Banking Structure, Labor Intensity, and Industrial Growth: Evidence from China[1]

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Abstract

While China has seen rapid economic growth over the last three decades, many studies document a negative correlation between traditional measurements of banking development and economic growth in China. Among many efforts to explain the low efficiency of Chinese banking sector, two arguments focus on the dominance of the four big state-owned banks but they emphasize different facets of the "Big Four". The ownership-structure view argues that the state ownership of the largest banks and corresponding government interventions in capital allocation should be responsible for the bad performance of the banking sector. The size-structure view states that it is the improper size structure of the banking sector that leads to its low efficiency. This paper aims to empirically disentangle these two different explanations. With data on the banking sector and 28 manufacturing sectors in 30 provinces of mainland China over the period 1999-2007, this paper investigates the differential effects of banking structure on the growth rates of different industries. In order to identify the channel through which banking structure affects industrial growth, the paper constructs two interaction variables: interaction between labor intensity of each industry and banking structure at each province, interaction between the share of non-state-owned firms and banking structure. To capture the purely technological feature of each industry, the paper uses the labor-capital ratio of each U.S. manufacturing sector as a proxy for labor intensity of the corresponding Chinese manufacturing industry. We find that more labor-intensive industries grow faster than more capital-intensive industries in provinces with more active small banks, compared to provinces with more dominant Big Four banks. These results are robust to alternative measures of labor intensity. Thus the results are consistent with the size-structure view while the interaction variable used to capture the ownership-structure view is not significant.

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I. Introduction

The finance-and-growth literature has shown that financial development is one key factor in promoting economic growth. But the China case provides a puzzling counterexample to this general conclusion. China has seen continuously rapid economic growth in the last three decades while the Chinese financial system is dominated by a large but inefficient banking sector. Many empirical studies document a non-positive or even negative correlation between the relative size of the banking sector and economic growth in China.

Among many efforts to explain the low efficiency of Chinese banking sector, two arguments focus on the banking structure characterized by the dominance of four largest state-owned banks[2] (henceforth the Big Four). But they emphasize different facets of the Big Four banks. The prevailing view is that the state ownership of the four largest banks and corresponding government interventions in capital allocation should be responsible for the bad performance of the banking sector. Some studies, however, emphasize the composition of large and small banks in the banking sector and argue that it is the improper size structure of the banking sector that leads to its low efficiency. According to the size-structure view, small banks should play a dominant role in China's banking system at its current development stage, but the Chinese banking system is dominated by four largest banks which cannot provide good services to medium- and small-sized enterprises, which have been the main engine in promoting China's rapid economic growth in the past three decades.

These two views have very different policy implications for the ongoing banking reforms in China. The ownership-structure view suggests reforming the ownership structure of Big Four banks and improving their corporate governance. Actually, the Chinese banking reform since 2003 has been following this path. But the size-structure view would suggest policies allowing freer entry into the banking sector, favoring smaller regional banks, or even breaking the four banking giants. This view also indicate that the recent government efforts in reforming the banking sector may improve the profitability of the largest state-owned banks themselves (esp. with the large spread between deposit and loan rates which are still controlled by the government), but may not be able to effectively improve the efficiency of the banking sector in allocating capital and supporting economic growth. Therefore, empirically disentangling the two views can help us improve the understanding of Chinese banking system and is highly relevant to China's ongoing financial reform.

However, since the four largest banks that dominate the Chinese banking system have also been state-owned banks, it is very difficult to empirically disentangle the two different views. In our knowledge, there has been no empirical study attempting to tackle this issue. This paper is the first attempt to fill this gap. This paper uses data on 28 manufacturing industries and the banking sector in 30 provinces of mainland China to investigate the differential effects of banking structure on growth rates of different industries. Banking structure is measured with the loan market share of non-Big-Four banks in the banking system. In order to investigate the channel in which banking structure affects industrial growth, the paper constructs and employs two interaction variables: interaction between labor intensity of each industry and banking structure at each province, interaction between the share of non-state-owned firms and banking structure. To capture the purely technological feature of each industry, the paper uses the labor-capital ratio of each U.S. manufacturing sector as a proxy for labor intensity of the corresponding Chinese manufacturing industry. As robustness tests, we also use two alternative measures of labor intensity of each industry, one with official data and the other with

[2] The four largest banks are Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China(ABC), People's Construction Bank of China(CBC), and Bank of China(BOC).

data estimated by Wu (2012). The regression results are consistent with the size-structure view while the interaction variable used to capture the ownership-structure view is not significant.

This paper contributes to the literature on finance-growth nexus in China. Previous studies used national level data or provincial level data to look at the relationship between banking development and economic growth. This is perhaps the first attempt to employ industry-province level data to investigate this issue.

This paper also contributes to the literature on the banking structure and economic growth which traditionally focuses either on the competitiveness of the banking sector or the role of state-ownership of banks. It suggests that the composition of large and small-sized banks is also an important dimension of banking structure.

The paper also contributes to the broader literature on finance-growth relationship. It illustrates that the structure of the financial system does matter for economic growth and financial structure should be taken into serious consideration in order to properly measure "financial development" and assess its impact on economic growth.

The reminder of the paper is structured into seven sections. Section II provides some institutional background of Chinese banking sector; Section III briefly reviews the related literature. Section IV explains the basic empirical model while Section V presents the data set. Section VI reports the empirical results of the baseline model and section VII provides some robustness tests. The last section concludes.

II. Institutional Background of Chinese Banking System

China's banking system has come a long way. This section briefly reviews the history of Chinese banking reforms and describes how the banking structure has evolved.

Between 1950 and 1978, as part of the centrally planned economic regime, the Chinese financial sector consisted of only one bank, People's Bank of China (PBOC). The financial reform after 1978 can be divided into two stages.

The first stage was from 1979 to 1994, in which financial reforms were characterized by expansion of the financial sector and rapid monetization of the economy. From 1978 to 1984, the four state-owned banks were established or reestablished, PBOC was formally established as China's central bank, and a two-tier banking system was formed. The four state-owned banks were initially limited to serve only their designed sectors of the economy, then they were allowed to compete in all areas since 1985. However, competition among them was very limited until the mid-1990s, because the big four banks served mainly as policy-lending "conduits" for the government and lacked incentives to compete. In the late 1980s and early 1990s, the banking system was further expanded with the development of financial intermediaries other than Big Four banks. A network of Rural Credit Cooperatives (RCCs) was reopened, while Urban Credit Cooperatives (UCCs) were created. Some joint-stock banks were established. Non-bank financial intermediaries also entered the financial system, such as the Trust and Investment Companies, financial companies, and other institutions. As a result, the market share of the Big Four gradually declined (see Fig. 1).

In this period, market structure of the banking sector was, at least partially, determined by the credit quota system. In 1985, a new policy was implemented to reduce the role of fiscal appropriation and to increase the role of bank loans in financing investment programs (the so-called "Bo-Gai-Dai"). Since then, the central government increased money supply by permitting banks to keep an unbalanced sheet with loans exceeding deposits. But rapid money growth brought about huge pressure of high inflation. In order to keep money supply under control, the central government adopted a credit quota system to manage banks' credit growth.

PBOC made comprehensive credit plans under the supervision of the central government and assigned credit quotas to each of the four state-owned banks, other banking institutions, and each province. Then each of Big Four banks allocated the assigned credit quota among their regional branches under the supervision of regional branches of PBOC. Facing soft budget constraints, these state-owned banks had no incentives to do risk management, instead they sought to expand credit and organization size rather than generating profits. This is one reason why the Big Four banks have stayed in dominance in the banking sector for such a long time although other joint-stock banks were present since 1986[3]. In addition, branching of Big Four banks was in accordance with the administrative structure of the government, which let local governments have more influence on loan decisions of branches of state-owned banks. Therefore, market shares of Big Four banks and other banking institutions at both national and provincial levels were to a great extent controlled by PBOC through the credit quota system and strict control over entry into the banking sector. This quota system was finally removed in 1998.

The second stage of reforms started in 1994. The asset quality of state-owned banks deteriorated significantly during the 1990s. The government decided to initiate the commercialization reform of state-owned banks. Three policy banks were created in 1994 to take over the policy-lending activities from Big Four banks. The four state-owned banks, together with other banking institutions, were obligated to adopt asset-liability management and risk management. The 1995 Central Bank Law of China confirmed PBOC as the central bank and substantially reduced the influence of local governments on credit allocation decisions. The 1995 Commercial Bank Law of China officially termed the four state-owned banks as "commercial banks", and directed them more towards commercial businesses based on market principles instead of policy-lending. More reforms occurred in the mid-1990s, such as transforming the UCCs into city commercial banks, granting limited licenses to some foreign banks, establishing some new banks[4], etc.

Following the Asian financial crisis in 1997, financial sector reforms in China has focused on state-owned banks. In 1998, The Ministry of Finance issued 270 billion RMB of 30-year government bonds to recapitalize the four state-owned banks. In 1999 and 2000, about 1.4 trillion RMB of non-performing loans (NPLs) of the Big Four (roughly 22% of their total loans outstanding as of 1998) were transformed at face value to four newly created state-owned asset management companies.

A further wave of change in the banking sector came about with China's entry into the WTO in 2001. CBRC (China Banking Regulatory Commission) was created in 2003 to oversee reforms and regulations; interest rate controls were gradually loosened; greater freedom of operational and geographical scope in the banking system was granted; entry of foreign banks was increased. Since the year of 2003, the government has launched ownership reforms of the big four state-owned banks: injected about $79 billion to recapitalize them[5], divested about 1.98 trillion RMB of NPLs[6] from these banks, introduced changes in the banks' ownership structure and corporate governance, brought in strategic foreign investors, and eventually listed

[3] In 1986, the Bank of Communications, the first domestic joint-equity bank, was established

[4] China Minsheng Banking corporation was founded in 1996 and is almost solely owned by private institutional shareholder, making it the largest private bank in China. By the end of 1999, there were 12 national joint-stock commercial banks with total assets of 1447.7 billion RMB(PBOC, 2000).

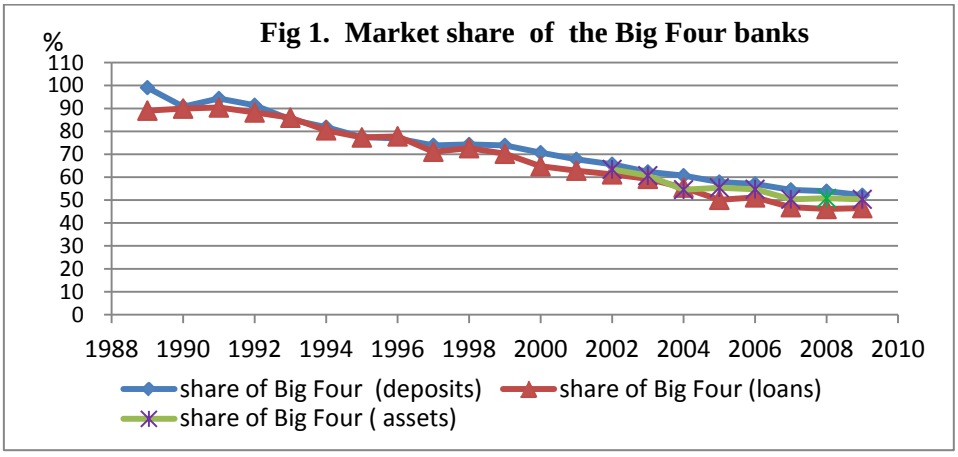
[5] In detail, $22.5 billion were injected into BOC in 2003, $22.5 billion into CBC in 2003, $15 billion into ICBC in 2005, and $19 billion into ABC in 2008. (Data source: Annual reports of the four banks and news coverage from various websites.)

