suggesting that the largest shareholder has significant voting power in banks. The concentration of ownership in commercial banks is prevalent in the world. Li and Song (2013) report that the largest shareholder holds an average of 32.04% of total shares (sample including 255 banks from 48 countries) and Caprio et al. (2007) report an average of 32.6% (sample including 244 banks from 44 countries). The mean value of HCR is 0.814, indicating that the shares held by the largest shareholder equals 81.4% of the total shares owned by the second through the tenth shareholders. The mean value of STATE is 0.76, indicating 76% of banks are directly or indirectly controlled by the government, which is consistent with the finding in La Porta et al. (2002) that government ownership of banks is large and pervasive worldwide.

Table 2 also shows that 5.5% of observations are the Big Four banks, and 19.4% of observations in our sample are listed banks. The mean (median) of SIZE is 18.107 (17.695), larger than that reported in Berger et al. (2010). The mean (median) value of LOAN is 0.512

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(0.521), indicating that loans account for 51.2% (52.1%) of total assets.

[Insert table 2 here]

4. Primary analysis

4.1. How does borrower concentration affect loan quality and bank performance?

To distinguish between the *monitoring view* and the *tunneling view*, we estimate a pooled OLS model (equation 1) to be consistent with previous studies, such as Berger et al. (2010) and Haw et al. (2010):[18]

$$Loan\ Risk\ /\ Performance = \beta_0 + \beta_1 SIZE + \beta_2 LOAN + \beta_3 FD + \beta_4 STATE + \beta_5 FORCAP + \beta_6 BIG4 +$$
$$\beta_7 GDPGrowth + \beta_8 Borrower\ Concentration + \sum \delta_i Year\ dummies + \varepsilon \quad (1)$$

Among the dependent variables, we use the NPL to measure the loan risk. Since the NPL is a censored variable that ranges from 0 to 1, we use the logit transformation of non-performing loans ratio (TNPL) instead. We use return on assets (ROA) or operating return on assets (OROA) to measure bank performance. Borrower concentration is the main variable of interest, which we measure using two proxies, LC1 represents the largest loans as a percentage of net capital and LC10 the largest ten loans as a percentage of net capital.

Following Andres and Vallelado (2008) and Haw et al. (2010), we include the log of total assets (SIZE), loans as a percentage of total assets (LOAN) in our regression model. According to prior literature (La Porta et al., 2002; Haw et al., 2010), bank ownership is an important determinant of bank performance. Therefore, we include three variables, FD, STATE and FORCAP, to capture the ownership structure. FD indicates whether the first shareholder has an ownership larger than the sample median; STATE indicates whether the largest shareholder is the government or a state-owned enterprise; FOCAP indicates whether a foreign investor is

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[18] We also tried a random effect model and a fixed effect model and our conclusions are consistent. The results for the fixed effect model are reported in section 4.4. The results for random effect model are not reported and are available upon request.

among the bank's top 10 shareholders. Berger et al. (2009) find that the big four banks are much larger than other banks and are the least efficient with respect to operations and cost management. Therefore, we include the dummy variable BIG4 in model (1). We also include the gross domestic product growth at the province level (GDPGrowth). To control for potential biases in standard errors estimated in the OLS regression, we base our tests on robust standard errors adjusted for heteroskedasticity and cross sectional correlations in the residuals (Peterson, 2009).

We report regression results for the full set of bank operating characteristics in Table 3. In column 1 and column 2, the coefficients of LC1 and LC10 are 0.688 (significant at the 5% level) and 0.344 (significant at the 1% level), respectively, suggesting that banks with higher levels of borrower concentration have higher non-performing loan ratios. A one standard deviation increase in LC1 (LC10) increases NPL by 0.48%(0.67%). Given that the sample mean of NPL is 1.7%, these effects are of clear economic significance. In column 3 and column 4, LC1 and LC10 are negatively correlated with ROA. The coefficients are -0.004 and -0.002, respectively, and are both significant at the 1% level. A one standard deviation increase in LC1 (LC10) decreases ROA by 0.16%(0.23%). In column 5 and column 6 using OROA as the dependent variable, LC1 and LC10 have coefficients of -0.005 and -0.002, both significant at the 1% level. A one standard deviation increase in LC1 (LC10) decreases OROA by 0.20%(0.23%). Given that the sample mean of ROA (OROA) is 0.9% (1.2%), these effects are of clear economic significance. The results in Table 3 indicate that a high degree of borrower concentration is significantly associated with high loan risk and low performance, after controlling for the other variables. The results are consistent with the *tunneling view* and contradict with the *monitoring view*.

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Regarding the control variables, SIZE is significantly negative in column 3 through column 6, suggesting that smaller banks are associated with better performance. LOAN is positive in columns 1, 2, 3, 5 and 6, indicating that banks with more loans have higher non-performing loans, but also enjoy higher performance. This is reasonable because banks in China primarily profit through interest rate spreads. BIG4 is significant in columns 1-6, suggesting that the big four banks had higher non-performing loans but also earned higher profits during this period.[19] The non-significance of GDPGrowth in all models suggests that there is no obvious difference between the performance of banks in more developed and developing areas.

[Insert table 3 here]

4.2. The effect of Ownership structure on borrower concentration

In this section, we link ownership structure with borrower concentration by running a pooled OLS model (equation 2):

$$Borrower\ Concentration = \beta_0 + \beta_1 SIZE + \beta_2 LOAN + \beta_3 STATE + \beta_4 FORCAP + \beta_5 BIG4 + \beta_6 GDPGrowth + \beta_7 Ownership + \sum \delta_i Year\ dummies + \varepsilon \qquad (2)$$

The dependent variable is borrower concentration, proxied by LC1 or LC10 as defined above. Our main variable of interest is ownership structure, for which we use two proxies: FD and HCRD. FD measures the absolute voting rights of the largest shareholder; the higher the level of ownership, the higher the decision power. HCRD, however, considers the voting rights of the largest shareholder relative to other block shareholders. The literature (for example Jian and Wong, 2010; Jiang et al., 2010) suggests that controlling shareholders engage in tunneling behavior when legal and market institutions are weak. For large shareholders to tunnel from the bank, they need to dominate its lending decisions. We predict that the coefficients of FD and

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[19] Berger et al. (2009) find that the big four banks are less efficient than other banks, contrary to our results. The reason could be the difference in time periods. Berger et al. (2009) examine bank performance in an earlier period.

