Bank Ownership and Efficiency in China:
What Will Happen in the World's Largest Nation?

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Abstract

China is embarking on a significant reform of its banking industry, partially privatizing three of its dominant "Big Four" state-owned banks and taking on minority foreign ownership of these institutions. Predicting the efficiency effects of these and other reforms is difficult because 1) there is very little research evidence on Chinese bank efficiency; 2) there are no studies to our knowledge on the efficiency effects of minority foreign ownership of banks in any nation; and 3) information about the institutional history and regulation of the Chinese banking system is not widely disseminated. The main goals of this paper are to fill in these three gaps in the research literature in order to help address issues of Chinese bank reform. We analyze profit and cost efficiency of using 256 annual observations over 1994-2003 on commercial banks in China with different majority ownership – state-owned; private, domestically-owned; and foreign-owned. We also examine minority foreign ownership of both state-owned and private, domestically-owned Chinese institutions. In addition, we provide background information on the history, regulation, and market environment for the Chinese banking industry. The empirical results suggest strong favorable efficiency effects from reforms that reduce the state ownership of banks in China and increase the role of foreign ownership. For both efficiency concepts (profit and cost) and for both categories of majority domestic ownership (state and private domestic), minority foreign ownership increases expected efficiency. Potential policy implications of these findings are also discussed.

1. **Introduction**

China is the world's largest nation, and its economy has been growing at a rate of about 9% per year in real terms over the last decade. At its current pace, China is projected by some to surpass the U.S. and become the world's largest economy in another decade (e.g., Allen, Qian, and Qian 2005). The rapid growth of this developing economy may be largely linked to the globalization of trade, but it has yet to "globalize" its banking sector. The Chinese banking industry is dominated by four very large state-owned banks – the "Big Four" – with about three-fourths of the total industry assets, and the industry has very few banks with majority foreign ownership. As well, its legal and financial systems are not well developed – even by the standards of most developing nations.

The extant research on bank efficiency in developing nations and on the finance-growth nexus strongly suggests that the observed high growth rates cannot continue indefinitely without significant reform of the banking system and the legal/financial infrastructure. The banking research suggests that state ownership of banks is associated with low bank efficiency, restricted access to credit for small and medium enterprises (SMEs), and slower economic growth in developing nations. This literature also suggests that foreign bank ownership and relatively unrestricted foreign bank entry are associated with high efficiency and SME credit availability in other developing nations.

The research on the finance-growth nexus also consistently finds that economic growth in developing nations is highly positively related to efficient legal systems and better financial market development (e.g., King and Levine 1993, La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1998, Djankov, La Porta, Lopez-de-Silanes, and Shleifer 2003, Beck, Demirguc-Kunt, and Maksimovic 2005, Jappelli, Pagano, and Bianco 2005). As well, recent banking research suggests that elements of the legal/financial infrastructure have important effects on the abilities of banks to use "hard" information lending technologies – such as loans based on financial statements, credit scores or easily-valued fixed assets pledged as collateral – to extend credit to SMEs (e.g., Berger and Udell 2005, Qian and Strahan 2005).

To date, China has been able to maintain high growth in spite of these problems in part because of the excess of funds available for investment. Very high savings rates and trade surpluses in recent years have yielded a surplus of funding that is currently used to invest in foreign securities (e.g., U.S. treasuries), as well as foreign direct investment (e.g., the Lenovo-IBM deal). Thus, efficient

allocation of funding within China may not have been as necessary as in other funds-starved developing nations because there were more than enough funds available to invest in China. However, it seems unlikely that such large imbalances will persist and be sufficient to allow for inefficient credit allocation and high growth to continue indefinitely.

A recent study also suggests that most of the growth has been concentrated in the "private sector" – firms that are not state-controlled or publicly listed. Using survey information on Chinese entrepreneurs and executives, this study also finds that that these "private sector" firms gained access to funding through alternative financing channels and governance mechanisms, including those based on "soft" information from reputations and relationships (Allen, Qian, and Qian 2005). It also seems unlikely that high growth for the Chinese economy can persist indefinitely based in substantial part on alternative funding means for just this one sector of the economy. While a withering of the state-controlled sector may not harm long-term economic growth, the listed sector will likely need to grow significantly using standard "hard" information funding methods in the long run.

Another recent analysis of China suggests that an inefficient banking sector and poor legal/financial infrastructure may already be restraining growth and development. The research finds that access to external finance in the form of bank loans is important to reinvestment of profits by Chinese firms (Cull and Xu 2005). The authors also find that key elements of the legal/financial infrastructure – contract enforcement, private ownership, and expropriation risk – are additional important determinants of reinvestment. Such profit reinvestment may grow in importance when surplus funds are less available.

Recent news suggests that significant reform of the banking system is occurring that may significantly affect bank efficiency, and may presage further reforms. During 2005, three of the Big Four state-owned banks announced plans to partially privatize and take on minority foreign ownership. Bank of America and Temasek (Singapore) reached deals to buy 9% and 5.1% stakes in China Construction Bank (CCB), with further purchases planned after the IPO. In addition, Royal Bank of Scotland and Temasek each agreed to purchase 10% of the shares in Bank of China (BOC). Finally, a group of foreign investors including Goldman Sachs, American Express, and Allianz have agreed to purchase 10% of Industrial & Commercial Bank of China (ICBC). In October, the first of the Big Four went public – China Construction Bank (CCB) raised US $8 billion on the Hong Kong exchange,

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the IPO in the world in the last four years (since Kraft Foods Inc. raised US $8.68 billion in 2001). Thus, the "globalization" of the Chinese banking industry appears to have begun in earnest.

Unfortunately, the extant research is missing some analyses that are needed to address the likely future efficiency effects of these changes and other potential reductions in state bank ownership and increases in foreign bank ownership in China. First, there is very little research evidence on Chinese bank efficiency. The few studies have mixed or contradictory results on the relative efficiency of the Big Four banks and on the effects of prior regulatory reforms. As well, none to our knowledge have used the comprehensive concept of profit efficiency nor have they addressed issues of foreign ownership, making extrapolation to the effects of partial privatization and minority foreign ownership of the Big Four essentially inconclusive. Second, we are unaware of prior research using data from any nation on the effects of minority foreign ownership of banks. We know only of prior studies of majority foreign ownership in other nations. While results on majority foreign ownership may be extrapolated to draw inferences about minority foreign ownership, it remains unclear whether minority foreign owners are able to significantly affect the performance of institutions that are majority controlled by the government or by local private investors. Third, relatively little background information on the Chinese banking industry is widely known. Much less information is disseminated in the research literature about institutional history and regulation of the Chinese banking system than is available about banks in developing nations elsewhere in Asia, in Latin America, and in the transition nations of Eastern Europe. Knowledge of how the economic environment in China differs from these nations and the effects of prior reforms in China may provide insight on the likely effects of future reforms.