6 The details are as follows: 185.8 billion RMB of NPLs were divested from CBC in 2003, 272 billion RMB of NBLs from BOC in 2004, 705 billion RMB of NPLs from ICBC in 2005, and 815.695 billion RMB of NPLs from ABC in 2008. (Data source: Annual reports of the four banks and news coverage from various websites.)

them on stock exchanges[7]. At the same time, some joint-stock banks and city commercial banks also went through certain restructuring process such as introducing foreign investors and listing on stock exchanges.

To wrap up, the current Chinese banking system is a two-tier system with the People's Bank of China as the central bank. Depository financial institutions includes four types: the Big Four banks, other commercial banks (including joint-stock commercial banks, foreign banks, city commercial banks, and rural commercial banks), Credit Cooperatives (UCCs, RCCs, rural cooperative banks), other financial intermediaries (financial companies, policy banks, postal savings bank[8], etc.).

Fig 1 shows the historical evolution of market structure of Chinese banking sector. Two features are salient. First, the banking sector has been dominated by the four largest state-owned banks. Second, the market share of the Big Four has been declining since 1980s, but his process has been very slow. After 10 years of reforms, Big Four banks held 91% of total deposits and 90% of total loans of the whole banking system in 1990. After another 20 years of financial reforms, as of the end of 2009, the market share of Big Four banks was still 52.1% in terms of deposits, 46.5% in terms of loans, and 50.3% in terms of total assets.



Data source: The People's Bank of China, Almanac of China's Finance and Banking, various issues.
Note: In calculating the share of big four banks in terms of assets, we exclude Development Bank of China and Import and Export Bank of China.

III. Literature Review

III.1. Banking development and economic growth in China: a puzzling case

Financial intermediaries, as part of the financial system, can provide important financial services and enhance economic growth. As Levine (2005) summarize, financial intermediaries can produce information and allocate capital, monitor firms and exert corporate governance, provide risk amelioration services, and serve as a vehicle of pooling savings. There have been extensive empirical efforts to investigate the relationship between financial development and economic growth (King and Levine, 1993; Rajan and Zingales, 1998; Demirguc-Kunt and Maksimovic, 1998; Levine, Loayza, and Beck, 2000; etc.). Although with exceptions, the majority of the evidence suggests that financial intermediaries have a strong positive impact upon long-term economic growth.

[7] CCB was listed on Hong Kong Exchange on Oct. 27th, 2005 , then on Shanghai Stock Exchange on Sep. 25th, 2007.
BoC was listed on Hong Kong Exchange on June 1st, 2006 and then on Shanghai Stock exchange on July 5th, 2006.
ICBC was listed on both Shanghai and Hong Kong Exchanges on Oct 27th, 2006.
ABC was listed on Shanghai Stock Exchange on July 15th , 2010, and on Hong Kong Exchanges next day. .
[8] Postal savings bank was created in 2007.

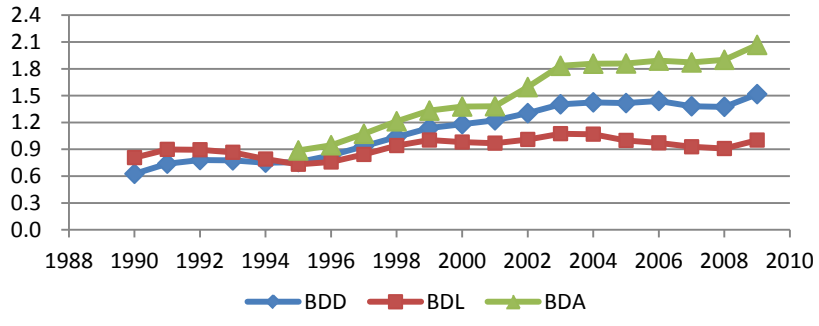
However, empirical studies on China's banking development and economic growth have shown that China is a puzzling counterexample to the well accepted finance-growth literature.

On the one hand, measured by the size of banking sector relative to GDP, Chinese banking sector is very large. As Fig.2 illustrates, in 1999, Chinese banking sector's total deposits as a share of GDP was 1.14, the ratio of total loans to GDP 0.94, and the ratio of total assets of banking institutions (excluding central bank) to GDP was 1.33. These ratios in 2007 became 1.38, 0.93, and 1.87 respectively. As a comparison, according the World Bank Financial structure Database, the median of the ratio of financial system deposits to GDP across countries in 2007 was 0.42, the 95% percentile 1.38; the median of the ratio of deposit money bank assets to GDP across the world in 2007 was 0.48 and the 95% percentile 1.79. Therefore, the size of Chinese banking sector relative to GDP in 2007 was at or above the 95% percentile across the world.

On the other hand, many empirical studies find that there is none-positive or even negative correlation between these indicators of banking development and economic growth in China. With data for 27 provinces during the period 1988-1997, Aziz and Duenwald (2002) find ***no*** evidence that financial development (measured by bank loans relative to GDP) boosts economic growth among Chinese provinces. Using a multivariate Vector Autoregression approach and annual data over the period 1952-2001, Liang and Teng (2006) find that high levels of bank credit in China do not cause higher growth. Boyreau-Debray (2003) uses provincial level data over the period 1990-1999 and finds that credit extended by the banking sector has a ***negative*** impact on economic growth. The negative correlation between the banking sector's development (often measured by the size of banking sector relative to GDP) and economic growth in China is also confirmed by other similar studies, such as Ljungwall and Li (2007), Guariglia and Poncet (2008) .

Considering the miraculous growth rate of the Chinese economy, two questions naturally come out. First, the negative correlation between various measures of banking size and economic growth indicates that there should have been serious misallocation of financial resources with a large portion of bank loans not allocated to the most efficient sections in the real economy. Then how were these loans misallocated? Second, since the real economy has been growing very fast, there must have been some substitutes for the formal banking system which provided the necessary financial resources for economic growth. Then what are these substitutes? This paper tries to shed some light on the first question.

Fig. 2 The Size of Chinese banking sector



Note: BDD=deposits held by all banking institutions as a share of GDP;
BDL=loans outstanding held by all Banking institutions as a share of GDP;
BDA= assets of all banking institutions (excluding the central bank) as a share of GDP.
Data source: The People's Bank of China, Almanac of China's Finance and Banking, various issues

III.2 Has the banking structure caused the low efficiency of Chinese banking sector?

Different arguments have been raised to explain the zero or negative association between banking size and economic growth. Among these efforts, two views argue that it is the improper banking structure characterized by the dominance of the four largest state-owned banks that has contributed to the misallocation of financial resources in the economy.

(1) The ownership-structure view

A large body of literature, such as La Porta et.al.(2002), finds evidence that state ownership of banks is detrimental to bank efficiency, to financial development, and through these channels, also to economic growth. Lending decisions of state-owned banks can be influenced by political considerations of politicians, projects or firms financed by state-owned banks are more likely to be inefficient and have adverse effects on productivity growth. Moreover, state-owned banks may crowd out private financial institutions and thus depress financial development.

In the Chinese context, the main explanation for the negative correlation between measures of banking development and economic growth is that the four largest state-owned banks have dominated the Chinese banking sector and a great part of loans made by these banks went to state-owned enterprises which have been inefficient.

Take some for examples. Chang (2003) argues that China's SOEs have been kept afloat with loans from state-owned commercial banks (SOCBs) and SOCBs continued to lend to SOES because they were aware that they could not force SOEs to pay back their loans without causing their collapse and the inevitable political crisis that would cause. Boyreau-Debray (2003) argues that the negative correlation between indicators of banking development and economic growth found in that paper is due to the dominance of state-owned banks in the banking system and the ownership bias of state-owned banks towards state-owned firms which are very inefficient or even losing money. After controlling for this ownership bias, that paper finds that the size of banking sector relative to GDP is not significant any more in the regression of economic growth on affecting factors. Similarly, many other studies also attribute the inefficient capital allocation by the Chinese banking system to the dominance of the four state-owned banks and correspondent government interventions (Liang and Teng, 2006; Guariglia and Poncet ,2008; Ferri, 2009; etc.).

Some studies do provide evidence on the behavior, in particular, the ownership bias in lending, of the state-owned banks in China. With city level data over period 1989-1991, Wei and Wang (1997) find that loan/output ratio grows faster in cities with a higher initial share of SOEs, which the paper interprets as evidence that bank loans favored state-owned industrial enterprises. Allen et. al.(2006) document that the overwhelming amount of bank loans goes to manufacturing industries with many SOEs while the amount of loans made to TVEs, private firms, collectively owned firms, and joint ventures is much less. With provincial level data over 1991-2005, Chang, Jia, and Wang (2010) find that there is no correlation between fund reallocation of Big Four state-owned banks and regional economic growth. Park and Sehrt(2001) show that the financial reforms of the mid-1990s were ineffective at lowering policy lending by state-owned commercial banks whose lending still did not respond to economic fundamentals. By examining lending growth, credit pricing, and regional patterns in lending by the large state-owned banks from 1997 to 2004, Podpiera (2006) finds that the large state-owned banks have slowed down credit expansion, but the pricing of credit risk remains undifferentiated, and these banks' lending seems to be driven mainly by the availability of funds and does not appear to take enterprise profitability into account when making lending decisions.

There are also papers discussing government interventions in state-owned banks' lending. Boyreau-Debray and Wei (2005) show that capital mobility within China is very low, which suggests a much severe

segmentation in the internal capital markets. The authors believe that the low capital mobility is resulted from the interference of local governments, which is made possible by the state-ownership of the largest banks. Some recent studies indicate that recent financial reforms have improved the profitability of state-owned commercial banks but may have not substantially changed the behavior of these banks because they are still forced to satisfy contradictory objectives: financing employment and social stability while transforming themselves to commercially viable corporate entities. Dobson and Kashyap (2006) have assembled macroeconomic, microeconomic, and anecdotal evidence suggesting that the government influence, while less explicit than in the past, is continuing despite recent reforms.