HCRD will be significantly positive in model (2).

To control for other possible factors that may influence the determinants of borrower concentration, we also include SIZE, LOAN, STATE, FORCAP, BIG4 and GDPGrowth as control variables in model (2). In addition, we include year dummies to control for time fixed effects.

Table 4 presents the regression results. In column 1 and column3, the coefficients of FD are 0.187 and 0.555, respectively (both significant at the 1% level). The economic significance is also large. A one standard deviation increase in FD increases LC1(LC10) by 9.5% (28.2%).The results indicate that when the largest shareholder has more voting power, borrower concentration is more severe. In column 2 and column 4, the coefficients of HCRD are also significantly positive, with coefficients of 0.256 and 0.771 (both significant at the 1% level). Compared to firms with below-median HCR, firms with above-median HCR have 25.6% (77.1%) more of LC1(LC10). The results indicate that when the voting power of the largest shareholder relative to other block shareholders is high, borrower concentration is more severe. Taken together, the results in table 4 provide further evidence supporting the *tunneling view*.

[Insert table 4 here]

Regarding the control variables, the coefficients of SIZE are significantly negative at the 1% level in all regressions, which indicates that larger banks have a lower degree of loan concentration. LOAN is not significant in any regression, showing that banks with more loan assets do not have high levels of borrower concentration. The coefficients of FORCAP are significant in columns 1, 2 and 3, suggesting that foreign investors have a positive monitoring effect on the distribution of loans.

4.3. Borrower concentration and reported related lending

A high degree of borrower concentration could be the result of a large volume of related lending. Because banks also disclose related lending in their annual reports, a natural question to ask is: what is the relationship between the disclosed related lending and borrower concentration? To answer this question, we further collect disclosed related lending information from the banks' annual reports.

Of the 366 bank year observations in our original sample, we can only collect related lending information for 198 (or 54.10% of the original sample). In these 198 observations, banks disclosed related lending to large shareholders and their associates. We use the related lending information to construct two variables: R1 represents the share of the largest related loans in net capital; R10 represents the largest ten related loans as a share of net capital. These variables are constructed analogously to the borrower concentration variables.

As reported in Panel A of Table 5, banks in our sample have an average R1 of 10.3% and R10 of 21.6%. This indicates that the largest related loans represent 10.3% of net capital and the largest ten related loans represent 21.6% of net capital. We also calculate the percentage of related loans in the total loans. The mean value of the largest (top 10) related loans is 1.15% (2.44%) of total loans.[20]

We calculate the correlations between measures of borrower concentration and related lending and present the results in Panel B of Table 5. The results show that borrower concentration and related lending are highly correlated, with coefficients ranging from 0.495 to 0.731. The results support the view that high borrower concentration is a result of a large volume of related lending.

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[20] Compared to findings in La Porta et al. (2003), related loans in Chinese commercial banks seem lower. La Porta et al. (2003) find that among the top 300 largest loans of Mexican banks, 20% are made to related borrowers.

However, compared to the measures of borrower concentration, the related lending is much smaller (R1=10.3% versus LC1=21.7%; R10=21.6% versus LC10=88.2%). This suggests that many large loans are not included in related lending disclosures. There are two possible explanations for this phenomenon: First, some large borrowers are not related parties; therefore, loans to these borrowers are not included in related lending disclosures. Second, some borrowers are related parties, but banks have not correctly identified loans to these parties as related lending. In other words, the related lending disclosures only present an incomplete picture of the true situation of related lending. The first possibility seems undeniably true; however, we argue that the second possibility is also true, a point elaborated below.

Banks may not correctly identify and report all related lending for a few reasons. First, many banks in China only identify loans related to the largest ten shareholders as related lending, which will underestimate total loans to related parties. Therefore, a few large borrowers are not identified as related parties. Second, as a transitional country, many commercial banks of China are controlled by the government. The government simultaneously operates numerous enterprises through different departments. The government can divert funds to the enterprises it controls, but according to regulations, does not need to report these loans as related lending. Third, there is a broad consensus that large bank shareholders divert resources to their firms through related lending in developing countries. For example, La Porta et al. (2003) find that related lending results in reduced loan collateral ratios, interest rates, and performance and higher non-performing loss. Cull et al. (2006) suggest that related lending is a serious enough concern to compel governments to monitor it. The regulator, the CBRC, has established strict supervision rules on related lending to control for potential financial risk.[21] Therefore, banks

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[21] Regulations issued by the CBRC allow credit line commercial banks to provide loans to related parties in the amount of less than 10% of their net capital. Our findings suggest that, on average, Chinese commercial banks provide related lending exceeding

may intentionally avoid reporting loans as related lending.

To provide evidence supporting the above arguments, we include the case of Guilin Bank in Appendix B. The Appendix shows that the largest shareholder of Guilin Bank is the Guilin Bureau of Finance, a department of the Guilin government. There are no disclosed large loans related to the largest shareholder. However, an examination of the top borrowers finds that the three largest borrowers are all controlled by the local government. Overall, these three borrowers borrowed a total of 519.4 million in loans, or 114.58% of net capital, which leads to a high level of borrower concentration that exceeds the regulatory limit. This case clearly illustrates that some of banks' largest borrowers are related parties but are not correctly identified as such and loans to these parties are not disclosed as related lending. Therefore, the high level of borrower concentration could be used as an indicator of a large amount of related lending. This indicator could more appropriately reflect the true situation of related lending (or tunneling) than the disclosed information on related lending.