The main goals of this paper are to help fill in these gaps in the research literature. First, we analyze the profit and cost efficiency of banks operating in China using 256 annual observations over the years 1994-2003, covering 94% of total banking assets in China. We compare the efficiency of the Big Four banks, other state-owned institutions, private, domestically-owned banks, and foreign banks. The data are gathered from a number of sources, including Bankscope and the Almanac of China's Finance and Banking.

Second, we conduct what we believe to be the first examination of the efficiency effects of minority foreign ownership of banks using any nation's data. A number of the state-owned banks in

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China other than the Big Four have minority foreign ownership. Some of the private, domestic banks also have minority foreign ownership. We test the efficiency effects of minority foreign ownership for both of these ownership categories. It seems reasonable to assume that if minority foreign ownership has strong effects on the efficiency of both of these types of institutions, it is likely to have qualitatively similar effects on the Big Four banks.

Third, we provide background information on the history, regulation, and market environment for the Chinese banking industry. This industry has undergone quite a few changes in economic environment over the last several decades, including regulatory reforms in the 1980s and 1990s, competition from foreign entry in the 1990s, and substantial reform following China's World Trade Organization (WTO) entry in 2001, including the partial privatization and minority foreign ownership of three of the Big Four that are now underway.

By way of brief preview, the empirical results suggest strong favorable efficiency effects from reforms that reduce the state ownership of banks in China and increase the role of foreign ownership. The profit efficiency findings suggest that in terms of majority ownership, foreign banks are the most efficient, followed by private, domestically-owned banks, with state-owned institutions – particularly the Big Four – being measured as least efficient. These results are consistent with findings for other developing nations. The cost efficiency findings present the anomaly that state-owned institutions have relatively high measured cost efficiency – possibly due to government subsidies on the cost side. Further investigation suggests any subsidies on the cost side are more than consumed by poor loan revenues as state-owned banks have much higher rates of nonperforming loans. Note that findings for the banks with majority foreign ownership must be viewed with caution, as we are able to include only a small number of these institutions with permission to take deposits/make loans in the local currency.

Our main empirical focus is on the effects of minority foreign ownership. The results suggest that such ownership increases the efficiency of the state-owned banks and the private, domestic banks that have such ownership. These findings is holds for both profit and cost efficiencies. We also conduct a check of the data that suggests that our findings of beneficial effects of minority foreign ownership generally reflect improvements in performance after the foreign investment, rather than just a selection of efficient banks in which the foreigners invest.

The findings of efficiency benefits from minority foreign ownership are consistent with

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anecdotal evidence that foreign investors tend to acquire one or two board seats on Chinese banks and are able to use their positions to press for positive effects. The findings are also consistent with research on corporate governance in developed nations on the role of institutional investors and with results on partial privatization of state-owned nonfinancial companies in India.

Section 2 reviews some of the research literature on bank ownership type and efficiency in developing nations. Section 3 gives background information on the Chinese banking industry and its market environment. Section 4 shows our data on the Chinese banks and the empirical methodology for examining these data. Section 5 displays our empirical results. Section 6 concludes.

2. Literature on bank ownership type and efficiency

In recent years, a large number of studies have examined the efficiency effects of bank ownership type – whether an institution is foreign-owned, state-owned, or private, domestically-owned – with very significant differences found among these types. The literature compares the performance of operations within a single nation, in effect, comparing foreign, state-owned, and private, domestic institutions against the best-practice frontier for banks operating in the same host nation.[1]

Here, we highlight some of the findings of this research, focusing on results for developing nations, which may give more insights into the likely effects in China than those for the developed nations. We also briefly discuss the limited evidence related to minority foreign ownership of banks in other nations and the few studies on bank efficiency in China.

2.1. Evidence on bank efficiency in developing nations

Foreign banks, state-owned banks, and private domestic banks have a number of efficiency advantages and disadvantages relative to one another, and the measured efficiency of each ownership type reflects the net effects of these comparative advantages/disadvantages. Foreign banks headquartered in developed nations have generally superior managerial expertise/experience, access to capital, use of hard-information technologies, and ability to diversify risk in most developing host nations, where domestic institutions have not acquired comparable skills. However, foreign banks also generally suffer from disadvantages due to distance-related diseconomies, language and cultural

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[1] Although some studies compare the efficiencies of bank operations across different nations, such results are unreliable in our view because the economic environments in which the banks in different nations compete are simply too different. See Berger (forthcoming) for more discussion.

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differences, and poor ability to access and process locally-based soft information. State-owned institutions may have funding advantages due to government subsidies, but also often have disadvantages because of mandates to make certain types of loans. State-owned banks may also be inefficient due to a lack of market discipline.

The most common findings for developing nations are that on average, foreign banks are more efficient than or approximately equally efficient to private, domestic banks. Both of these groups are typically found to be significantly more efficient on average than state-owned banks, but there are variations on all of these findings. To illustrate, some research using data from the transition nations of Eastern Europe finds foreign banks to be the most efficient on average, followed by private, domestic banks, and then state-owned banks (Bonin, Hasan, and Wachtel 2005a,b). However, another study of transition nations finds the mixed result that foreign banks are more cost efficient, but less profit efficient than both private, domestic and state-owned banks (Yildirim and Philippatos 2003). A study using 28 developing nations from various regions finds foreign banks to have the highest profit efficiency, followed by private, domestic banks, and then state-owned banks (Berger, Hasan, and Klapper 2004). For cost efficiency, the private, domestic banks rank higher than the foreign banks, but both are still much more efficient than state-owned banks. Two studies using Argentine data (prior to the crisis in 2002) find roughly equal efficiency for foreign and private, domestic banks, and that both are more efficient on average than state-owned banks (Delfino 2003, Berger, Clarke, Cull, Klapper, and Udell 2005). A study employing Pakistani information finds foreign banks are more profit efficient than private, domestic banks and state-owned banks, but all of these groups have similar average cost efficiency (Bonaccorsi di Patti and Hardy 2005). Finally, a study of banks in India finds that foreign banks are more efficient on average than private, domestic banks (Bhattacharya, Lovell, and Sahay 1997). This study also finds the unusual result that state-owned banks are relatively efficient. The reason is not known, but it may be partially or wholly due to accounting practices, cross-subsidies from other government agencies, or relatively low-cost accounts by other government-owned firms.