Findings in another strand of literature on cost or profit efficiency of Chinese banks are also consistent with the above arguments. These studies consistently find that the Big Four state-owned banks are less profit efficient and less cost efficient than commercial banks with other types of ownership structures(Berger, Hansan, and Zhou,2007; Ariff and Can, 2008).

(2) The size-structure view

Lin et. al. (2009) proposes a theory of optimal financial structure in economic development. Departed from above studies which highlight the potential problems associated with state-ownership of the Big Four, Lin et al (2009) emphasizes the composition of banks of different sizes in the banking system. According to this view, China at its current development stage should have a banking sector dominated by small regional banks.

Their main arguments are as follows. Because of distinct endowment structure of production factors, there exist systemic differences in the industrial structure across countries at different stages of economic development. Since firms operating in different industries have different characteristics in size, risk, and informational transparency, the demand for financial services by the real economy is systemically different across countries at different development stages. On the supply side, different financial institutions have both advantages and disadvantages in providing financial services to the real economy. Therefore, the optimal financial structure should be different across countries at different development stages. In a poor country, where the endowment structure is characterized by labor abundance and capital scarcity, labor-intensive industries are consistent with the comparative advantages determined by its endowment structure. Since labor-intensive businesses are usually smaller, they are more informationally opaque and require less amount of external finance than firms in capital-intensive industries. Lending to smaller businesses often requires banks to collect soft information on borrowers. Due to organizational complexity and the corresponding difficulty in communicating soft information, it is more difficult for large banks to effectively collect and utilize soft information about borrowers when making lending decisions. But smaller local banks have advantages in monitoring small firms and satisfying their financial needs. Therefore, poor countries such as China should have smaller local banks to play a dominant role in their banking sector.

However, due to strict barriers to entry and other government policies and interventions, the Chinese banking structure has been seriously distorted. As shown in Fig.1, the four largest banks have been dominating the banking sector and small banks have been refrained from expanding their businesses. While the market share of the Big Four has declined from over 90% in 1980s to around 50% in 2009, they are still too big. As of the year 2009, the assets of the largest Chinese bank, ICBC, are 34.6% of total GDP; the assets of the fourth largest bank, BOC, 22.8% of total GDP; the ratio of total assets of all Big Four banks to GDP is 112%! [9] Consistent with their huge size, these banks have very complicated internal organization. Take ICBC for example. At the end of 2009, ICBC consisted of 16232 domestic branch offices and 162 oversea branch

[9] As a comparison, the ratio of assets of Bank of America to U.S. GDP was about 15.8% in 2009. (Data source: Bankscope).

offices, hired 386723 employees. After many years of efforts in "flat management reform", there are still five management layers from ICBC headquarter to local offices (Fig. A1). With such complex banks, the soft-hard information arguments certainly apply. It would not be easy for local officers to convince credit officers at the tier-one branch level that the owner of a small firm is honest and capable and the firm's product is very popular in the local market and so the firm should be granted a loan. Thus the improper banking structure has led to inefficient capital allocation with small- and medium-sized firms having little access to loans and other financial services.

Lin and Sun (2008) test this idea with provincial level data for China's 28 provinces over the period of 1985-2002. The paper finds that economic growth rates are higher in provinces where smaller banks are more active and thus banking structure is less distortive.

IV. The Empirical Model

As summarized in the last section, both the ownership-structure view and size-structure view attribute the low efficiency of Chinese banking system to the dominance of the four largest state-owned banks, but they emphasize different facets of the Big Four banks. According to the ownership-structure view, it is the state ownership of these banks and corresponding government interventions that caused these banks' lending biased towards SOEs that are often inefficient, which was the key misallocation of funds in the Chinese economy. But the size-structure view indicates that it is the improper size structure of the banking sector that caused funds disproportionately allocated to more capital-intensive industries while more labor-intensive industries which are consistent with the comparative-advantage of Chinese economy could not get enough financial support. This paper aims to empirically disentangle the two views.

In order to do that, two issues need to be addressed. First, the two views actually discuss the same phenomenon but emphasize its different facets. They both concern about the dominance of the Big Four in the banking sector. But one view emphasizes the state ownership of the Big Four while the other view focuses on the huge size of these banks. Any measurement of the dominance of the Big Four banks in Chinese banking sector will capture both the effect of state-ownership and the effect of huge size. Therefore, any successful empirical work attempting to disentangle the two views must find some way to distinguish the two effects embedded in the same measurement. Second, as with other empirical work on finance and growth, there is a causality issue. It is observed that the economy grows faster in provinces where the Big Four banks account for a smaller market share. But the causality can go in both directions. It can be that the dominance of Big Four retards growth of small firms due to the size mismatch (under the size-structure view) or hinders the growth of non-state-owned enterprises due to the ownership bias by the Big Four banks (under the ownership-structure view). But it may also be that in provinces with more small firms or non-state-owned firms, which the Big Four tend to ignore, other banking institutions have incentives to expand to meet the demands from the real economy and thus the market share of the Big Four is lower. Thus it is necessary to find effective ways to address this causality issue.

To address the first issue, this paper uses data on the banking sector and individual manufacturing industries for 30 provinces in mainland China. The main idea of the empirical design is to analyze how banking structure differentially affects the growth of individual industries with different characteristics. In order to distinguish the two arguments, two key characteristics will be employed for each industrial sector: one is the share of non-state-owned enterprises in each manufacturing sector at each province; the other is the labor intensity of each manufacturing sector.

The share of non-SOEs will be used to capture the ownership effect. The view highlighting the state-ownership of the Big Four banks argues that the state-owned banks, implicitly or explicitly influenced by the central and local governments, have an ownership bias in lending towards SOEs which are often inefficient or even losing money. Thus controlling for the share of non-SOEs in each industrial sector should at least partly capture the ownership effect.

The variable "labor intensity" is used to capture the size effect. The size-structure view would predict that more labor-intensive industries should grow faster than more capital-intensive industries in provinces with more active small banks, compared to provinces where the Big Four banks are more dominant.

The empirical model is set up as follows:

$$g_{j,k} = \beta_0 + \beta_1 \cdot initialshare_{j,k} + \beta_2 \cdot lkr_j \cdot nonbig4_k + \beta_3 \cdot nonsoe_{jk} \cdot nonbig4_k$$

$$+ \sum_j \beta_{4j} \cdot dummy1_j + \sum_k \beta_{5k} \cdot dummy2_k + \xi_{jk}$$

In the model, the dependent variable is $g_{j,k}$, the growth rate of industry j in province k during the sample period. The primary variables of interest are $lkr_j \cdot nonbig4_k$ and $nonsoe_{jk} \cdot nonbig4_k$. Here, $nonbig4_k$ is the banking structure in province *k*, defined as the loan market share of all non-Big Four banks in the banking sector in province k. And lkr_j is the labor-capital ratio of sector j, $nonsoe_{jk}$ is the share of non-state-owned firms in sector j and province k. Then $lkr_j \cdot nonbig4_k$ is the product of sector j's labor-capital ratio and banking structure in province k; $nonsoe_{jk} \cdot nonbig4_k$ is the product of the share of non-SOE firms in industry *j* in province *k* and banking structure in province *k*. By using the interaction terms, we will examine the differential impact of banking structure on industries with different labor intensity or different shares of non-SOEs. In other words, the interaction terms are used to identify the channels through which banking structure affects industrial growth. The ownership-structure argument would predict that $\beta_2 = 0$ and $\beta_3 > 0$ and the size-structure view would predict that $\beta_2 > 0$ and $\beta_3 = 0$.

And $initialshare_{j,k}$ is the share of value-added of industry j in the total industrial GDP in province k in the initial year of the sample period, used to capture the potential convergence effect. Here $dummy1_j$ is a dummy variable for industry j and $dummy2_k$ a dummy variable for province k. The two groups of dummy variables are used to control for the region fixed effect and industry fixed effect, thus will enable us to control for region and industry characteristics and avoid some criticism about omitted variables. Finally, ξ_{jk} is the error term.

V. Data

V.1 Data Sources

(1) Data on industrial sectors

The data on manufacturing industries mainly comes from the Yearly Industrial Data in "China Data Online"[10] maintained by the China Data Center at the University of Michigan[11]. We also checked various issues of China Industry Economy Statistical Yearbook, edited by the National Bureau of Statistics of China. This dataset covers all industrial sectors at all provinces in mainland China from the year 1999 to 2009. For each industrial sector at each province, the dataset covers all state-owned industrial enterprises and above-size non-state-owned industrial enterprises (i.e. firms with annual revenues from principal businesses over 5 million Chinese Yuan).

As an indicator of the significance of these enterprises, in 2004, the state-owned and non-state-owned industrial enterprises above the designated size account for 90.4% [12] of the whole manufacturing sector in terms of gross industrial output value, 87.9% in terms of total assets, 90.7% in terms of sale revenues, and 70.1% in terms of total employment. But these enterprises only account for 20.4% of the whole manufacturing sector in terms of number of units, indicating that the dataset coves large-, medium-sized, and only a fraction of small-sized industrial enterprises[13].

The coverage of the dataset varies much across sectors. The Appendix Table A1 displays the percentage of state-owned and above-size non-state-owned industrial enterprises in all manufacturing sectors in 2004. Sectors in which more enterprises are large or state-owned are more presented in the dataset than those with more smaller non-state-owned enterprises. For instance, the industry C16 (Manufacture of Tobacco), C25 (Processing of Petroleum, Coking, Processing of Nuclear Fuel), C28 (Manufacturing of Chemical Fibers), C32 and C33 (Melting and Pressing of Metals) are more presented, but such industries as C20 (Manufacture of Wood, Bamboo, Rattan, Palm, and Straw Products) and C21 (Manufacture of Furniture) are less presented. Despite the systematic difference in the coverage, by analyzing this dataset we can obtain the general growth trend of different industries[14].

From this dataset, we choose the data on 28 two-digit manufacturing sectors in 30 provinces[15]. Since the dataset does not report data on value-added for 2008 and 2009, our analysis focuses on the growth of these 28 sectors in 30 provinces from 1999 to 2007[16].

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[10] For details, please refer to China Data Online at http://www.chinadataonline.org/

[11] According to China Data Center, the original source of data on China Data Online is the National Bureau of Statistics of China.

[12] The number is calculated by the authors with data from the China Economic Census Yearbook 2004. Same for other numbers used in this paragraph.

[13] In China, the classification criteria for large-, medium-, and small-sized industrial enterprises are as follows. Large sized enterprises need to satisfy all of the following three criteria: employment equal to or above 2000 persons, total assets equal to or above 400 million Yuan, sales revenue equal to or above 300 million Yuan. Medium-sized enterprises need to satisfy all of the three criteria: employment equal to or above 300 but below 2000 persons, total assets equal to or above 40 million but below 400 million Yuan, sales revenue equal to or above 30 million but below 300 million Yuan. Small-sized enterprises are those with employment under 300, total assets under 40 million Yuan, or sales revenue under 30 million Yuan. Notice that enterprises have be to satisfy all of the three criteria in order to be classified as large- or medium-sized enterprises, otherwise are classified into the lower category.