The foregoing arguments are based on a case study. To validate the arguments we require some large sample evidence. Ideally, if we can identify whether each of the large borrowers is actually a related party of large shareholders, then we can calculate the true amount of related lending and provide direct evidence. However, the relationship between large borrowers and large shareholders cannot be observed directly.

We provide some indirect evidence. If related lending is driving the relation between loan concentration and performance, and banks correctly identify all related loans, then the disclosed related loans should absorb all of the explanatory power of borrower concentration with respect to loan risk and bank performance. Therefore, in table 5 Panel C, we compare the explanatory power of borrower concentration and related lending with respect to loan risk and bank

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this limit.

performance. After controlling for related lending, we find that the effects of the borrower

concentration measures do not change. The LC10 estimates are positively related to loan risk and

negatively related to bank performance, with significance levels of 0.01. A one standard

deviation increase in LC10 increases NPL by 0.74%, and decreases ROA(OROA) by

0.23%(0.23%). Conversely, the effects of related lending are not stable. When R10 is included in

the regression without including LC10, R10 is not significantly related to non-performing loans

and is significantly negatively related to bank performance. However, when LC10 is included,

the relationship between R10 and non-performing loans becomes significantly negative

(coefficient= -0.231 and t-stat=-2.09). Additionally, the relationships between R10 and bank

performance decline in significance. Overall, the evidence suggests that compared to related

lending, borrower concentration provides additional information to explain loan quality and bank

performance. The evidence is consistent with the arguments that the related lending disclosures

are not complete and borrower concentration acts as a useful indicator of large shareholder

tunneling through related lending.

[Insert table 5 here]

4.4. Controlling for endogeneity issues

Endogeneity issues may arise because certain omitted variables drive both borrower

concentration and firm performance. We use several different methods to address concerns

regarding endogeneity.

First, we use a 2SLS model with instrumental variables. In the first stage model, we regress

borrower concentration on instrumental variables and other control variables. We choose two

instrumental variables. The first is FNUM, which is the log of the number of manufacturing

firms with sales exceeding five million yuan (approximately $800,000) in the province in which

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the bank is located. This information is obtained from the annual survey of the National Bureau of Statistics (NBS). When a province has fewer large enterprises, banks in the province have fewer potential borrowers; therefore, we expect banks in that province to have high levels of borrower concentration. The second variable is SNUM, which is the average number of employees per bank unit at the province level. In a province where bank employees are concentrated in a few branches, the bank has less chances accessing to the population of potential borrowers, therefore the bank is more likely to have a high level of borrower concentration.[22]

In Panel A of table 6, we report the results of the first stage regression, where we regress borrower concentration on the above two instrumental variables and other control variables. The instrumental variables are significant as predicted. FNUM is significantly negative, suggesting that the more large enterprises there are in the province, the lower the degree of borrower concentration. SNUM is significantly positive, suggesting that in regions where each bank unit has more employees the borrower concentration is high. We also report Stock and Yogo (2005) tests for the weak instrument problems in Panel B of table 6. The relevant F-statistics for the first-stage regressions range from 9.35 to 17.87, suggesting that our instruments are generally acceptable.[23]

In Panel B of Table 6, we report the results of the second stage regression, where we use the estimated borrower concentration from the first stage regression as our independent variable to replace actual borrower concentration. As we can see, the results are qualitatively similar to the previous results, indicating that borrower concentration is positively related with risk and negatively related with performance. An advantage of having two instrumental variables (IVs)

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[22] To ensure that these two variables can effectively serve as instrumental variables, we examine whether the error terms from columns 1-6 of table 3 are correlated with our instrument variables. We find that the correlations between error terms and our instrumental variables are small and insignificant.

[23] Stock and Yogo (2005) suggests that for the critical values at 15% and 20% significance level for n=1 (one endogenous variable) and K2 = 2 (two instruments) is 11.59 and 8.75, respectively.

and only one endogenous regressor is that we can conduct an over-identification test of whether the IVs satisfy the exclusion restriction. In Panel B of table 6, we show the p-values for the Sargan Test on the over-identifying restrictions in the second stage. In all cases, we fail to reject these restrictions, with p-values ranging from 0.344 to 0.960. These results indicate that our instruments are exogenous. The results suggest that controlling for endogeneity does not change our results.

Another common method to address endogeneity concerns is to use a bank fixed effects model. We present the results of the bank fixed effects model in Panel C of table 6. The results are qualitatively unchanged.

We also examine a modified version of our model, in which we regress the change in performance or the change in risk on the change in borrower concentration and other control variables. We also find evidence consistent with our conclusions. [24]

In summary, we use various methods to address the endogeneity issue, all of which produce consistent results.

[Insert table 6 here]

5. Further Analyses

5.1. Ownership types of large borrowers

Although we cannot obtain detailed information on large borrowers, the information provided in the financial statements allows us to identify the ownership types of large borrowers. We group large borrowers into three categories according to ownership type: the government and its departments, State-owned Companies, and Non-state-owned companies. The first group of borrowers includes all levels of government, government financing platforms, and government

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[24] For brevity we do not report these results, which are available upon request.

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funded public institutions. These borrowers do not operate for profit. The second group of

borrowers includes enterprises that are controlled by the government. The third group of

borrowers includes private or foreign enterprises. We calculate for each bank the distribution of

the largest ten loans across these three categories of borrowers.

Table 7 presents the results. In the left-hand part of table 7, we divide the sample into two

groups according to whether FD equals 0 or 1. For the loans to Government and its departments

and the loans to State-owned enterprises, we do not find significant difference between these two

groups. For the loans to Non-state-owned enterprises, there is marginal significance between

these two groups. In the right-hand part of table 7, we further divide banks for which FD equals 1

into two sub-groups: banks with state-owned controlling shareholders and banks with

non-state-owned controlling shareholders. The distribution of large loans between these groups

differs significantly. For banks with state-owned controlling shareholders, 13.3% of large loans

go to the government and its departments, 32.6% go to state-owned enterprises, and the

remaining 54.1% go to non-state-owned enterprises. Conversely, for banks with non-state-owned

controlling shareholders, only 3.6% of large loans go to the government and its departments,

18.5% go to state-owned enterprises and the remaining 77.9% go to non-state-owned enterprises.