2.2. Evidence related to minority foreign ownership of banks

Although we are unaware of any prior research measuring the efficiency effects of minority foreign ownership of banks, there is some evidence that suggests why it may increase efficiency, and

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that it has worked in China. Anecdotal evidence suggests that even when foreign investors have only one or two board seats on Chinese banks, corporate governance and risk management improves significantly. The foreign board members/owners also appear to have convinced senior managers to be more aware of shareholders' interests and to use more modern management techniques. In at least one instance, foreigners have taken over senior positions on the board and in management. In some cases, the Chinese banks with minority foreign ownership are also able to send employees to the foreign bank's headquarters for advanced training (Ling and Lu 2004, Wall Street Journal 2004, Lin 2005, Liu 2005).

The finding that minority foreign owners have superior skills to transfer to Chinese banks is consistent with the findings above that majority foreign-owned banks are generally much more efficient than state-owned banks and either more efficient than or equally efficient to private, domestic banks in developing nations. These net comparative advantages may be even larger in China, given that the banking sector has been so tightly regulated until recently.

It is not as clear why the senior management agrees to implement the reforms suggested by the minority foreign ownership, particularly for the majority state-owned banks that may have very different objectives from maximizing shareholder value. Nonetheless, some research on other nations suggests why minority ownership can result can result in benefits, although the research does not differentiate minority foreign ownership from other private minority owners.

Research on corporate governance of nonfinancial corporations in developed nations suggests that institutional investors and large block shareholders may improve monitoring of managers and mitigate free-rider problems (e.g., Shleifer and Vishny 1986, McConnell and Servaes 1995, Agrawal and Knoeber 1996). A study that tests these governance effects on the bank efficiency using U.S. data in some cases finds positive effects of institutional holdings (Berger and Bonaccorsi di Patti forthcoming). Finally, the results of a study of partial privatization in India is consistent with favorable effects of minority private ownership of majority state-owned nonfinancial companies (Gupta 2005). The author finds that allowing non-controlling shares of state-owned enterprises to be held privately has positive effects on profitability, productivity, and investment.

2.3. Evidence on bank efficiency in China

Some of the bank research literature on China compares bank performance using ratio analysis

(e.g., Li, Liu, Liu, and Whitmore 2001). Ratio analyses do not control for individual bank outputs, input prices, or other exogenous factors facing banks in the way that studies using modern efficiency methodology do, and so may give misleading results. To illustrate, a cost-efficient bank may have relatively high cost ratios because it is producing a high-cost output bundle (e.g., more loans, fewer liquid assets) or faces high input prices, and so may be incorrectly identified as a poor performer.

Some studies also describe Chinese bank reform and its consequences (e.g., Shiria 2001). Examples include examinations of the determinants and timing of foreign bank entry into China and time for foreign branches in Shanghai to make a profitable return (e.g., Leung 1997, Leung, Young, and Rigby 2003a,b). The effects of the current reform in which the large state-owned banks are taking on minority foreign ownership has not been analyzed to our knowledge.

There have been a few recent studies of Chinese bank efficiency and reform with mixed or contradictory results. To our knowledge, none have used the comprehensive concept of profit efficiency that appears make an important difference in our empirical results below and nor have they addressed issues of foreign ownership. One study finds that the Big Four banks and the small joint-equity banks are cost efficient relative to the medium-sized joint-equity banks (Chen, Skully, and Brown 2005). These results are consistent with those in our research below when we confine attention to cost efficiency. However, these authors also cite some other studies finding low efficiency for the large state-owned banks, suggesting that their findings are not robust.[2]

Another recent working paper using an input distance function approach also finds contrary results. Kumbhakar and Wang (2005) find that the Big Four are less efficient than joint-equity banks. The two studies also appear to have contradictory implications regarding the effects of deregulation. Chen, Skully, and Brown (2005) find that the financial deregulation of the mid-1990s had strong positive efficiency effects, whereas Kumbhakar and Wang find that deregulation did not result in significant efficiency improvement.

Our empirical application from is quite different in that we show a very different outcome for the Big Four state-owned banks when use the more comprehensive concept of profit efficiency, which embodies revenues and loan performance, rather than just costs or inputs. More important, we study

[2] We could not locate these other studies, which appear to be published in Chinese journals that are not electronically accessible.

the effects of the current, potentially most important reform, allowing for foreign ownership, particularly minority foreign ownership of Chinese banks, which has not been addressed in this literature.

3. **Background on the Chinese banking industry**

We briefly review the institutional history, regulation, and economic environment of the Chinese banking system. This system has undergone – and continues to undergo – significant changes due to policy shifts prior to the 1990s, during the 1990s until WTO entry in December 2001, and since WTO entry.

3.1. Pre-1990s banking environment

The Chinese socialist banking system was established in the late 1940s following the system in the former Soviet Union. The central bank, PBOC (People's Bank of China) was founded in 1948 through consolidation of the former Huabei Bank, the Beihai Bank and the Xibei Peasant Bank. PBOC was stripped of many of its central bank functions during the Cultural Revolution (1966-1976), but later regained responsibility for currency issue and monetary control. Before 1978, the Chinese financial system followed a mono-bank model, where PBOC combined the roles of central and commercial banking. The banks – which were either taken over/restructured into the PBOC system or under administration by PBOC or the Ministry of Finance – were just part of the hierarchy to ensure that national production plans would be fulfilled, with no incentives to compete with one another.

Under reforms begun in 1978, the banking system expanded by establishing several large state-owned commercial banks, and splitting the Big Four state-owned banks and the lending functions from the PBOC. The Big Four are Bank of China (BOC, established 1912), China Construction Bank (CCB, 1954), Agricultural Bank of China (ABC, 1979), and Industrial and Commercial Bank of China (ICBC, 1984). These banks were initially limited to only serve their designated sector of the economy (i.e., foreign trade and exchange, construction, agriculture, industrial and commercial), but starting in 1985, the Big Four were allowed to compete in loan and deposit services in all sectors. Nonetheless, competition among them was very limited until the mid-1990s, because they served mainly as policy-lending "conduits" for the government, and lacked incentives to compete.

Also in the mid-1980s, the nature of centrally planned financial resources allocation was revised, and the local governments could decide their own resource allocation via domestic loans and

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self-raised funds, nurturing a revitalization process of banking (Li 1994, Yi 1994). Although policy lending blocked competition among state-owned banks, the entry of new banks created a new source of competition in the industry.

3.2. The 1990s until WTO entry in December 2001

The asset quality of the state-owned banks deteriorated significantly during the 1990s, as the state-owned banks made most of their loans to state-owned enterprises (SOE), which had little incentive to repay. To ameliorate this problem, the government established three policy banks in 1994 to take over the policy-lending activities from the state-owned banks and the Ministry of Finance issued 270 billion yuan (US $32.6 billion) of 30-year government special bonds to recapitalize the Big Four banks in 1998. In 1999, 1.4 trillion yuan of nonperforming loans (NPLs) of the Big Four (roughly 20% of their total loans) were bought at face value by four state-owned asset management companies.