[14] The systematic difference in the coverage of the data set for different industries will not go against our results. More capital-intensive industries are more presented than labor intensive industries in the data set, so only a smaller part of the growth of labor-intensive industries is recorded compared to capital-intensive industries. If we can still find that labor-intensive industries grow faster in provinces where smaller banking institutions are more active in this dataset, then with the full dataset this effect would be stronger.

[15] Tibet is excluded from the sample due to data availability problems.

[16] Since the year 2003, the statistics for industrial sector follow the new industrial classification which was revised in 2002 by the National Bureau of Statistics of China in an effort to make the Chinese statistics more compatible with the International Standard Industrial Classification (Rev.3). We have checked the data consistency and tried to match the data before and after 2003. For our purpose, the main matches are as follows: C39 after 2003 is matched with C40 before 2003, C40 after 2003 with C41 before 2003, C41 after 2003 with C42 before 2003; two industries (C42 and C43 after 2003) were dropped due to inconsistency with industrial classification before 2003. There are also other minor changes in the new industrial classification system, but since we use data for industries at two-digit level, we believe that those minor changes won't affect our main results. The 28 industries included in the analysis are C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C39,C40,C41. (Please see explanation of these codes in the appendix Table A1).

(2) Data on the banking sector

The data on the banking sector comes from various issues of Almanac of China's Finance and Banking. We also double check some data in Bankscope, various issues of China Statistical Yearbook, and the People's Bank of China Quarterly Statistical Bulletin.

V.2 Definition and Measurement of Variables

(1) Industrial growth ($g_{j,k}$)

We think the most appropriate measurement of an industry's growth is the growth in value-added for that industry. So industrial growth is defined as the annual compounded growth rate in real value-added over the period 1999-2007 for each industry in each province. More specifically, the growth rate of industry j in province k is defined as:

$$g_{j,k} = \left[\ln(realvadd2007_{j,k}) - \ln(vadd1999_{j,k}) \right] / 8$$

Here, real value-added in 2007, $realvadd2007_{j,k}$, is obtained by deflating the current-price value-added in 2007 with PPI. The data on PPI comes from various issues of China Statistical Yearbook. There is no data on PPI both by industry and by province, so we have to use data on PPI by industry or data on PPI by province. The growth variable obtained with PPI by industry is denoted as $g1$ while the growth variable obtained with PPI by province is denoted as $g2$.

As a robustness check, we also calculate the growth rate in gross output value of each industry in each province, similarly defined as the growth rate in value-added. Again, real output value in 2007 is obtained by deflating the current-price gross output value in 2007 with PPI by industry or PPI by province. Similarly, the growth rate in total output value is denoted as $gout1$ and $gout2$ respectively.

(2) Initial share ($initialshare_{j,k}$ **)**

The initial share of each sector *j* in province *k* is measured as the share of value-added of sector *j* in the total industrial GDP of province *k* in 1999.

(3) Non-SOEs

We use two measurements of non-SOEs for each industry at each province: $nonsoe\_out_{jk}$ and $nonsoe\_emp_{jk}$. Here $nonsoe\_out_{jk}$ is defined as the share of gross output value of non-SOE enterprises in the gross output value of industry j at province k. And $nonsoe\_emp_{jk}$ is defined as the share of employment of non-SOE enterprises in the total employment of industry j at province k. To reduce potential endogeneity issues, we use $nonsoe\_out_{jk}$ and $nonsoe\_emp_{jk}$ in the year of 1999, the initial year of our sample period.

(4) Labor intensity (lkr_j)

Theoretically, the realized labor-capital ratio is determined by both technological characteristics of industries and the factor endowments of the economy. To capture the purely technological determinant of labor intensity, we use the labor-capital ratio of each manufacturing sector in the United States as a proxy for the labor-capital ratio of the corresponding Chinese manufacturing sector.

The justification of this method is as follows. If we compare the realized labor-capital ratios in the two countries, then the labor-capital ratio of an industry in the U.S. should be lower than the labor-capital ratio of the same industry in China, because capital is more abundant relative to labor in the United States than in China. But due to the intrinsic technological characteristics of industries, the ranking order of labor-capital ratios across industries in the U.S. should be consistent with the ranking order of labor-capital ratios across industries in China. So the labor-capital ratios of industries in the U.S. can be used to capture the exogenous technological determinant of labor intensity of Chinese industries.

The data used to calculate labor-capital ratios of U.S. industries comes from NBER-CES Manufacturing Database[17] . The database contains annual data on output, employment, real capital stocks and other variables for all 6-digit NAICS[18] manufacturing industries from 1958 to 2005. We first checked the consistency between the CSIC (Chinese Standard Industrial Classification) with NAICS, then we mapped the NAICS data into CSIC codes and aggregated the data at two-digit level. Then we calculate the labor-capital ratio of each U.S. manufacturing industry by dividing "total employment" with "total real capital stock" which is measured in 1987 constant U.S. dollars. Therefore, labor intensity is measured as the number of employees per one million dollars of physical capital. As the last step of this method, we average the labor-capital ratios of each U.S. manufacturing sector from 1986 to 2000 and take it as the proxy for the labor-capital ratio of corresponding Chinese industry[19]. This proxy is denoted as *lkr_us* in the regression.

(5) Banking development and banking structure

To measure banking development in each province, we use two variables: bdl_k and bdd_k. Here bdl_k is the ratio of total loans outstanding held by all banking institutions to GDP in province k while bdd_k the ratio of total deposits outstanding to GDP in province k.

Banking structure is defined as the loan market share of non-Big-Four banking institutions in the banking sector. More specifically, banking structure for province k is measured by one minus the ratio of loans held by the Big Four banks to total loans outstanding held by the whole banking sector in that province. This measurement of banking structure captures the role of state-owned banks in the banking sector in each province (a smaller value of banking structure means a higher loan market share of state-owned banks).

In the context of China's banking system, this measurement also captures the concept of banking structure in terms of composition of large and small banks in the banking sector[20]. In order to understand this, we need to briefly describe the banking market at the provincial level. Since their very beginning, each of Big Four banks has established branches at various levels throughout China according to the administrative structure of the government. Each of them has one tier-one branch at each province and each of the "independently planned cities"[21], and then more layers of sub-branches and sub-sub-branches at lower administrative levels[22]. In each province, the branches of the Big Four banks compete with local banking institutions or regional banks. Although each branch of the Big Four banks is granted with some authorities by their supervisors, they have

[17] Please refer to http://www.nber.org/data/nbprod2005.html for details of the database.

[18] NAICS: North American Industry Classification System.

[19] The choice of the period (from 1986 to 2000) is sort of arbitrary. My thought is that Chinese manufacturing sectors are less advanced than U.S. industries in terms of technology, so we should use the U.S. data in some earlier period to capture the technological characteristics of current Chinese industries. But I have no strong reference about which period is most appropriate.

[20] Compared to the Big Four banks, the joint-stock commercial banks are rather small. Urban commercial banks, credit cooperatives, and other banking institutions are even smaller. For instance, as of the end of 1999, the total assets of all 12 joint-stock banks were 1470.439 billion Yuan, while the assets of BOC, CCB,ABC, and ICBC were 910.271 billion Yuan, 2201.056 billion Yuan, 2275.835 billion Yuan, and 3539.866 billion Yuan respectively. (Data source: Almanac of China's Finance and Banking 2000).

[21] These cities refer to Dalian, Qingdao, Ningbo, Xiamen, and Shenzhen.

[22] The organizational structures of BoC, CCB, and ABC are very similar to the organizational structure of ICBC shown in Fig.A1.

to follow rules, especially rules about credit criteria, set by headquarters. Therefore, it can be predicted that practices of branches of the Big Four banks in each province would be less flexible and less tailored to local conditions than local banking institutions. But on the other hand, each branch of the Big Four does not need to worry about risk diversification of their asset portfolios as much as those small banks in the local market because each big bank as a whole can diversify risks across regions. Also, the large internal market within each of the Big Four can more easily facilitate funds transfers among branches. Therefore, branches of the Big Four banks should behave differently from their local counterparts. Our measurement of banking structure at each province measures the role of branches of the Big Four banks relative to that of local banking institutions.

To reduce the possibility of reverse causality, we use the data on banking development and banking structure in 1999, the initial year of the sample period. Table A2 presents the values of banking development (bdl_k and bdd_k) and banking structure ($nonbig4_k$) in 1999, as well as the ranking order of provinces by each of these variables. As a robust check, we also calculated banking structure in terms of deposits, *nonbig4_dep*, similarly defined as $nonbig4_k$.

Table1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
g1	832	0.18	0.11	-0.37	0.62
g2	832	0.16	0.11	-0.39	0.59
bdl	832	1.11	0.31	0.64	1.87
bdd	832	1.25	0.54	0.75	3.80
nonbig4	832	0.35	0.06	0.17	0.47
nonbig4_dep	832	0.33	0.07	0.14	0.43
lkr_us	832	14.55	12.24	1.37	61.11
lkr_wu	832	19.97	14.37	3.10	58.14
lkr_99	832	17.91	10.02	4.19	44.82
nonsoe_out	811	0.62	0.29	0.00	1
nonsoe_emp	811	0.51	0.27	0.00	1
Initial share	832	0.17	0.25	0.00	0.41

Table 2 Correlation coefficients

	g1	g2	bdl	bdd	nonbig4	nonbig4_dep	lkr_us	lkr_wu	lkr_99	nonsoe_out
g2	0.936	1.000								
bdl	**-0.138**	**-0.143**	1.000							
bdd	**-0.164**	**-0.118**	0.725	1.000						
nonbig4	**0.118**	**0.141**	-0.150	-0.078	1.000					
nonbig4_dep	**0.094**	**0.193**	-0.451	-0.120	0.525	1.000				
lkr_us	0.047	-0.036	-0.012	-0.017	0.016	0.004	1.000			
lkr_wu	0.049	-0.035	-0.011	-0.008	0.012	0.015	**0.831**	1.000		
lkr_99	0.051	-0.045	-0.004	-0.006	0.007	0.006	**0.830**	**0.964**	1.000	
nonsoe_out	0.049	0.052	-0.165	0.003	0.117	0.295	**0.329**	**0.369**	**0.347**	1.000
nonsoe_emp	0.005	0.041	-0.184	-0.018	0.172	0.318	**0.327**	**0.363**	**0.326**	0.909

(6) Summary statistics

Table 1 shows the summary statistics of main variables. Table 2 presents the correlation coefficients between these variables.

VI. Regression Results

VI.1 The negative correlation between banking development and industrial growth

First, let us check whether the negative correlation between banking development and economic growth holds in our sample. Table 3 presents the regression results with *g1* as the dependent variable[23].