The differences in the distributions are all significant. The evidence is consistent with the

tunneling view. Banks with non-state-owned controlling shareholders tend to provide loans to

non-state-owned enterprises, while banks with state-owned controlling shareholders tend to

provide loans to governments or state-owned enterprises. The ownership type of controlling

shareholders matches the ownership types of large borrowers.

It may be argued that the evidence regarding the ownership types of controlling

shareholders and large borrowers is not direct evidence of tunneling. In China, credit is often

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regarded as a scarce good and is rationed. Therefore, if a private enterprise obtains control over a local commercial bank, it will likely use its own decision rights to direct a larger proportion of the rationed loans to itself or its related parties. Some may argue that this related lending could be beneficial to social welfare.[25] However, we argue that one should approach this issue from the perspective of the minority shareholders. Previous results suggest that this related lending is associated with high risk and low performance, and hence is clearly detrimental to bank value and clearly expropriates minority shareholders.

Similar arguments apply if the controlling shareholder is the state. Li and Zhou (2005) find that competition over regional GDP growth is of crucial importance for local government officials in China. Therefore, state shareholders, often controlled by the local government, have a strong incentive to offer a high volume of loans to government departments or state owned enterprises (for example, all types of city development corporations), which could help to accomplish their political objectives. These loans typically bear low interest rates and high risk. This is consistent with Halling et al. (2010), who find that banks controlled by Austrian municipalities use their loans for political purposes at the expense of operating performance. From the perspective of minority shareholders, this lending represents a tunneling of funds away from the bank at the expense of minority shareholder interests. La Porta et al. (2002) find that when the level of government ownership in commercial banks is high, the banking system cannot effectively allocate capital because the government will divert funds to entities that can accomplish its political purposes. Bailey et al. (2012) also find that state-controlled banks in China often provide loans to firms with poor financial performance. Our findings provide bank level evidence that when the controlling shareholder is state-owned, the bank is more likely to divert loans to companies related to the state.

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[25] Ayyagari et al. (2010) find that firms in China with bank financing have higher growth rates.

[Insert table 7 here]

5.2. The governance effect of going public on borrower concentration

The literature on tunneling suggests that improved corporate governance or institutional development will constrain the tunneling behavior of large shareholders (see for example, Jiang et al., 2010). Among the variety of governance factors, going public on the stock market is an effective one (Jiang et al., 2009). The stock market can provide meaningful protection for minority investors protections through stricter regulations and market mechanisms. Jiang et al. (2009), for example, demonstrate that the performance of firms that have been privatized through an issue of shares (SIP, share issue privatization) is higher than that of matched non-SIP SOEs, and the authors attribute this to improved market institutions. In this section, we investigate whether going public constrains tunneling behavior by the largest shareholders, using borrower concentration as an indicator.

At the end of 2011, 16 Chinese commercial banks underwent the IPO process and were listed on the Shanghai or Shenzhen stock exchange. We expect that public shareholders will devote greater attention to the banks' governance and will monitor borrower concentration. In addition, listed commercial banks are dually regulated by the China Security Regulation Committee (CSRC) and the CBRC and are characterized by greater information transparency than non-listed commercial banks, which will constrain the tunneling behavior of large shareholders.

We run a pooled OLS model (equation 3) to investigate whether banks being listed can constrain the largest shareholder's tunneling behavior through borrower concentration.

$$Borrower\ Concentration = \beta_0 + \beta_1 SIZE + \beta_2 LOAN + \beta_3 STATE + \beta_4 FORCAP + \beta_5 BIG4 + \beta_6 GDPGrowth +$$
$$\beta_7 LIST + \beta_8 Ownership + \beta_9 LIST * Ownership + \sum \delta_i Year\ dummies + \varepsilon \quad (3)$$

We add LIST, a dummy variable for banks' listing status, and an interaction variable LIST*Ownership. The main variable of interest here is the interaction term, which we expect to be negative, as being listed on the stock market should constrain controlling shareholders' tunneling behavior through related lending, thereby reducing the relationship between ownership structure and borrower concentration. The other control variables are identical to those in previous analyses.

Table 8 presents the regression results. In columns 1 and 3, the ownership structure variable is FD. In columns 2 and 4, the ownership structure variable is HCRD. The results clearly show that the interactions between the ownership structure variables and the LIST dummy are significantly negative, consistent with the above arguments. The performance of the other control variables is quite similar to those reported in table 4.[26]

[Insert table 8 here]

6. Conclusion

In this paper, we investigate credit borrower concentration using a sample of Chinese banks. Although China's banking regulator has established a limit regarding borrower concentration, we find that many banks maintain a high degree of borrower concentration, well above regulatory limits.

To understand banks' incentives to maintain a high degree of borrower concentration, we examine empirically the relationship between borrower concentration and loan quality or bank performance. We find strong evidence that borrower concentration is positively related to

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[26] According to the model specification described in the research design section, we estimate how banks' listing status affects borrower concentration. However, the publicly listed banks report higher levels of pre-event performance (selection effect), which means that listed banks are larger and have better performance (Lin and Zhang, 2009). Therefore, a potential concern of our study is a self-selection problem. To alleviate this problem, we use treatment effect model, and our results still hold.

non-performing loans and negatively related to ROA or OROA. The evidence is consistent with the *tunneling view* that large shareholders divert resources from banks by lending to related parties, which leads to a high degree of borrower concentration. A large volume of related loans will yield lower loan quality and poorer bank performance. Additionally, we find that when the largest shareholder has control over voting and other block shareholders lack sufficient power to constrain the largest shareholder, the level of borrower concentration is higher. This evidence is also consistent with the *tunneling view*. Our results still hold after we explicitly address endogeneity concerns.