Two major legislative reforms occurred in 1995. 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 major state-owned banks as "commercial banks," and directed them more towards commercial business based on market principles instead of policy lending.

New banks also entered the market in the mid-1990s. China Minsheng Banking Corporation was founded in 1996 and is solely owned by private institutional shareholders, making it the largest private bank in China. By the end of 1999, there were 12 national shareholding commercial banks, with total assets of 1,447.7 billion yuan (PBOC 2000). The central government also allowed local governments to establish local banks in the mid-1990s by consolidating local rural and urban cooperatives. They take the form of shareholding banks and are named as city cooperative banks, with their business restricted to their localities. By the end of 1999, 90 such banks were operating in China, with total assets of 554.7 billion yuan (PBOC 2000).

The Chinese government has been very conservative in allowing foreign bank entry. Foreign banks were allowed to open representative offices in 1979, and have been allowed to open operational branches in Special Economic Zones since 1982 (e.g., Hong Kong banks operating in nearby Shenzhen). This geographical restriction was somewhat relaxed in 1994 – they were allowed to

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operate in 23 cities based on individual applications.

Foreign banks were first permitted to make deposits and loans in local currency (i.e., yuan) in the Shanghai Pudong New Zone in 1996 (and later in Shenzhen Special Economic Zone) on individual application basis. In 1998, PBOC permitted eight foreign licensee banks to obtain local currency funding in 1998. In 1999, foreign banks were further allowed to conduct local currency business in neighboring regions. By the end of 1999, 25 foreign banks had permission to conduct local currency business, with totals of 21,813 million yuan in assets, 11,341 million yuan in loans, and 15,100 million yuan in deposits. Total assets of all foreign banks in China reached US $32,844 million (nearly 272 billion yuan) by 1999.

Regulatory permission for foreign investors to hold minority stakes in domestic banks was forthcoming more slowly. The first case was in 1996, when Asian Development Bank (ADB) bought a 1.9% stake in China Everbright Bank[3] (a national shareholding commercial bank, majority state-owned). This was followed by the purchase of 5% stake in Bank of Shanghai (a municipal commercial bank, 30% stake held by Shanghai municipal government) by International Finance Corporation (IFC) in 1998, the purchase of a 15% stake of Nanjing City Commercial Bank (a majority state-owned city commercial bank) by ADB in 2001, and acquisition of an 8% stake in Bank of Shanghai by HSBC Holdings PLC. Total equity investment by foreigners in the domestic banks through 2001 was minimal due to stringent license granting policies and regulations, and most of the investors were non-profit international organizations.

Other important reforms in the 1990s include: 1) the 1995 Commercial Banking Law strictly prohibits commercial bank involvement in nontraditional banking activities like insurance and securities (similar to Glass-Steagall); (2) in 1998, PBOC further reduced local government influence on bank lending activities by replacing its 30 provincial branches with 9 cross-province regional branches; (3) increased flexibilities for commercial banks to adjust interest rates; (4) recommending standard accounting and prudential norms, such as new risk-adjusted classifications of loans designed to take more accurate control over loans.

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[3] In fact, 21.39% stake of CEB has been held by China Everbright Limited (CEL) which was listed in HK stock exchange from 1973, and CEL's controlling shareholder is China Everbright Group (CEG) who holds 55.8% of CEL's total shares, acquired in 1994. CEG is a state-owned financial group under direct administration of the State Council.

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3.3. The environment after WTO entry in December 2001

Since China gained entry into the WTO, a new set of rules began to take effect. According to the promised agenda, we can expect more liberalization of interest rates, more fair treatment of tax rates among players, less restrictions on ownership takeovers and M&As, greater freedom of operational and geographical scope, etc. One attempt of the government to achieve better monitoring of the banking industry is the creation of China Banking Regulatory Commission (CBRC) in 2003 to oversee reforms and regulations. Other banking laws were subsequently issued, including revisions of the 1995 Central Bank Law and 1995 Commercial Bank Law. Also in 2003, the State Council initiated the "pilot state-owned bank-overhaul program," granting US $45 billion to BOC and CCB to increase capital, instead of writing off bad loans. New systems of external and internal monitoring of asset quality were also implemented.

Foreign investment in domestic banks became intensified in 2003, when CBRC updated guidelines to encourage foreign share purchases. Under the new rules, foreigners can own up to 25% of a domestic bank, with any single investor allowed up to 20%, subject to regulatory approval. Examples of strategic foreign investments post-WTO includes Citigroup's 4.6% share in Shanghai Pudong Development Bank (a Shanghai-based commercial bank, about 40% state-owned) and a consortium including Hang Seng Bank Ltd., IFC, took a 24.98% stake in Industrial Bank (a southern Fujian Province-based bank, 34% held by Fujian Provincial Bureau of Finance). In 2004, Newbridge Capital Ltd. (a U.S. investor group) bought 18% stake of Shenzhen Development Bank Co. (a national Shenzhen-based listed bank), the first time that foreign investors came to be the largest and controlling shareholder of a national domestic bank. Hongkong & Shanghai Banking Corp. (a unit of HSBC Holding PLC.) also agreed to purchase 19.9% stake of Bank of Communications (the fifth-largest bank in China, 23.76% owned by Ministry of Finance of China) and it secured the right to double this share when regulations allow. However, after the investment, the Ministry of Finance increased its shares so that it remains the largest shareholder, potentially a sign that that the Chinese government remains caution about foreign investment in banking.

The partial privatization has now spread to three of the Big Four banks, as they reached agreements to take on minority foreign ownership. On June 17, 2005, Bank of America reached a deal to buy a 9% stake in China Construction Bank (CCB, one of China's Big Four state-owned banks) and

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committed to invest a further US $500 million to maintain its ownership level when CCB proceeds with the planned IPO. Bank of America also has a nonexclusive, 5 1/2-year option to increase its stake to 19.9% at the price of shares in the IPO. Bank of America's deal with CCB is the first foreign equity investment in one of the Big Four banks that dominate banking in mainland China (Wall Street Journal, Eastern edition, June 17, 2005, pg. A.3). At the same month (June 2005), China Construction Bank signed a deal with Temasek in which the Singapore investor would pay US $1.5 billion for a 5.1% stake and then invest a further US $1 billion in shares when the bank goes public. (International Herald Tribune, 2005/9/21). In September 2005, Royal Bank of Scotland and Temasek have agreed to buy each of 10% stake in Bank of China (BOC, second-largest among the Big Four state-owned banks) (International Herald Tribune, 2005/9/21). On Aug 31, 2005, a group of foreign investors, including Goldman Sachs Group Inc., American Express Co., and Allianz AG have agreed to purchase 10% shares of ICBC (Industrial & Commercial Bank of China, one of China's biggest state-owned commercial banks) at the price of more than US $3 billion.