Table 3 Negative correlation between banking development and industrial growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Var.	g1	g1	g1	g1	g1	g1	g1	g1
Initial share	-0.4311***	-0.4296***	-0.363***	-0.3510***	-0.4094***	-0.4320***	-0.3632***	-0.3566***
	[0.115]	[0.125]	[0.114]	[0.112]	[0.108]	[0.116]	[0.105]	[0.104]
bdl	-0.0438***	-0.0426***	-0.044***	-0.0445***				
	[0.011]	[0.012]	[0.011]	[0.012]				
nonbig4		0.1766***	0.181***	0.1866***				
		[0.063]	[0.065]	[0.064]				
nonsoe_out			-0.007				-0.0032	
			[0.022]				[0.023]	
nonsoe_emp				-0.0128				-0.0079
				[0.023]				[0.024]
bdd					-0.0285***	-0.0270***	-0.0264***	-0.0264***
					[0.005]	[0.005]	[0.005]	[0.005]
nonbig4_dep						0.1322**	0.1446**	0.1506**
						[0.062]	[0.065]	[0.067]
Obs.	804	804	783	783	804	804	783	783
R-squared	0.191	0.200	0.205	0.206	0.196	0.203	0.208	0.208

Note: (1) In all regressions, the dependent variable is *g1,* the annual growth rate in real value-added over 1999-2007 for each manufacturing sector in each province. Here *initial share* is the share of each industry's value-added in the total industrial GDP of each province in the initial year of the sample period. The variable *bdl* is the ratio of total loans held by all banking institutions to GDP in each province in the year1999, used to measure banking development. And *bdd* is another measure of banking development in each province, defined as the ratio of total deposits of the banking sector to GDP. The variables *nonbig4* and *nonbig4_dep* are two measures of banking structure in each province. Here *nonbig4 is* defined as the loan market share of non-Big-Four banking institutions and *nonbig4_dep* deposit market share of non-Big-Four banking institutions. The variables *nonsoe_out* and *nonsoe_emp* are two measures of the share of non-SOEs in each industry at each province with the former defined in terms of gross industrial output value and the latter defined in terms of employment. (2) All the regressions are run with industry dummies. (3) Robust standard errors in brackets. (4) *** p<0.01, ** p<0.05, * p<0.1.

In the first column, the coefficient of banking development, measured as the ratio of loans of all banking institutions to GDP, *bdl*, is -0.0438, which is significant at 1% level. Thus consistent with the literature, the predetermined development of the banking sector is negatively associated with the growth of manufacturing

[23] Regression results with *g2* as the dependent variable are very similar and thus not reported here.

industries in the sample period. This negative association continues to hold when we add banking structure variable *nonbig4* into the regression, as shown in column (2). Notice that *nonbig4* is significantly positive, indicating that the growth rates of industries are higher in provinces where the market share of branches of Big Four banks is smaller. Thus the structure of the banking sector does matter even when the level of banking development is controlled for, but this result can be interpreted as consistent with both the ownership-structure view and the size-structure view. In column (3) and (4), we add variables measuring the share of non-SOE enterprises, *nonsoe_out* and *nonsoe_emp* , the coefficient of banking development, *bdl,* and banking structure, *nonbig4* , do not change much while the share of non-SOEs is not significant in both regressions.

The regression results are similar when we use another pair of proxies for banking development and banking structure in terms of total deposits, *bdd* and *nonbig4_dep,* as shown in column (5)-(8).

VI.2. Main results: banking structure, labor intensity, and industrial growth

Table 4 presents the mains results with both province and industry fixed effects. In all regressions, the dependent variable[24] is *g1*, the annual growth rate in real value-added over the period 1999-2007 for each two-digit manufacturing industry in each province. The initial share is significantly negative in all regressions.

Table 4. Banking structure, labor intensity and industrial growth

	(1)	(2)	(3)	(4)	(5)
VARIABLES	g1	g1	g1	g1	g1
initial share	-0.3908***	-0.3291**	-0.3101**	-0.3057**	-0.2894**
	[0.007]	[0.013]	[0.017]	[0.026]	[0.033]
lkr_us x nonbig4	0.0111*	0.0136**	0.0144**		
	[0.065]	[0.031]	[0.024]		
nonsoe_out x nonbig4		-0.0282		-0.0069	
		[0.718]		[0.927]	
nonsoe_emp x nonbig4			-0.0824		-0.0551
			[0.335]		[0.507]
Obs.	804	783	783	783	783
R-squared	0.352	0.367	0.369	0.360	0.361

Note: (1) In all regressions, the dependent variable is *g1,* the annual growth rate in real value-added over 1999-2007 for each manufacturing sector in each province. Here *initial share* is the share of each industry's value-added in the total industrial GDP of each province in the initial year of the sample period. Banking structure, *nonbig4,* is the loan market share of non-Big-Four banks in each province. *lkr_us* is labor-capital ratio of each manufacturing sector in the U.S. The variables *nonsoe_out* and *nonsoe_emp* are two measure of the share of non-SOEs in each industry at each province with the former defined in terms of gross industrial output value and the latter defined in terms of employment. (2) All the regressions are run with both industry and province dummies. (3) p-values are in brackets; robust standard errors are used to calculate p-values. (4) *** p<0.01, ** p<0.05, * p<0.1.

Column (1) reports the results with only initial share and the interaction term between labor-capital ratio and banking structure. The coefficient is 0.0111, which is significant at 10% level. To understand the economic magnitude of this coefficient, let's do the following thought experiments. Based on the ranking order by labor-capital ratio, *lkr_us*, the industry at the 20th percentile of labor-capital ratio (more capital intensive) is C22 (papermaking industry) with *lkr_us* equal to 5.2, and the industry at the 90th percentile of labor-capital ratio (more labor intensive) is C21 (manufacture of furniture) with *lkr_us* equal to 35.2. Based on the

[24] The results are almost the same when *g2* is used as the dependent variable and thus not reported here.

ranking order by banking structure, *nonbig4*, the province at the 20th percentile of banking structure (higher market share of Big Four banks) is Qinghai (*nonbig4* equal to 0.300) while the 90th percentile of banking structure (more active small banks) is Shandong (*nonbig4* equal to 0.421). We set the initial shares of industries at their overall means. The estimated coefficient, 0.011, would predict that Manufacture of Furniture industry would grow 3.99% faster than Papermaking industry annually in Shandong province compared to Qinghai province. As comparison, the overall mean of *g1* over this period is 18% . In column (2) and column (3), we report the results with initial share, the interaction between labor intensity and banking structure, and the interaction between non-SOE share and banking structure. Notice that the magnitude and significance of the interaction variable between labor intensity and banking structure do not change compared to column (1). And the interaction between non-SOE share and banking structure is not significant in both regressions. And this result is not likely to be driven by the colinearity between the two interaction variables, because the interaction between non-SOE share and banking structure is not significant when we do not include the product of labor intensity and banking structure, as shown in column (4) and (5). Thus the regression results are consistent with the size-structure view, i.e. labor-intensive industries grow faster than capital-intensive industries in provinces with more active small banks compared to provinces with Big Four branches more dominant.

The result that the product of non-SOE share and banking structure is not significant is contrast to the traditional results on Chinese SOEs and Non-SOEs in the literature. One possible explanation for this result is that the performance of SOEs in the sample period, 1999-2007, was improved compared to SOEs in earlier period which were discussed in most of the literature. The 15th Communist Party Commission (September 1997) adopted a policy of "grasping the large and letting go the small" to reform state sector. In "grasping the large", policy makers sought to focus on the largest state-owned firms, reorganize them into even larger and hopefully more competitive enterprises, restructure and refinance them while keeping them under state control. In "letting the small go", policy makers were giving local governments much greater authority to restructure the small SOEs, to privatize them, or to close down some of them. Since then the state sector experienced a painful restructuring process with millions of SOE workers laid off. After 2000, the state sector was increasingly concentrated on energy, natural resources, infrastructure, and a few sectors which are identified as strategic to the whole economy. Probably SOEs which survived this reform process are those relatively large and with better performance. If this is the case, even state-owned banks still have ownership bias towards SOEs, it would not be as serious a concern as before. Yet, another possible explanation for this result might be that not only Big Four banks but also other banking institutions favor state-owned enterprises in lending, this could be more possible when SOEs have higher profitability. But in either case, the results here indicate that ownership-structure arguments may not hold in the sample period.

But the above discussions should be taken with caution because one possible reason for this result is measurement errors. To avoid endogeneity problem, we use the share of non-SOEs in the initial year of the sample period instead of the average over the period. But the share of non-SOE enterprises increased a lot over this period[25] and the increase in the share of non-SOEs varies significantly across industries and across provinces. So the share of non-SOEs in 1999 may not be a very good IV for the share of non-SOEs over this period. Unfortunately, we cannot rule out this possibility by finding a better instrument variable.

VII. Robustness Tests

[25] For instance, at the national level, in 1999, the share of gross output value of non-SOE firms in all industrial sectors was 0.51, but this number rose to 0.70 in 2007. The ratio of non-SOE firms' employment in all industrial sectors was 0.42 in 1999, and this number became 0.80 in 2007.

This section presents some robustness tests. First, we check whether the regression results hold with different measures of labor intensity of manufacturing industries. Next, we rerun the regressions with the growth rate in gross output value as the dependent variable. Following that, we try to directly test whether small firms grow faster in provinces with more active small banking institutions. Lastly, a different measure of banking structure will be used in the regressions.

VII.1 Different proxies for labor intensity

In order to capture the effect of banking structure on different industries with different labor intensity, we wish to measure the purely technologically determinant of labor intensity across industries. In the basic regressions, we use the labor-capital ratio of each U.S. manufacturing sector as a proxy for the labor intensity of corresponding Chinese manufacturing sector. The advantage of this measure is that it completely avoids the endogeneity issue and is not affected by the endowment structure of Chinese economy and all kinds of market frictions and government interventions in China. But this measurement was also affected by the endowment structure of the U.S. economy during that period. It would be nice to know if the pattern of labor intensity across industries in the U.S. is consistent with the realized labor-capital ratios in the Chinese manufacturing sectors and how this may affect the regression results. This subsection tries to use two alternative measures of labor intensity for each Chinese industry.

The critical difficulty to measure labor-capital ratio is to find the appropriate measures of capital stock at industrial level. Here two measures of capital stock are used: the official data on "net value of fixed assets" and some estimated capital stock data for Chinese manufacturing industries.

The official Chinese statistics includes two series of capital stock, "original value of fixed assets" and "net value of fixed assets", with the latter defined as the former minus the accumulated value of depreciation. We use "net value of fixed assets" as a proxy for capital stock. Then we divide "the number of employees" with "average balance of net value of fixed assets" for each industry in the official data to get a proxy for labor-capital ratio. To reduce the potential endogeneity issue, we use the value of labor-capital ratio in the initial year of the sample period. This proxy is denoted as *lkr_99*, measured as the number of employees per one million Yuan of net fixed assets.