When we compare borrower concentration and disclosed related lending information, we find that the level of disclosed related lending is much smaller. Further investigation reveals that many large borrowers are not identified as related despite having close relationships with large shareholders. Therefore, borrower concentration could serve as an indicator of the true level of tunneling. Consistent with this argument, we find that compared to related lending, borrower concentration has a more stable and significant relationship with loan quality and bank performance.

Our further analyses provide a detailed analysis of the ownership types of large borrowers. We find that the ownership types of controlling shareholders are related to the ownership types of large borrowers. We also find that going public on the stock market is an effective mechanism to constrain tunneling by large shareholders through related lending.

Overall, our paper provides a thorough analysis of borrower concentration in China. Its results suggest that borrower concentration could be the result of related lending, which serves as a warning to regulators that high levels of borrower concentration may not only be a sign of financial risk but also indicate the existence of expropriation by large shareholders through

related lending.

As a caveat, our empirical results are only based on a sample of Chinese banks and may not apply to other countries. The lack of borrower concentration information for the U.S. and international banks makes it impossible to make comparisons between Chinese banks and others. However, the finding in La Porta et al. (2003) that large borrowers from Mexican banks are often related parties is consistent with our investigation, suggesting that the situation in China may not be unique.

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Appendix A: Variable Definition

Variable	Definition
LC1	The ratio of loans of the largest client to bank net capital
LC10	The ratio of loans of top 10 clients to bank net capital
NPL	Non-performing loan ratio
TNPL	Logit transformation of NPL, TNPL=log(NPL/(1-NPL))
ROA	Return on assets (net earnings to total assets)
OROA	Operating return on assets (operating earnings to total assets)
FIRST	The percentage of shares held by the largest shareholder
FD	Dummy variable for FIRST, defined as 1 if the value of FIRST exceeds the sample median value of FIRST, and 0 otherwise
HCR	The percentage of shares held by the largest shareholder to the percentage of shares held by the second through the tenth shareholders
HCRD	Dummy variable for HCR, defined as 1 if the value of HCR exceeds the sample median value of HCR, and 0 otherwise
STATE	Dummy variable for state ownership, defined as 1 if bank's largest shareholder is the government or a state-owned enterprise, and 0 otherwise
FORCAP	Dummy variable, defined as 1 if one of top 10 shareholders of the bank is foreign investor, and 0 otherwise
BIG4	Dummy variable, defined as 1 if the bank is one of: Industrial and Commercial Bank of China, China Construction Bank, The Agricultural Bank of China, or Bank of China, and 0 otherwise
SIZE	Logarithm of bank assets
LOAN	Ratio of loans to assets; SIZE is logarithm of bank assets
GDPgrowth	The gross domestic product growth at the province level
R1	The largest related loans as a percentage of net capital
R10	The largest ten related loans as a percentage of net capital
LIST	Dummy variable, defined as 1 if the bank is a public bank, and 0 otherwise
SNUM	The average number of employees in one bank operating unit in the province where the bank is located.
FNUM	The log of the number of manufacturing firms with sales exceeding five million yuan (approximately \$800,000) in the province in which the bank is located.

Appendix B: A Case of Guilin Bank

The Guilin Bank was established in 1997.We obtain the relevant information from its annual reports in 2007.

Panel A shows the ownership structure of Guilin Bank and related loans to the top 10 shareholders in 2007. The largest shareholder is the Guilin Bureau of Finance, a department of the Guilin government. The largest shareholder has 15.37% of the total shares. The annual reports disclose related loans to the largest ten shareholders. As shown in the table, 125 million RMB of loans are classified as related loans. There are no related loans to the largest shareholder.

Panel B presents loans to the top 10 borrowers of Guilin Bank. The largest 10 borrowers have borrowed 246.42% of the net capital, which is above the regulated limit by a large amount. Comparing Panel A and Panel B, we see none of the largest loans are classified as related lending. However, detailed investigation suggests another story. The three largest borrowers (i.e. Guilin Land Reserve Transaction Management Center (GLRTMC), Guilin Economic Construction Investment Company (GECIC)), and Guilin National Asset Investment Management Co (GNAIMC) have total loans of 519.4 million RMB(or 114.58% of net capital, or 14.56% of Guilin Bank's total loans), are actually closely related to the largest shareholder. GLRTMC, although has an independent legal person status, is attached to Guilin Bureau of Land and Resource, a department of Guilin government. GECIC is founded by the Guilin government for state-owned operations and infrastructure construction. It is completely controlled by the Guilin State-owned Assets Supervision and Administrative Commission, another department of Guilin. GNAIMC is directly owned by the Guilin Government. These three largest borrowers have close relation to the largest shareholder. However, their loans are not classified as related lending.

This case illustrates the issue that some large borrowers, although seem unrelated, are actually related to large shareholders.

Panel A Ownership structure and related lending of Guilin bank in 2007

Name of shareholders	Ownership at the end of 2007 (in 1000 shares)	Ownership ratio (%)	Lending (in 1000 RBM)
Guilin Bureau of Finance	61,472	15.37	0
Guilin Aoqun Color Print Co.	36,000	9	0
Guilin Anxia Real Estate Development Co.	20,100	5.02	40,000
Liuzhou Zhengling Group	20,000	5	10,000
Guilin Xinjin Industrial Co.	19,600	4.9	19,700
Guilin Guilian Agricultural Equipment Co.	19,000	4.75	55,800
Guangxi Yuanchen Investment Group	19,000	4.75	0
Guangxi Electric Power Development Co.	18,000	4.5	0
Guilin Laiyin Biotechnology Co.	16,000	4	0
Guilin Tourism Development Co.	15,000	3.75	0
Total	244,171	61.04	125,000