The first of the Big Four has now gone public. On October 20, 2005, China Construction Bank (CCB) issued 26.49 billion shares to investors in the Hong Kong stock exchange, raising HK $62.25 billion (i.e., US $8 billion) with a group of underwriters including China International Capital Corp., Credit Suisse First Boston (a unit of Credit Suisse Group), and Morgan Stanley, thus becoming the first among Big Four to go public and the largest issuer in the world among the IPOs that were issued within last four years. Moreover, Bank of America (which purchased a 9% stake earlier in the year) has said it will buy US $500 million of CCB's shares in the IPO, and Temasek (which purchased a 4.49% stake earlier) said it will buy an additional US $1 billion of CCB's shares in the offering (Wall Street Journal, Oct 20, 2005, p. 1).

Eight city commercial banks had also reached agreement with foreign investors by September 2005.[4] Foreign institutions have spent about US $17 billion buying sizable stakes in Chinese domestic banks over the past three years. It is reported that the Chinese regulators are considering further raising the permitted level of foreign investment in Chinese banks (Wall Street Journal, Eastern edition, Sept 15, 2005, pg. A18).

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[4] These eight city commercial banks are (in sequence of the date of agreement): Bank of Shanghai, Nanjing City Commercial Bank, Bank of Beijing, Xi'an City Commercial Bank, Jinan City Commercial Bank, Wenzhou City Commercial Bank, and Nanyun City Commercial Bank, and Hangzhou City Commercial Bank.

4. <u>Data and methodology</u>

4.1. Sample and definition of majority ownership

Our sample is an unbalanced panel which includes financials and ownership data of 37 Chinese banks during the period of 1994 to 2003, totaling 256 observations. The basic data source is Bankscope - Fitch's International Bank Database, whenever Bankscope doesn't provide enough information or has questionable values, we collect or double-check the data from other official sources as best as we can, such as Almanac of China's Finance and Banking, 1994-2004; Yearly Statistics Book of China's Economics, each individual bank's website which provides the bank's financial statement and ownership structures, etc. Among the 37 Chinese banks, we have full information of the Big Four state-owned banks which takes up more than 72% of the total market share in Chinese banking industry in 2003. Among the 11 national shareholding commercial banks – known as the "second-tier" domestic banks which own almost 19% of banking assets – our sample include 9 banks. These 9 banks own 98% of the total assets of the second-tier banks. Besides, we also have 16 of the 113 city commercial banks in China who possess almost half the assets of these city banks. Most of these city banks are established after 1998 and are very small and do not provide any information of their financial activities or ownership details. We also have 6 joint venture banks[5] and 2 solely foreign-owned banks. The city commercials, along with the joint venture banks and solely foreign owned banks, make up the "third-tier" banks in the industry, and they took up less than 10% of the total markets in 2005. We have attempted an exhaustive search to get all information and any banks missing our sample means they do not provide any relevant information in any public domain or they suffer from missing information and observations. Our sample covers over 94% of the banking assets in China.

Based on the sample banks, we further define majority state-owned banks as those banks whose state and state-owned enterprises ownership is greater than 50% of total ownership; majority domestic private banks are defined as those banks whose domestic private ownership is greater than 50% of total ownership; majority foreign banks are defined as those banks whose foreign ownership is

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[5] The joint venture banks are defined by relevant government documents as the banks whose foreign ownership is more than or equal to 25% but less than 100% of total shares.

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greater than 50% of total ownership, and mixed ownership banks are those without any majority ownership. We acknowledge the possibility that some of the banks we identify as majority private, domestic banks may be more than 50% state-owned if the government or state-owned enterprises own most of the outstanding shares. Bank size is defined based on total assets (inflation adjusted to the base year 1994) of the bank at year t, and the bank is a small bank if its assets are less than or equal to US \$ 1 billion, medium bank if the bank's assets are greater than US \$1 billion but less than or equal to US \$30 billion; large bank if the bank's assets are greater than US \$30 billion.

4.2. Computation of efficiency levels and efficiency ranks

Cost and profit efficiency levels (and efficiency ranks) measure how well a bank is predicted to perform relative to other banks in a particular sample or a peer group for producing the same output bundle under the same exogenous conditions. In our case, we estimate efficiency level (and efficiency ranks) relative to banks in the same year.

We specify the commonly-used translog functional form to estimate the cost and profit functions for each year. For convenience, we show only the cost function:

$$\ln(C/w_2 z_1) = \delta_0 + \delta_1 \ln(y_1/z_1) + \delta_2 \ln(y_2/z_1) + \delta_3 \ln(y_3/z_1) + \delta_4 \ln(y_4/z_1)$$

$$+ \tfrac{1}{2} \delta_{11} \ln(y_1/z_1) \ln(y_1/z_1) + \tfrac{1}{2} \delta_{22} \ln(y_2/z_1) \ln(y_2/z_1) + \tfrac{1}{2} \delta_{33} \ln(y_3/z_1) \ln(y_3/z_1)$$

$$+ \tfrac{1}{2} \delta_{44} \ln(y_4/z_1) \ln(y_4/z_1) + \tfrac{1}{2} \delta_{12} \ln(y_1/z_1) \ln(y_2/z_1) + \tfrac{1}{2} \delta_{13} \ln(y_1/z_1)\ln(y_3/z_1)$$

$$+ \tfrac{1}{2} \delta_{14} \ln(y_1/z_1) \ln(y_4/z_1) + \tfrac{1}{2} \delta_{23} \ln(y_2/z_1) \ln(y_3/z_1) + \tfrac{1}{2} \delta_{24} \ln(y_2/z_1) \ln(y_4/z_1)$$

$$+ \tfrac{1}{2} \delta_{34} \ln(y_3/z_1) \ln(y_4/z_1)$$

$$+ \beta_1 \ln(w_1/w_2) + \tfrac{1}{2} \beta_{11} \ln(w_1/w_2) \ln(w_1/w_2) + \theta_1 \ln(y_1/z_1) \ln(w_1/w_2)$$

$$+ \theta_2 \ln(y_2/z_1) \ln(w_1/w_2) + \theta_3 \ln(y_3/z_1) \ln(w_1/w_2) + \theta_4 \ln(y_4/z_1) \ln(w_1/w_2)$$

$$+ \ln u_{it} + \ln v_{it}, \tag{1}$$

where C represents the bank's total costs. The four output - y - variables (total loans, total deposits, liquid assets, and other earning assets), two input price - w – variables (interest expenses to total deposits, and the noninterest expenses to fixed assets), and one fixed input - z - variable (total earning assets). The ln u term is a factor that represents a bank's efficiency level and ln v is a random error that incorporates both measurement error and luck. The cost function is estimated using the (ln$u$ + ln$v$) as a composite error term. The normalization by bank's total earning assets (z_1) reduces heteroskedasticity, and allows banks of any size to have comparable residual terms from which the

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efficiency ranks are calculated. The normalization by the last input price (w_2) ensures price homogeneity.