But there are some important flaws with this alternative measure of labor intensity. According to Wu (2002), in the Chinese statistics, the way of calculating current year's gross capital stock, "original value of fixed assets" is to add the value of the "investment in fixed assets" in the current year to the value of the existing stock of fixed assets at historical or acquisition prices. "Net value of fixed assets" is defined as the "original value of fixed assets" minus the accumulated value of depreciation. Even we ignore the problems with the official depreciation method, inaccurate valuation is still a problem with these official capital stock data. It is impossible to find a deflator that can correctly deflate the capital stock mixed with different types of assets purchased at different times and prices.

Our second alternative measure of labor intensity at the industrial level will use estimated data on capital stock and labor for each industrial sector by Wu(2012) and his recent research[26]. Similarly, to avoid endogeneity issue, we use the estimated labor-capital ratio for each manufacturing sector in 1999, the first year of our sample period. This measurement is denoted as *lkr_wu*. While *lkr_wu* reduces the problems with official data on net fixed assets and employment, this measurement has its own disadvantage because many assumptions have to be made when estimating the capital stock at industrial level with flawed official data.

[26] The detailed assumptions and methods used in estimating capital stock and labor at industrial level , please refer to Wu(2012) and Wu (2008).

Thus the three proxies for labor intensity of industries, *lkr_us*, *lkr_99*, *and lkr_wu,* have their own advantages and disadvantages. Interestingly, despite all the imperfectness, the three proxies are highly correlated with each other with correlations higher than 0.83 (see table 2). Fig.3 also illustrates the trend of the three series of capital-labor ratio across 28 industries in the sample. Although the absolute level of capital-labor ratio for each industry is different with the three different measures, the relative ranking of capital-labor ratios across industries is consistent with different measures. Table A3 in the appendix also presents the values of *lkr_99* and *lkr_us* for each industry.

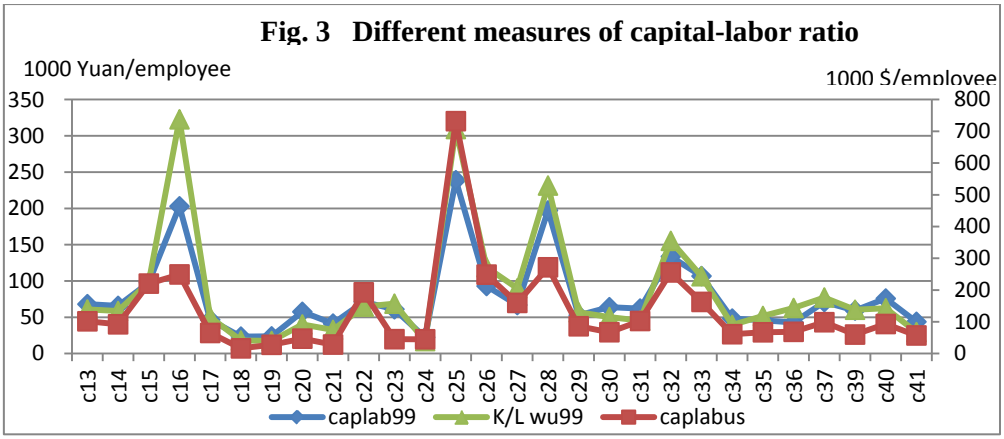
With the two alternative measures of labor intensity of industries, we rerun the regressions. Table 5 shows the results. Column (1)-(3) are results with *lkr_99*, and column (4)-(6) are results with *lkr_wu*. In all the regressions, the coefficient for the interaction between labor intensity and banking structure is significantly positive and the magnitude of the coefficients are similar to that in Table 4, where labor intensity of each industry is measured by the labor-capital ratio of the corresponding industry in the United States. And interactions between the share of non-SOE enterprises and banking structure are still not significant.

Table 5 Industrial growth with alternative measures of labor intensity

VARIABLES	(1) g1	(2) g1	(3) g1	(4) g1	(5) g1	(6) g1
Initial share	-0.4053***	-0.3424***	-0.3237**	-0.4001***	-0.3352***	-0.3156**
	[0.004]	[0.008]	[0.011]	[0.005]	[0.009]	[0.012]
lkr_99 x nonbig4	**0.0163****	**0.0180****	**0.0190****			
	[0.031]	[0.023]	[0.016]			
nonsoe_out x nonbig4		-0.0346			-0.0362	
		[0.661]			[0.646]	
nonsoe_emp x nonbig4			-0.0877			-0.0910
			[0.310]			[0.294]
lkr_wu x nonbig4				**0.0118****	**0.0128****	**0.0135****
				[0.024]	[0.019]	[0.013]
Obs.	804	783	783	804	783	783
R-squared	0.354	0.368	0.370	0.355	0.369	0.371

Note: (1) In all regressions, the dependent variable is *g1,* the annual growth rate in real value-added over 1999-2007 for each manufacturing sector in each provinces. Here *initial share* is the share of each industry's value-added in the total industrial GDP of each province in the initial year of the sample period. Banking structure, *nonbig4*, is the loan market share of non-Big-Four banking institutions in each province. The variables *nonsoe_out* and *nonsoe_emp* are two measures of the share of non-SOEs in each industry at each province with the former defined in terms of gross industrial output value and the latter defined in terms of employment. *lkr_99* is labor-capital ratio of each manufacturing sector in 1999 calculated with official data. *lkr_wu* is labor-capital ratio for each industry in 1999 estimated by Wu(2012) . (2) All the regressions are run with both industry and province dummies. (3) p-values are in brackets; robust standard errors are used to calculate p-values. (4) *** p<0.01, ** p<0.05, * p<0.1.

Fig. 3 Different measures of capital-labor ratio



Note: *caplab99* is the ratio of net fixed assets to employment in 1999 calculated with official data, measured as thousand Yuan per employee; *caplabus* is ratio of capital stock to employment in the U.S. manufacturing sectors averaged over 1986-2000, measured as thousand 1987 U.S. dollars per employee; *caplabwu* is ratio of capital stock to employment in 1999 estimated by Wu(2012) , measured as thousand 1995 Yuan per employee.

VII.2 Growth in gross output value

In this subsection, as a robust test to the main results in Section VI, we rerun the regressions with the growth rate in gross industrial output value as the dependent variable. Table 6 summarizes the results.

Table 6 Growth in output value with various measures of labor intensity

Var.	(1) gout1	(2) gout1	(3) gout1	(4) gout1	(5) gout1	(6) gout1	(7) gout1	(8) gout1	(9) gout1
Initial share	-0.1220	-0.1098	-0.0968	-0.1278	-0.1135	-0.1002	-0.1321	-0.1192	-0.1066
	[0.204]	[0.262]	[0.320]	[0.180]	[0.241]	[0.297]	[0.169]	[0.222]	[0.271]
lkr_us x nonbig4	**0.0103***	**0.0123****	**0.0129****						
	[0.073]	[0.041]	[0.033]						
nonsoe_out x nonbig4		-0.0088			-0.0143			-0.0126	
		[0.900]			[0.843]			[0.861]	
nonsoe_emp x nonbig4			-0.0498			-0.0553			-0.0523
			[0.516]			[0.482]			[0.505]
lkr_wu x nonbig4				**0.0098****	**0.0107****	**0.0113****			
				[0.046]	[0.038]	[0.028]			
lkr_99 x nonbig4							**0.0135***	**0.0149****	**0.0157****
							[0.056]	[0.046]	[0.035]
Obs.	804	783	783	804	783	783	804	783	783
R-squared	0.349	0.358	0.359	0.351	0.359	0.360	0.350	0.358	0.359

Note: (1) In all regressions, the dependent variable is *gout1*, the annual growth rate in real gross industrial output value over the period 1999-2007 for each two-digit manufacturing sector in each province. The growth rate is calculated by deflating nominal output value with PPI by industry. *initial share* is the share of each industry's value-added in the total industrial GDP of each province in the initial year of the sample period. Banking structure, *nonbig4*, is the loan market share of non-Big-Four banks in each province. *lkr_us* is labor-capital ratio of each manufacturing sector in the U.S.. *lkr_99* is labor-capital ratio of each manufacturing sector in 1999 calculated with official data. *lkr_wu* is labor-capital ratio for each industry in 1999 estimated by Wu(2012) . *nonsoe_out* is the share of non-SOEs in each industry at each province in terms of gross industrial value and *nonsoe_emp* the share of non-SOEs in each industry at each province in terms of employment. (2) All the regressions are run with both industry and province dummies. (3) p-values are in brackets; robust standard errors are used to calculate p-values. (4) *** p<0.01, ** p<0.05, * p<0.1.

Column (1)-(3) present results with labor-capital ratios of U.S. industries as the proxy for labor intensity of Chinese industries. Column (4)-(6) have the estimated labor-capital ratios by Wu(2012), *lkr_wu*, as the proxy for labor intensity, and column (7)-(9) are results with labor-capital ratios calculated with official data.

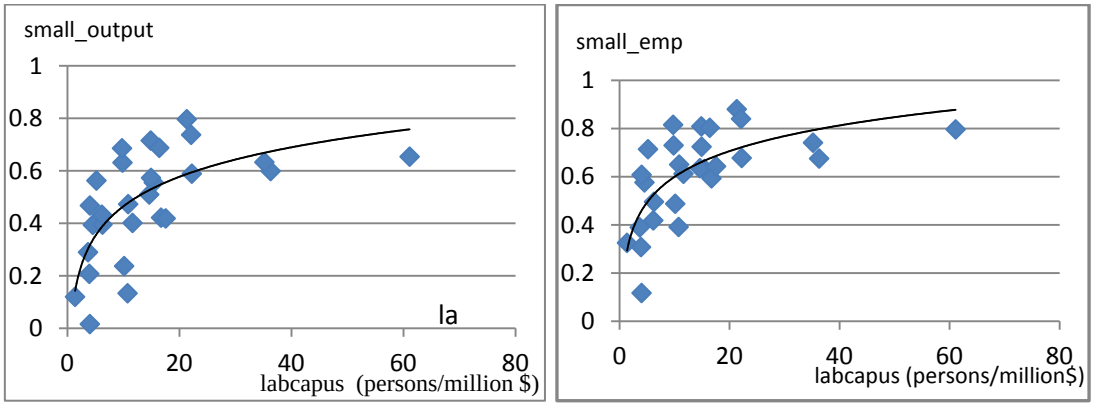
Consistent with the main results in last section, the interaction between labor intensity and banking structure is significantly positive in all nine regressions, although the magnitude of the coefficients varies when different proxies for labor intensity are used. And the product of the share of non-SOE enterprises and banking structure is not significant in all six regressions.