Panel B Top 10 borrowers of Guilin bank in 2007

Name of borrowers	Loan (in 1000 RBM)	As % of net capital	As % of total loan
Guilin Land Reserve Transaction Management Center	233,000	51.40	6.53
Guilin Economic Construction Investment Co.	178,800	39.44	5.01
Guilin National Asset Investment Management Co.	107,630	23.74	3.02
Guilin Deye Real Estate Development Co.	96,600	21.31	2.71
Guilin Hongrui Technology Development Co.	90,000	19.85	2.52
Guilin Tianxing Hydropower Development Co.	90,000	19.85	2.52
Guilin High and New Technology Industrial Development Co.	90,000	19.85	2.52
Guilin Guangyun Industrial Investment Co.	80,000	17.65	2.24
Guilin JingangReal Estate Development Co.	76,000	16.77	2.13
Guilin HongruiReal Estate Development Co.	75,000	16.55	2.10
Total	1117,030	246.42	31.32

Table 1 Sample distribution

	2006	2007	2008	2009	2010	2011	Total
Commercial banks in China	130	141	153	160	164	161	909
Sample in this paper	46	61	53	61	74	71	366
Ratio	35.38%	43.26%	34.64%	38.13%	45.12%	44.10%	40.26%

Note: This table describes our sample distribution by year and the percentage of Chinese banks included in our sample.

Table 2 Summary statistics

Variables	#Obs	Mean	Std	Min	P25	Median	P75	Max
LC1	366	0.217	0.405	0.008	0.047	0.075	0.128	4.405
LC10	330	0.882	1.127	0.060	0.275	0.489	0.876	8.930
NPL	366	0.017	0.017	0	0.008	0.012	0.021	0.146
TNPL	366	-4.432	1.203	-9.210	-4.885	-4.398	-3.842	-1.768
ROA	353	0.009	0.005	-0.014	0.007	0.010	0.012	0.029
OROA	361	0.012	0.007	-0.016	0.009	0.013	0.015	0.035
FIRST	366	0.232	0.168	0.029	0.117	0.191	0.268	0.900
HCR	347	0.814	2.322	0.113	0.259	0.351	0.612	26.099
STATE	366	0.760	0.428	0	1	1	1	1
FORCAP	366	0.303	0.460	0	0	0	1	1
BIG4	366	0.055	0.228	0	0	0	0	1
SIZE	366	18.107	2.013	14.377	16.655	17.695	19.214	23.463
LOAN	366	0.512	0.099	0.035	0.459	0.521	0.580	0.787
GDPGrowth	366	0.179	0.070	-0.051	0.156	0.179	0.206	0.546
LIST	366	0.194	0.396	0	0	0	0	1
SNUM	366	15.564	3.863	9.463	12.767	14.939	16.806	25.341
FNUM	366	9.549	1.046	5.956	8.764	9.555	10.532	11.090

Note: This table presents bank characteristics for our sample. Variable definitions are shown in Appendix A.

Table 3 Borrower concentration, loan risk and performance

Variables	Dependent variables					
	TNPL		ROA		OROA	
	(1)	(2)	(3)	(4)	(5)	(6)
SIZE	-0.001	0.051	-0.000*	-0.000**	-0.001***	-0.001***
	(-0.02)	(0.96)	(-1.86)	(-2.23)	(-2.70)	(-2.88)
LOAN	1.703*	1.336*	0.006*	0.005	0.016***	0.017***
	(1.97)	(1.81)	(1.86)	(1.33)	(4.32)	(3.85)
FD	-0.237	-0.260	-0.000	-0.000	-0.001	-0.001
	(-1.47)	(-1.51)	(-0.56)	(-0.20)	(-0.85)	(-0.66)
STATE	-0.006	0.006	-0.000	-0.000	-0.002*	-0.002
	(-0.04)	(0.04)	(-0.51)	(-0.65)	(-1.73)	(-1.62)
FORCAP	0.104	0.069	-0.002**	-0.002**	-0.003**	-0.003**
	(0.39)	(0.26)	(-2.51)	(-2.46)	(-2.45)	(-2.30)
BIG4	0.726***	0.619***	0.004***	0.004***	0.007***	0.007***
	(3.11)	(2.75)	(3.74)	(3.64)	(4.68)	(4.59)
GDPGrowth	-0.770	-0.704	-0.008	-0.007	-0.003	-0.002
	(-1.39)	(-1.36)	(-1.38)	(-1.30)	(-0.53)	(-0.40)
LC1	0.688**		-0.004***		-0.005***	
	(2.55)		(-4.40)		(-4.46)	
LC10		0.344***		-0.002***		-0.002***
		(3.62)		(-4.65)		(-4.93)
Constant	-5.575***	-6.461***	0.018***	0.021***	0.023***	0.026***
	(-6.67)	(-6.77)	(4.21)	(4.67)	(4.68)	(4.58)
Year dummies	Controlled		Controlled		Controlled	
#Obs	366	330	353	319	361	326
R^2	0.30	0.32	0.29	0.30	0.35	0.37

Note: This table presents the results of pooled OLS regressions of loan risk and performance on borrower concentration. The dependent variables are: TNPL, ROA and OROA, respectively. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Table 4 Determinants of borrower concentration

Variables	Dependent variables			
	LC1		LC10	
	(1)	(2)	(3)	(4)
SIZE	-0.038***	-0.063***	-0.179***	-0.261***
	(-2.92)	(-3.88)	(-4.63)	(-5.58)
LOAN	0.244	0.279	0.241	0.422
	(1.37)	(1.45)	(0.28)	(0.50)
STATE	0.031	0.043	0.100	0.129
	(0.79)	(0.96)	(0.71)	(0.82)
FORCAP	-0.117**	-0.117**	-0.313**	-0.252
	(-2.38)	(-2.08)	(-2.17)	(-1.55)
BIG4	0.002	0.088	0.141	0.385**
	(0.04)	(1.35)	(0.84)	(2.00)
GDPGrowth	0.504	0.640	1.014	1.528*
	(1.35)	(1.61)	(1.20)	(1.74)
FD	0.187***		0.555***	
	(3.26)		(3.67)	
HCRD		0.256***		0.771***
		(3.62)		(4.33)
Constant	0.479**	0.859***	3.179***	4.396***
	(2.01)	(3.11)	(3.50)	(4.06)
Year dummies	Controlled		Controlled	
#Obs	366	347	330	311
R^2	0.28	0.32	0.37	0.42