The level of cost efficiency of a bank is determined by comparing its actual costs to the best-practice minimum costs to produce the same output under the same conditions using estimates of the efficiency factor ln u, which is disentangled from the estimated cost function residual using some distributional assumptions.[6] For our purposes, we also use the efficiency rank, and we create a rank ordering of the banks in each year based on the cost efficiency levels. The ranks are then converted to a uniform scale over [0,1] using the formula (order$_{it}$ - 1)/(n_t - 1), where order$_{it}$ is the place in ascending order of the ith bank in the tth year in terms of its cost efficiency level and n_t is the number of banks in year t. Thus, the bank i's efficiency rank in year t gives the proportion of the other sample banks in that year with lower efficiency level (e.g., a bank in year t with efficiency level better than 70% of other banks in the country has a rank of 0.70). The bank with the lowest cost efficiency level has the worst rank of 0 [(1 - 1)/(n_t - 1)], and the bank with the highest cost efficiency level has the best rank of 1 [(n_t - 1)/(n_t - 1)].

The use of efficiency ranks is preferred over the efficiency levels because the ranks are more comparable across time. The ranks for every time period follow the same uniform [0,1] distribution, whereas the distributions of efficiency levels may be very different, depending on conditions in the time period. We wish to abstract from these differences and focus on relative efficiency within a time period. That is, our null and alternative hypotheses are about the efficiency of Chinese banks relative to other banks at the same time.

Profit efficiency ranks are estimated in a similar fashion. Total profits replace total costs and we add a constant before taking the log to avoid taking a log of negative number. We also rearrange the residuals in ascending order, so that the bank with the highest profit function residual is given the highest rank of 1.[7] The profit efficiency ranks may be considered to be the more accurate indicator of the quality of the management of the institution, at least for private institutions, given that profit efficiency is the more general concept and that the managerial goals are more likely achieved by

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[6] For a general description and examples of bank efficiency estimation, see Berger and Mester (1997).

[7] The use of output quantities, rather than output prices is necessitated by the lack of accurate data on output prices. Other arguments also favor the use of this alternative profit function (see Berger and Mester 1997).

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higher profits than lower costs. This method of calculating efficiency rank ratio is consistent with that used in Berger, Clarke, Cull, Klapper and Udell (2005).

5. <u>Empirical results</u>

We test the differences in average profit and cost efficiency for the three main categories of majority bank ownership – majority state-owned, private, domestically-owned, and foreign-owned over the sample period. We also test for differences in average efficiency of some subcategories – specifically the Big Four state-owned banks, the other majority state-owned banks with minority foreign ownership, and the majority private, domestically-owned banks with minority foreign-ownership. Together, these findings may help address the issue of whether the Big Four banks have a problem of low efficiency and whether minority foreign ownership of these institutions might help correct such a problem.

We generally consider profit efficiency to superior to cost efficiency as an indicator of the quality of management of an institution. This is because profit efficiency is the more inclusive concept – taking account of both cost and revenue performance – and managers have some control over both revenues and costs. Any qualitative difference in the findings because profit and cost efficiency should be considered to be due to differences in revenue performance.

Given that our data spans the decade from 1994-2003, we measure efficiency in all cases against the best-practice frontier for the same year. Our regressions for the effects of ownership type also take account of the changes over time due to technological progress and changes in the economic environment by alternatively including time fixed effects and by using efficiency ranks that impose the same distribution on the efficiencies each year.

Before proceeding, some important caveats are in order regarding analyzing the efficiency of state-owned banks. First, these institutions have objectives other than profit maximization. They often have mandates to subsidize certain customers, or may allocate funds for political purposes (e.g., Sapienza 2004). The data for state-owned banks may also contain inaccuracies due to government accounting principles or biases due to subsidies that are not explicitly accounted for in the data. For example, state-owned banks may have artificially low costs because they do not pay full market rent for offices, because they pay below-market rates on deposits from government-owned nonfinancial

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firms, or because they have subsidized equity capital and other protections from the government.

Table 3 shows descriptive statistics for the profit and cost efficiency levels and ranks for the different ownership categories. The overall efficiencies shown at the bottom of the table are in line with efficiency literature. The mean profit efficiency level of 0.461 suggests that on average, banks earn about half of the profits that the best-practice bank in the sample would make under the same conditions. Similarly, the mean cost efficiency level of 0.740 suggests that the typical bank wastes about one-quarter of its costs relative to the best-practice bank. The means for the efficiency ranks are both 0.50 by construction. The levels have the benefit of taking account of the measured distance from the best-practice frontier, but the ranks may be more comparable over time because they are forced to have the same overall uniform distribution for every year.

The profit efficiencies in Table 3 clearly suggest that with regard to majority ownership, foreign-owned banks are the most efficient, with mean level and rank of 0.687 and 0.797, respectively, followed by private, domestically-owned banks (0.550, 0.531), with majority state-owned institutions being measured as least efficient (0.419, 0.460). The banks with no majority ownership (mix of state, private domestic, and foreign ownership with no share above 50%) have no clear ownership control, and so are just included as a control group in the regressions, but their efficiencies are not analyzed.

The subcategories of ownership show even more dramatic and interesting differences. The Big Four state banks are by far the least profit efficient set of banks, with a mean level of 0.165 and rank of 0.099. Minority foreign ownership also appears to be quite important. Majority state-owned banks with minority foreign ownership have much higher profit efficiency and rank than those with no foreign minority, and the same effect occurs for majority private, domestically-owned banks. For example, minority foreign ownership is associated with almost a 10 percentage higher rank for majority state-owned banks – rank of 0.640 versus 0.542 – and the difference is even greater for the majority private, domestically-owned institutions. Thus, the profit efficiency means are consistent with the hypothesis that the Big Four banks are quite inefficient, and that minority foreign ownership may be expected to make these institutions more efficient, but the tests of this hypothesis await the regression analysis below.