VII.3 The share of small firms, banking structure, and industrial growth

So far our regression results are consistent with the size-structure view, i.e. labor-intensive manufacturing sectors grow faster than capital intensive industries in provinces where non-Big-Four banks are more active compared to provinces with more dominant Big Four branches. And the interaction variable to capture the ownership-structure view is not significant in all the regressions. In this subsection, we try to test the size-structure view more directly. Two of the key logic steps in the size-structure view are that firms in more labor-intensive industries are smaller than those in more capital-intensive sectors and smaller banks are more capable of providing financial services to small firms. We will test these arguments with our data.

First, are firms in more labor-intensive industries smaller? Fig. 4 plots the share of small firms[27] against labor intensity for each industry. In both graphs, labor intensity is proxied by the labor-capital ratios of U.S. manufacturing industries. In the left graph, the share of small firms in each industry is measured by the share of small firms' output value in the total output value of the whole industry in the year 2004. The right graph plots the share of small firms in terms of employment. Both graphs show a clear positive relationship between labor intensity and the share of small firms, indicating that small firms do account for a higher percentage in more labor-intensive industries than in more capital-intensive sectors, which is consistent with the argument proposed by the size-structure view.

Fig. 4 Labor-capital ratio and the share of small firms



Data source for share of small firms: China Economic Census Yearbook 2004.
Note: *small_emp* is the share of small firms in each industry in terms of employment in 2004.
small_out is the share of small firms in each industry in terms of total output value in 2004.
lkr_us is the labor-capital ratio of each industry in the United States averaged over 1986-2000, measured as the number of employees per one million dollars of physical capital.

[27] Here we follow the official classification about small firms. Small firms are those with employment under 300, total assets under 40 million Yuan, or sales revenues under 30 million Yuan.

Next, we construct an interaction variable between the share of small firms (in terms of output value, employment, or sales revenue) in each industry in the year 2004 and banking structure in each province, then we rerun the regressions with this new interaction variable replacing the product of labor intensity and banking structure. The regression results[28] are summarized in Table 7. Column (1)-(3) are results when the share of small firms in terms of employment is used. Column (4)-(6) are results with the share of small firms in terms of gross output value. The last three columns are results when the share of small firms is measured in terms of sales revenue. In all the regressions, the interaction between the share of small firms in an industry and banking structure in each province is significantly positive and the magnitude of the coefficients is very large (larger than 0.6). So these results indicate that industries with a higher share of small firms grow faster in provinces with more active non-Big-Four banking institutions. These results are consistent with the argument of size-structure view that smaller banking institutions are more capable of serving small firms.

Table 7 Share of small firms, banking structure and industrial growth

VARIABLES	(1) g1	(2) g1	(3) g1	(4) g1	(5) g1	(6) g1	(7) g1	(8) g1	(9) g1
Share of small firms (employment) x nonbig4	**0.727****	**0.868****	**0.922*****						
	[0.025]	[0.010]	[0.007]						
nonsoe_out x nonbig4		-0.0348			-0.0358			-0.0368	
		[0.658]			[0.649]			[0.641]	
nonsoe_emp x nonbig4			-0.0858			-0.0878			-0.0890
			[0.320]			[0.309]			[0.303]
Share of small firms (output) x nonbig4				**0.604***	**0.775****	**0.829****			
				[0.061]	[0.020]	[0.013]			
Share of small firms (sales) x nonbig4							**0.623***	**0.792****	**0.846****
							[0.053]	[0.018]	[0.011]
Ob.	804	783	783	804	783	783	804	783	783
R-squared	0.352	0.366	0.368	0.351	0.366	0.368	0.351	0.366	0.368

Data source for share of small firms: China Economic Census Yearbook 2004.
Note: (1) In all regressions, the dependent variable is *g1*, the annual growth rate in real value-added over the period 1999-2007 for each two-digit manufacturing sector in each province. Banking structure, *nonbig4*, is the loan market share of non-Big-Four banks in each province. *nonsoe_out* is the share of non-SOEs in each industry at each province in terms of gross industrial value and *nonsoe_emp* the share of non-SOEs in each industry at each province in terms of employment. (2) All the regressions are run with both industry and province dummies and initial share. (3) p-values are in brackets; robust standard errors are used to calculate p-values. (4) *** p<0.01, ** p<0.05, * p<0.1.

VII.4 An alternative measure of banking structure

So far, banking structure is measured as the loan market share of non-Big-Four banking institutions in each province. An alternative measure of banking structure is the deposit market share of non-Big-Four banking institutions. Table 8 summarizes the results when this alternative measure of banking structure is used.

In columns (1)-(3), labor intensity is measured by labor-capital ratios of U.S. manufacturing industries. Compared the results here with that in Table 4, the coefficient for the interaction variable between labor intensity and banking structure is still positive, but not as significant as the results when banking structure is measured by the loan market share of non-Big-Four banks. Besides, the magnitude of the coefficient is also

[28] There are some endogeneity concerns here, because the economic census data in the year 2004 is used to calculate the share of small firms. Here we present these results only as a robust test to the main results in Section VI.

smaller. This pattern is also true when labor intensity is measured by *lkr_wu* (columns 4-6) and *lkr_99* (columns 7-9). Still, in all the regressions, the interaction term between the share of non-SOEs and banking structure is not significant.

These results are not surprising. Notice that the correlation coefficient between the two measures of banking structure is only 0.525 (see Table 2). The reason for this weak correlation between the two measures is that Big Four banks can and do reallocate funds among regional branches through their internal markets while local banks' lending are more constrained by their own deposits. We think that the loan market share of non-Big-Four banks is a better proxy for banking structure because our aim is to investigate how the behavior of Big Four banks, compared to other types of banks, affects the allocation of financial resources in the economy and how the allocation pattern affects economic growth in China.

Table 8 Industrial growth with the alternative measure of banking structure

VARIABLES	(1) g1	(2) g1	(3) g1	(4) g1	(5) g1	(6) g1	(7) g1	(8) g1	(9) g1
Initial share	-0.388**	-0.330**	-0.315**	-0.389**	-0.328**	-0.313**	-0.398**	-0.339**	-0.324**
	[0.011]	[0.021]	[0.024]	[0.011]	[0.020]	[0.024]	[0.010]	[0.019]	[0.022]
lkr_us x nonbig4_dep	0.007	0.008*	0.009*						
	[0.148]	[0.094]	[0.071]						
lkr_wu x nonbig4_dep				0.007	0.007	0.008			
				[0.172]	[0.157]	[0.119]			
lkr_99 x nonbig4_dep							0.011	0.012*	0.013*
							[0.106]	[0.088]	[0.066]
nonsoe_out x nonbig4_dep		0.0016			-0.001			-0.005	
		[0.984]			[0.991]			[0.948]	
nonsoe_emp x nonbig4_dep			-0.057			-0.061			-0.064
			[0.508]			[0.493]			[0.471]
Obs.	804	783	783	804	783	783	804	783	783
R-squared	0.350	0.364	0.365	0.350	0.363	0.364	0.351	0.365	0.366

Note: (1) In all regressions, the dependent variable is *g1*, the annual growth rate in real value-added over the period 1999-2007 for each two-digit manufacturing sector in each province. *lkr_us* is the labor-capital ratio of each industry in the U.S.; *lkr_wu* is the labor-capital ratio of each industry estimated by Wu(2012) an his recent research; *lkr_99* is the labor-capital ratio of each industry calculated with official data. (2) The banking structure is measured by *nonbig4_dep* , which is de ined as the deposit market share of non-Big-Four banking institutions in each province . (3) All the regressions are run with both industry and province dummies. (4) p-values are in brackets; robust standard errors are used to calculate p-values. (5) *** p<0.01, ** p<0.05, * p<0.1.

VIII. Conclusion

Some empirical studies find that indicators of banking development (usually measured by the size of banking sector relative to GDP) is negatively associated with economic growth in the China case. This pattern is not consistent with the well-established empirical evidence in the finance-growth literature,, where banking development is shown to have a positive impact on long-term economic growth. Among many efforts to explain this peculiar pattern in China, two views argue that it is the dominance of Big Four banks in the banking sector that has caused misallocation of funds in the Chinese economy. But the two views emphasize different aspects of the dominance of Big-Four banks. The ownership-structure view focuses on the state ownership of Big Four banks, which, as is argued, have granted majority of their loans to SOEs that are inefficient. The size-structure view emphasizes the huge size of Big Four banks and argues that the current

Chinese banking structure has deviated from its optimal path in which smaller banks should play a dominant role.

To empirically disentangle the two views, this paper uses data on the banking sector and 28 manufacturing industries in 30 provinces in mainland China in the period 1999-2007 to examine the channel by which banking structure affects economic growth. With a two-way fixed-effect model, the regression results are consistent with the size-structure view. More specifically, the paper finds that more labor-intensive industries grows faster than more capital-intensive industries in provinces with more active small banks, compared to provinces with more dominant Big Four branches. A surprising result in the regressions is that the interaction between the share of non-SOEs and the banking structure, which is supposed to be significantly positive under the ownership-structure view, is not significant in all the regressions.

Some caveats should be taken when interpreting the regression results. The insignificance of the product of the share of non-SOEs and banking structure may be due to measurement errors. Or the insignificance may reflect the improvement in the performance of SOEs after the year 2000 compared to SOEs in the 1980s and 1990s. If the latter interpretation holds true, then the regression results suggest that even the ownership bias of state-owned banks still exists it may not be a very serious concern in recent years.

The policy implication of the regression results is that the distribution of banks of different sizes may be worth taking into serious consideration in the ongoing banking reform in China. The Big Four state-owned banks are too big to serve the financial needs of small- and medium-sized firms, which has been the main engine of China's marvelous economic growth. A more diversified banking sector with more regional or local banks may be able to allocate financial resources more efficiently and thus promote economic growth. The government should loosen its control over entry into the banking sector by domestic private capital.