Note: This table presents the results of pooled OLS regressions of borrower concentration on ownership variables. The dependent variables are: LC1 and LC10. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

Table 5 Relationship between related lending and borrower concentration

Panel A Summary statistics

Variable	#Obs	Mean	Std	Min	P25	Median	P75	Max
R1	198	0.103	0.229	0	0.012	0.046	0.091	2.318
R10	198	0.216	0.381	0	0.032	0.098	0.239	3.130
LC1	366	0.217	0.405	0.008	0.047	0.075	0.128	4.405
LC10	330	0.882	1.127	0.060	0.275	0.489	0.876	8.930

Note: This table summarizes related lending and borrower concentration. Variable definitions are shown in Appendix A.

Panel B Correlation

	R1	R10	LC1
R10	0.895***		
LC1	0.731***	0.647***	
LC10	0.547***	0.495***	0.891***

Note: This table presents the correlation between related lending and borrower concentration. Variable definitions are shown in Appendix A.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Panel C Ownership, related loan and loan concentration on loan risk and performance

Variables	TNPL		ROA		OROA	
	(1)	(2)	(3)	(4)	(5)	(6)
SIZE	-0.078*	-0.008	-0.001**	-0.001***	-0.001***	-0.001***
	(-1.78)	(-0.20)	(-2.07)	(-3.00)	(-3.03)	(-3.71)
LOAN	1.585	1.777*	0.008	0.008	0.020***	0.022***
	(1.12)	(1.77)	(1.55)	(1.63)	(2.83)	(3.49)
FD	-0.012	-0.112	-0.001	-0.000	-0.001	-0.000
	(-0.06)	(-0.67)	(-1.31)	(-0.49)	(-0.98)	(-0.21)
STATE	-0.064	0.077	-0.000	-0.000	-0.002	-0.002
	(-0.36)	(0.49)	(-0.11)	(-0.27)	(-1.16)	(-1.29)
FORCAP	0.274	0.396**	-0.001	-0.002**	-0.001	-0.002
	(1.37)	(2.04)	(-1.39)	(-2.01)	(-1.06)	(-1.63)
GDPGrowth	-0.261	-0.489	-0.009**	-0.008	-0.010	-0.007
	(-0.28)	(-0.66)	(-2.01)	(-1.67)	(-1.45)	(-1.15)
R10	0.058	-0.231**	-0.003***	-0.002*	-0.005***	-0.003***
	(0.42)	(-2.09)	(-3.02)	(-1.72)	(-4.19)	(-2.94)
LC10		0.379***		-0.002***		-0.002***
		(5.29)		(-3.26)		(-3.61)
Constant	-4.288***	-5.853***	0.021***	0.025***	0.032***	0.038***
	(-3.99)	(-6.52)	(3.43)	(4.34)	(3.65)	(4.38)
Year dummies	Controlled		Controlled		Controlled	
#Obs	198	182	195	180	196	181
R^2	0.28	0.37	0.24	0.34	0.34	0.43

Note: This table presents the results of pooled OLS regressions of loan risk and performance on borrower concentration and related loans. The dependent variables are: TNPL, ROA, and OROA, respectively. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Table 6 Controlling for endogeneity problem

Panel A first stage regression

Variables	Dependent variables	
	LC1	LC10
	(1)	(2)
SNUM	0.014**	0.035*
	(2.02)	(1.90)
FNUM	-0.074***	-0.284***
	(-3.84)	(-5.47)
SIZE	-0.060***	-0.240***
	(-3.69)	(-5.62)
LOAN	0.373*	0.878
	(1.77)	(1.40)
FD	0.182***	0.522***
	(4.82)	(5.17)
STATE	0.000	-0.023
	(0.00)	(-0.19)
BIG4	-0.056	-0.063
	(-0.55)	(-0.24)
FORCAP	-0.111**	-0.261**
	(-2.29)	(-2.03)
GDPGrowth	0.270	0.195
	(0.78)	(0.22)
Constant	1.375***	6.387***
	(3.82)	(6.67)
Year dummies	Controlled	Controlled
#Obs	366	330
R^2	0.32	0.43

Note: This table presents the results of the first stage regression of the 2SLS model with instruments. We ran pooled OLS regression of borrower concentration on two instrumental variables and other control variables. The dependent variables are: LC1 and LC10. The instrumental variables are: SNUM and FNUM. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Panel B IV regression

| Variables | Dependent variables | | | | | |
| | TNPL | | ROA | | OROA | |
	(1)	(2)	(3)	(4)	(5)	(6)
SIZE	0.010	0.056	-0.000	-0.000	-0.001	-0.001**
	(0.24)	(1.15)	(-1.05)	(-1.53)	(-1.51)	(-1.99)
LOAN	1.821**	1.722**	0.004	0.002	0.013***	0.013***
	(2.20)	(2.57)	(1.11)	(0.57)	(2.82)	(2.65)
FD	-0.433**	-0.371**	0.000	0.000	0.000	0.000
	(-2.33)	(-2.15)	(0.35)	(0.49)	(0.26)	(0.31)
STATE	-0.028	0.003	-0.000	-0.000	-0.002*	-0.002*
	(-0.20)	(0.02)	(-0.44)	(-0.65)	(-1.70)	(-1.65)
BIG4	0.834***	0.703***	0.003***	0.003***	0.005***	0.006***
	(3.73)	(3.17)	(3.03)	(3.05)	(3.77)	(3.85)
FORCAP	0.272	0.179	-0.003***	-0.003***	-0.004***	-0.004***
	(0.91)	(0.61)	(-2.80)	(-2.59)	(-2.96)	(-2.68)
GDPGrowth	-1.510**	-1.115**	-0.004	-0.005	0.002	0.002
	(-2.50)	(-2.54)	(-0.74)	(-0.90)	(0.48)	(0.36)
LC1	1.729**		-0.007*		-0.010**	
	(2.17)		(-1.65)		(-1.99)	
LC10		0.540**		-0.003**		-0.004***
		(2.39)		(-2.06)		(-2.58)
Constant	-5.517***	-6.489***	0.015***	0.020***	0.018***	0.024***
	(-6.27)	(-6.60)	(3.00)	(3.35)	(3.03)	(3.11)
Year dummies	Controlled		Controlled		Controlled	
Sargan test	0.57	0.90	0.06	0.003	0.18	0.07
(p value)	(0.452)	(0.344)	(0.808)	(0.960)	(0.668)	(0.797)
Stock and Yogo test	10.17	17.87	9.35	16.73	10.06	17.78
#Obs	366	330	353	319	361	326
R^2	0.16	0.27	0.17	0.22	0.21	0.26