The cost efficiencies in Table 3 give the anomalous finding that state-owned banks are the most efficient, with the Big Four measured as particularly efficient. This may be due in part to

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accounting practices or subsidies on the cost side for state-owned institutions noted above. The low profit efficiency in spite of the high measured cost efficiency for state-owned banks is likely due in significant part to very poor loan revenues for these institutions. Further investigation is consistent with this explanation – state-owned banks have much higher rates of nonperforming loans than other institutions. Importantly, however, the subcategories with minority foreign ownership have higher average measured efficiency than the corresponding subcategories with no minority foreign ownership.

Tables 4 and 5 present regressions with the formal tests of all of these efficiency differences with various control variables. The first four columns in Table 4 show regressions of profit efficiency levels on the ownership types and include time fixed effects. The last four columns use profit efficiency ranks and do not include fixed effects. The regressions vary according to whether bank size class dummies are included and whether the subcategories of the Big Four banks and minority foreign ownership are specified. Table 5 presents the same material for the cost efficiency. In all cases, the results are consistent with the findings for the raw data on efficiency means discussed in Table 3 and support the hypothesis that the Big Four banks are not efficient, and that minority foreign ownership may be expected to improve their efficiency.

We recognize the possibility that our main empirical result – that minority foreign ownership is associated with higher efficiency – could in principle reflect selection bias, rather than efficiency benefits. It could have been the case that foreign owners selected relatively efficient institutions in which to invest and the efficiency of these banks did not improve as a consequence of their ownership. To investigate this possibility, we examine the change in average efficiency between periods $t > T$ and $t < T$ for banks that take on minority foreign ownership in period T. We compare this with the change in average efficiency between $t > T$ and $t < T$ for a peer group of banks with no foreign ownership. We do this comparison separately for majority state-owned banks (other than the Big Four) and majority private, domestic banks. Thus, we see if the foreign investment is associated with an improvement in efficiency beyond what occurred for the appropriate peer group for the same time period to ensure that the finding in our main regressions is not simply the result of selection bias.

Our preliminary results (not shown in tables) suggest that the effects of minority foreign ownership in most cases do reflect improvements above and beyond any selection effect. For the

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majority state-owned banks, the profit efficiency levels and ranks and the cost efficiency levels show significantly greater improvement in efficiency than their peer group. The findings for cost efficiency rank are not significant. For the majority private, domestic banks, the findings are qualitatively similar, but not statistically significant, likely due to the smaller number of observations on minority foreign ownership for these banks.

6. Conclusions

China is beginning a significant reform of its banking industry, partially privatizing three of its dominant "Big Four" state-owned banks and taking on minority foreign ownership of these institutions. Predicting the efficiency effects of these and other reforms is difficult because 1) the extant research on Chinese bank efficiency is very thin and contradictory; 2) there is no extant research to our knowledge on the efficiency effects of minority foreign ownership in any nation, and 3) information about the institutional history and regulation of the Chinese banking system is not widely known. The main goals of this paper are to fill in these three gaps in the research literature in order to help address issues of Chinese bank reform. We analyze profit and cost of using 256 annual observations over 1994-2003 on 37 commercial banks in China with different majority ownership – majority state-owned, private, domestically-owned, and majority foreign-owned. We also examine minority foreign ownership of both state-owned and private, domestically-owned Chinese institutions. In addition, we provide background information on the history, regulation, and market environment for the Chinese banking industry. The empirical results suggest strong favorable efficiency effects from reforms that reduce the state ownership of banks in China and increase the role of foreign ownership. For both efficiency concepts (profit and cost) and for both categories of majority domestic ownership (state and private domestic), minority foreign ownership increases expected efficiency.

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Table 1
Total Observations

This table shows the distributions of our sample across years, by various majority ownership groups and by bank size. Our overall sample is an unbalanced panel which consists of 256 observations (37 Chinese banks), covering ten years period - 1994 to 2003. In this table and throughout this paper, majority state-owned banks refer to those banks whose state ownership (including stake held by state-owned enterprises, i.e., both directly or indirectly owned by the state) is greater than 50% of total ownership. Majority state-owned banks are divided into three groups: Big Four state-owned banks, other majority state-owned banks without minority foreign ownership, and majority state-owned banks with minority foreign ownership. By the same token, majority domestic private banks refer to those banks whose domestic private ownership is greater than 50% of total ownership, and majority foreign banks refer to those banks whose foreign ownership is greater than 50% of total ownership. Mixed ownership group, therefore, includes those banks which are not fall within any of above groups. The bank size is defined based on total assets (inflation-adjusted to the base year 1994) of the bank at year t, and the bank is a small bank if its assets are less than or equal to US $1 billion, medium bank if the bank's assets are greater than US $1 billion but less than or equal to US $30 billion; large bank if the bank's assets are greater than US $30 billion. Sources of Data: Bankscope, Almanac of China's Finance and Banking, 1994-2004; individual bank's website, etc.

	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Bank Observations	256	15	19	20	24	26	31	32	32	30	27
Observations According to Ownership											
1. Majority State-owned	175	11	12	12	15	16	21	24	24	22	18
a. Big Four banks	40	4	4	4	4	4	4	4	4	4	4
b. Other Majority State-owned banks without foreign minority	100	4	5	5	7	9	14	17	16	14	9
c. Other Majority State-owned banks with foreign minority	35	3	3	3	4	3	3	3	4	4	5
2. Majority Domestic private	35	2	4	5	5	5	4	3	3	2	2
a. Majority domestic private without foreign minority	17	1	3	3	3	2	1	1	1	1	1
b. Majority domestic private with foreign Minority	18	1	1	2	2	3	3	2	2	1	1
3. Majority Foreign	21	1	2	2	2	3	3	2	2	2	2
4. No-majority ownership	25	1	1	1	2	2	3	3	3	4	5
Market share of assets by ownership groups											
1. Majority State-owned	0.915	0.958	0.946	0.937	0.923	0.926	0.924	0.916	0.907	0.893	0.868
a. Big Four banks	0.849	0.938	0.919	0.907	0.881	0.880	0.864	0.839	0.820	0.798	0.779
b. Other Majority State-owned banks without foreign minority	0.047	0.018	0.022	0.025	0.035	0.038	0.044	0.059	0.068	0.074	0.053