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Appendix

Table A1 Percentage of SOE and above-size Non-SOE enterprises in each industry in 2004 (%)

	industry code	Number of units	total output	total asset	sales revenue	total profits	employment
All industrial sectors		20.1	90.7	89.5	91.1	91.3	71.2
All manufacturing sectors		20.4	90.4	87.9	90.7	90.7	70.1
Processing of Food from Agricultural Products	C13	20.2	87.4	82.4	87.6	74.4	66.3
Manufacture of Foods	C14	18.5	88.2	83.8	88.2	87.8	69.4
Manufacture of Beverages	C15	13.6	89.2	86.4	89.5	90.4	68.7
Manufacture of Tobacco	C16	73.2	100.0	99.8	100.0	100.0	98.3
Manufacture of Textile	C17	29.1	88.8	86.8	89.2	85.8	77.0
Manufacture of Textile Wearing Apparel, Footware, and Caps	C18	24.9	85.6	78.9	85.5	89.3	68.9
Manufacture of Leather, Fur, Feather and Related Products	C19	28.2	88.3	82.5	88.5	84.8	76.5
Processing of Timber, Manufacture of Wood, Bamboo, Rattan, Palm, and Straw Products	C20	12.6	69.2	71.0	69.2	54.7	48.8
Manufacture of Furniture	C21	12.7	77.2	71.9	77.4	71.0	60.1
Manufacture of Paper and Paper Products	C22	18.8	84.9	84.6	84.9	84.1	64.9
Printing,Reproduction of Recording Media	C23	12.5	68.7	72.4	69.4	79.7	50.0
Manufacture of Articles For Culture, Education and Sport Activity	C24	23.1	85.2	79.6	85.5	85.7	72.4
Processing of Petroleum, Coking, Processing of Nuclear Fuel	C25	28.2	98.2	96.1	98.6	97.0	87.1
Manufacture of Raw Chemical Materials and Chemical Products	C26	25.0	92.3	90.2	92.5	94.7	73.4
Manufacture of Medicines	C27	41.7	96.3	89.3	96.6	104.0	86.3
Manufacture of Chemical Fibers	C28	45.4	97.9	94.1	98.0	97.3	90.6
Manufacture of Rubber	C29	20.9	88.8	87.8	88.8	88.1	74.0
Manufacture of Plastics	C30	17.6	79.8	77.8	80.2	79.9	60.1
Manufacture of Non-metallic Mineral Products	C31	12.6	75.0	80.6	75.0	67.3	49.5
Smelting and Pressing of Ferrous Metals	C32	34.8	97.9	96.7	98.1	98.3	89.6
Smelting and Pressing of Non-ferrous Metals	C33	34.9	95.9	94.9	96.0	97.6	86.5
Manufacture of Metal Products	C34	17.4	81.1	76.4	81.7	82.3	60.8
Manufacture of General Purpose Machinery	C35	18.1	83.0	83.3	83.1	85.0	65.1
Manufacture of Special Purpose Machinery	C36	19.8	87.0	84.5	87.3	90.3	71.0
Manufacture of Transport Equipment	C37	22.0	94.9	93.4	95.0	96.5	78.9
Manufacture of Electrical Machinery and Equipment	C39	26.8	93.3	89.2	93.5	96.4	78.3
Manufacture of Communication Equipment, Computers and Other Electronic Equipment	C40	33.5	98.5	94.6	98.6	101.7	87.0
Manufacture of Measuring Instruments and Machinery for Cultural Activity and Office Work	C41	23.4	91.0	85.1	91.5	98.0	74.0

Data source: China Economic Census Yearbook 2004.

Table A2 Banking development and banking structure by province

province	bdd	province	bdl	province	nonbig4
Anhui	0.752	Fujian	0.635	Ningxia	0.168
Hunan	0.763	Jiangsu	0.719	Yunnan	0.247
Hubei	0.812	Hunan	0.724	Fujian	0.270
Fujian	0.824	Shandong	0.741	Tianjin	0.274
Shandong	0.857	Anhui	0.750	Jiangxi	0.287
InnerMongolia	0.861	Hebei	0.802	Qinghai	0.300
Henan	0.917	Zhejiang	0.867	Guizhou	0.302
Jiangxi	0.964	Guangxi	0.880	Guangxi	0.314
Jiangsu	0.970	Henan	0.913	Shanxi	0.321
Guangxi	1.029	Hubei	0.914	Xinjiang	0.324
Guizhou	1.037	Jiangxi	0.915	Shaanxi	0.331
Heilongjiang	1.041	Yunnan	0.983	Hebei	0.340
Sichuan	1.057	Sichuan	1.057	Chongqing	0.352
Chongqing	1.068	Heilongjiang	1.071	Gansu	0.353
Hebei	1.102	InnerMongolia	1.076	Beijing	0.356
Qinghai	1.107	Chongqing	1.089	Heilongjiang	0.362
Jilin	1.161	Guizhou	1.111	Liaoning	0.365
Zhejiang	1.169	Liaoning	1.159	Hunan	0.365
Yunnan	1.215	Xinjiang	1.187	Jiangsu	0.366
Liaoning	1.257	Tianjin	1.259	Shanghai	0.370
Gansu	1.310	Shanxi	1.267	Jilin	0.372
Xinjiang	1.325	Guangdong	1.292	Zhejiang	0.374
Tianjin	1.421	Gansu	1.300	Anhui	0.379
Ningxia	1.424	Shanghai	1.344	InnerMongolia	0.387
Shaanxi	1.537	Ningxia	1.401	Guangdong	0.405
Shanxi	1.564	Shaanxi	1.416	Hubei	0.408
Shanghai	1.759	Jilin	1.554	Shandong	0.421
Guangdong	1.774	Qinghai	1.668	Sichuan	0.428
Hainan	1.799	Beijing	1.843	Hainan	0.439
Beijing	3.802	Hainan	1.872	Henan	0.469
median	1.105	median	1.082	median	0.359
National	1.325	National	1.142	National	0.387

Note: nonbig4 is the loan market share of non-Big-Four banks in each province in 1999.
bdl is the ratio of total loans outstanding by all banking institutions to GDP in each province in 1999.
bdd is the ratio of total deposits outstanding to GDP by all banking institutions in each province in 1999.
Notice that most of the provinces with *bdl* and *bdd* above the median level have *nonbig4* below the median level.

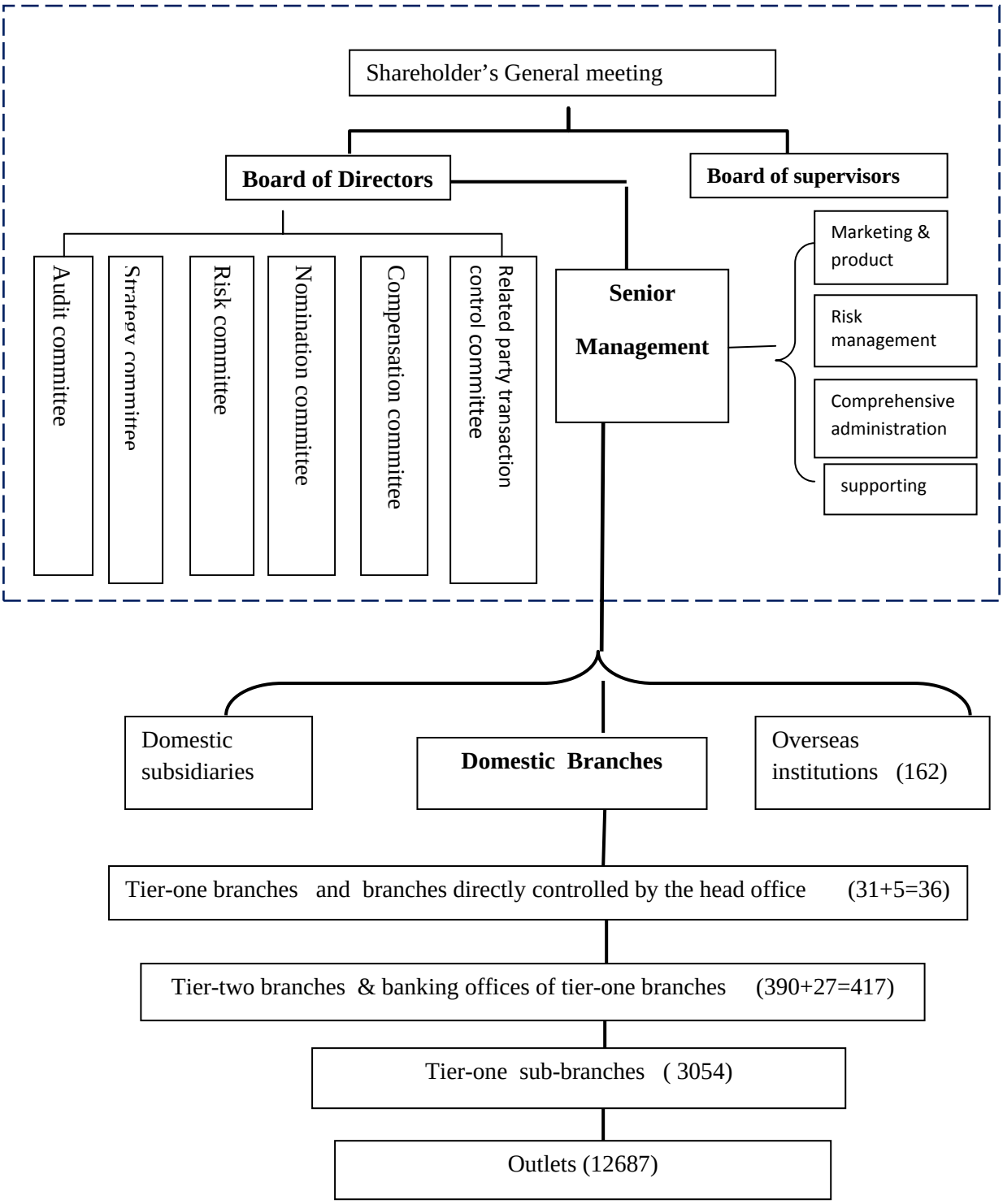
Table A3. Labor-capital ratio by industry

industry	*lkr_99* (number of employees per one million Yuan of net fixed assets)	rank		industry	*lkr_us* (number of employees per one million U.S. dollar of capital)	rank
C24	44.8	1		C18	61.1	1
C18	42.8	2		C19	36.3	2
C19	42.2	3		C21	35.2	3
C21	24.2	4		C24	22.2	4
C36	23.4	5		C23	22.1	5
C41	22.9	6		C20	21.3	6
C35	21.8	7		C41	17.6	7
C17	21.5	8		C39	16.7	8
C34	20.8	9		C34	16.4	9
C29	19.0	10		C17	15.4	10
C20	17.4	11		C35	14.9	11
C39	16.9	12		C30	14.9	12
C23	16.4	13		C36	14.6	13
C31	16.1	14		C29	11.6	14
C30	15.7	15		C14	10.9	15
C14	15.2	16		C40	10.7	16
C27	15.0	17		C37	10.1	17
C13	14.7	18		C13	9.8	18
C37	14.1	19		C31	9.8	19
C22	14.1	20		C27	6.3	20
C40	13.2	21		C33	6.1	21
C26	10.7	22		C22	5.2	22
C15	10.2	23		C15	4.5	23
C33	9.4	24		C26	4.0	24
C32	7.5	25		C16	4.0	25
C28	5.1	26		C32	3.9	26
C16	4.9	27		C28	3.7	27
C25	4.2	28		C25	1.4	28

Data source: The authors' own calculation based on data as described in section V and section VII.

Note: *lkr_99* is ratio of employment to net fixed assets of each industry in 1999 calculated with official data, measured as the number of employees per one million Yuan of net fixed assets; *lkr_us* is labor-capital ratio of each industry in the U.S. averaged over the period 1986-2000, measured as the number of employees per one million U.S. dollar of physical capital.

Fig. A1 Corporate structure of ICBC (as of 2009)



Note. Total number of branching or subsidiary institutions: 16232 domestic, 162 overseas.

Total number of employees: 386,723

Source: www.icbc.com.cn.