Note: This table presents the second-stage of regression, where LC1 and LC10 are estimated from the first stage regression. The dependent variables are: TNPL, ROA, and OROA. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

Panel C Panel data fixed-effects model

Variables	TNPL		ROA		OROA	
	Dependent variable					
	(1)	(2)	(3)	(4)	(5)	(6)
SIZE	0.631	0.858	-0.000	0.002	-0.001	0.001
	(1.30)	(1.59)	(-0.03)	(0.75)	(-0.35)	(0.48)
LOAN	1.353	1.508	-0.001	0.000	0.002	0.005
	(1.19)	(1.36)	(-0.12)	(0.09)	(0.33)	(0.73)
FD	0.125	0.128	0.002*	0.002**	0.002*	0.002**
	(0.83)	(0.78)	(1.91)	(2.40)	(1.86)	(2.18)
STATE	-0.335***	-0.363***	0.002**	0.001	0.000	0.000
	(-3.07)	(-3.03)	(2.29)	(1.54)	(0.50)	(0.02)
FORCAP	-0.244	-0.203	-0.001	-0.000	0.000	0.001
	(-1.38)	(-1.20)	(-0.73)	(-0.35)	(0.22)	(1.04)
GDPGrowth	0.181	0.265	-0.005	-0.005	0.001	0.001
	(0.35)	(0.50)	(-0.75)	(-0.70)	(0.11)	(0.28)
LC1	0.294**		-0.002***		-0.004***	
	(2.24)		(-3.45)		(-3.07)	
LC10		0.128**		-0.001***		-0.002***
		(2.17)		(-2.81)		(-3.46)
Constant	-17.231*	-21.677**	0.013	-0.019	0.032	-0.013
	(-1.80)	(-2.04)	(0.30)	(-0.45)	(0.58)	(-0.24)
Bank fixed effects	Controlled		Controlled		Controlled	
Year dummies	Controlled		Controlled		Controlled	
#Obs	366	330	353	319	361	326
Within R^2	0.59	0.60	0.37	0.38	0.38	0.41

Note: This table presents the results of bank fixed-effects regressions of loan risk and performance on borrower concentration. The dependent variables are: TNPL, ROA, and OROA respectively. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Table 7 Ownership types of borrowers and ownership types of controlling shareholder

	FD=0	FD=1	Diff (t-stat)	FD=1& STATE=0	FD=1& STATE=1	Diff (t-stat)
Government and its departments	0.137	0.113	0.024 (1.29)	0.036	0.133	-0.097 (-3.50)***
State-owned enterprises	0.352	0.297	0.055 (1.57)	0.185	0.326	-0.141 (-2.43)**
Non-state-owned enterprises	0.511	0.590	-0.079 (-1.81)*	0.779	0.541	0.238 (3.28)***

Note: This table examines whether ownership types of controlling shareholders affects the ownership types of large borrowers. We define three types of ownership types: Government and its departments, State-owned enterprises, and Non-state-owned enterprises. Variable definitions are shown in Appendix A.

* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

Table 8 The effect of going public on borrower concentration

Variables	LC1		LC10	
	Dependent variables			
	(1)	(2)	(3)	(4)
SIZE	-0.041*	-0.051**	-0.221***	-0.257***
	(-1.89)	(-2.12)	(-3.54)	(-3.54)
LOAN	0.253	0.324*	0.201	0.466
	(1.40)	(1.68)	(0.24)	(0.54)
STATE	0.039	0.029	0.129	0.094
	(0.97)	(0.68)	(0.90)	(0.60)
FORCAP	-0.126**	-0.132**	-0.349**	-0.288*
	(-2.50)	(-2.35)	(-2.35)	(-1.80)
BIG4	0.050	0.110	0.288*	0.464**
	(0.88)	(1.64)	(1.66)	(2.27)
GDPGrowth	0.508	0.641	1.089	1.586*
	(1.32)	(1.58)	(1.27)	(1.79)
LIST	0.094	0.115	0.449**	0.530*
	(1.31)	(1.24)	(2.04)	(1.93)
FD	0.209***		0.636***	
	(3.13)		(3.51)	
FD*LIST	-0.132*		-0.336*	
	(-1.89)		(-1.71)	
HCRD		0.282***		0.836***
		(3.66)		(4.42)
HCRD*LIST		-0.223***		-0.651***
		(-2.70)		(-3.02)
Constant	0.516	0.632	3.867***	4.314***
	(1.35)	(1.50)	(2.96)	(2.86)
Year dummies	Controlled		Controlled	
#Obs	366	347	330	311
R^2	0.28	0.32	0.37	0.43

Note: This table presents the results of the pooled OLS regressions of borrower concentration on LIST, and the interaction between LIST and ownership variables. Variable definitions are shown in Appendix A. Numbers in parentheses are t statistics, which are based on robust standard errors clustered by bank.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.