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c. Other Majority State-owned banks with foreign minority	0.016	0.004	0.004	0.006	0.008	0.008	0.015	0.016	0.020	0.021	0.035
2. Majority Domestic private	0.062	0.042	0.054	0.062	0.075	0.073	0.066	0.070	0.071	0.055	0.058
b. Majority domestic private without foreign minority	0.047	0.037	0.046	0.052	0.060	0.052	0.044	0.046	0.045	0.045	0.048
c. Majority domestic private with foreign Minority	0.015	0.005	0.007	0.010	0.014	0.020	0.022	0.023	0.026	0.010	0.009
3. Majority Foreign	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
4. No-majority ownership	0.023	0.000	0.000	0.000	0.000	0.000	0.008	0.015	0.021	0.052	0.075
Observations according to bank size											
Small Banks: assets < US $1 Billion	79	5	5	6	8	9	12	10	9	8	7
Medium Banks: US $1 billion<assets< US $30 billion	121	5	9	9	11	12	14	17	18	16	10
Large Banks: assets > US $30 Billion	56	5	5	5	5	5	5	5	5	6	10
Market share of assets by bank size											
Small Banks	0.002	0.002	0.001	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.002
Medium Banks	0.084	0.025	0.041	0.051	0.069	0.072	0.086	0.111	0.133	0.133	0.068
Large Banks	0.915	0.972	0.959	0.945	0.929	0.926	0.908	0.884	0.864	0.866	0.933

Table 2
Variables Used in Profit and Cost Efficiency (levels) Estimations

This table shows the descriptive statistics of basic variables used in the profit and cost efficiency (levels) estimations. In our translog based estimations of profit (cost) efficiency levels, output variables considered are total loans, total deposits, liquid assets, and other earning assets, and the input variables are: unit interest cost of deposits, defined as interest expenses to total deposits, and unit price of physical inputs, defined as non-interest expenses to total fixed assets. The outputs are normalized by total earning assets. All values are inflation-adjusted to the base year 1994.

	Mean	Standard Deviation	Median	Minimum	Maximum
Profit (Cost) (in billion US$)					
Total Profit	0.081	0.132	0.028	-0.081	0.844
Total Costs	3.362	9.797	0.319	0.001	69.800
Output Quantities (in billion US$)					
Total Loans (y1)	26.600	55.400	2.137	0.005	294.000
Total Deposits (y2)	39.200	81.200	3.724	0.002	427.000
Liquid Assets (y3)	10.800	22.300	1.644	0.005	143.000
Other Earning Assets (y4)	17.200	32.700	2.512	0.001	147.000
Input Prices					
Unit Interest cost of deposits (w1)	0.058	0.089	0.036	0.006	0.726
Unit Price of physical inputs (w2)	1.206	0.986	0.878	0.304	8.000

Table 3
Bank Efficiency by Ownership Type

This table shows the descriptive statistics of profit efficiency levels, profit efficiency ranks, cost efficiency levels, and cost efficiency ranks of the full sample and for subsamples grouped by majority ownership categories. The definition of majority ownership is the same as described in Table 1. Profit efficiency level is calculated based on the stochastic frontier estimation of translog function of four outputs and two inputs, as shown in table 2. Profit efficiency rank is defined in the following way: the efficiency level are put in rank order for a year and converted to a uniform scale over the [0,1] interval to make the ranks comparable across years; More specifically, the efficiency level of each observations are ranked in ascending order and converted to a uniform scale over [0,1] using the formula (order - 1)/(n - 1), where order is the place in ascending order of the banks residual in that year and n is the number of sample banks in the year. The bank with the highest residual has the best rank of 1 [(n - 1)/(n - 1)], and the bank with the lowest residual has the worst rank of 0 [(1 - 1)/(n - 1)]. Cost efficiency rank is calculated in the similar manner. Standard deviations are shown in parentheses below the mean.

Ownership Type	Profit Efficiency		Cost Efficiency	
	Profit Efficiency Level	Profit Efficiency Rank	Cost Efficiency Level	Cost Efficiency Rank
1. Majority state-owned	0.453	0.422	0.791	0.580
	(0.27)	(0.28)	(0.13)	(0.26)
a. Big Four banks	0.094	0.082	0.844	0.686
	(0.05)	(0.05)	(0.09)	(0.20)
b. Other majority state-owned banks without foreign minority	0.511	0.468	0.755	0.496
	(0.22)	(0.24)	(0.13)	(0.25)
c. Other majority state-owned banks with foreign minority	0.694	0.677	0.833	0.699
	(0.11)	(0.18)	(0.14)	(0.28)
2. Majority domestic private	0.625	0.675	0.582	0.258
	(0.28)	(0.34)	(0.15)	(0.24)
a. Majority domestic private without foreign minority	0.493	0.504	0.527	0.158
	(0.25)	(0.31)	(0.09)	(0.12)
b. Majority domestic private with foreign minority	0.751	0.835	0.634	0.352
	(0.25)	(0.28)	(0.17)	(0.29)
3. Majority foreign	0.747	0.752	0.715	0.489
	(0.10)	(0.17)	(0.23)	(0.44)
4. No-majority ownership (mixed ownership)	0.609	0.592	0.629	0.290
	(0.17)	(0.22)	(0.18)	(0.20)
All sample	0.516	0.500	0.740	0.500
	(0.27)	(0.30)	(0.17)	(0.30)

Table 4
Regressions on the Relative Importance of Ownership Determining Profit Efficiency

This table shows the second-stage OLS regressions results with profit efficiency (level and rank) as the dependent variable. The definitions of profit efficiency rank ratios, majority ownership dummies, and size dummies are the same as described in table 2. Majority private domestic is considered as an omitted variable in these regressions; Different sample years in the data are adjusted in two ways, i.e., by time fixed-effects in the profit efficiency regressions, or alternatively, by estimating the profit rank regressions. Time fixed effects estimations provide similar qualitative results reported here and are available upon request. Absolute values of t-statistics of the coefficients of the independent variables are shown in the parentheses, the standard errors are consistent estimates with White's heteroscedasticity corrections. ***, **, * are significant at 1, 5, and 10 percent significance levels respectively.

	Profit Efficiency Level				Profit Efficiency Rank			
	1	2	3	4	1	2	3	4
Constant	0.625***	0.735***	0.493***	0.529***	0.675***	0.803***	0.504***	0.582***
	(13.4)	(14.07)	(8.26)	(7.13)	(11.96)	(13.37)	(6.77)	(6.25)
Majority State	-0.173***	-0.190***	0.019	-0.064	-0.253***	-0.275***	-0.036	-0.146*
	(-3.39)	(-5.45)	(0.3)	(-0.91)	(-4.19)	(-6.62)	(-0.46)	(-1.67)
Majority Foreign	0.121**	0.012	0.254***	0.218***	0.077	-0.051	0.247***	0.170*
	(2.38)	(0.22)	(4.03)	(2.82)	(1.15)	(-0.73)	(2.99)	(1.7)
No-majority Ownership	-0.016	-0.064	0.117*	0.077	-0.082	-0.140*	0.088	0.022
	(-0.28)	(-0.95)	(1.71)	(0.99)	(-1.16)	(-1.76)	(1.02)	(0.22)
Big Four Banks			-0.417***	-0.266***			-0.386***	-0.191*
			(-17.62)	(-3.27)			(-15.17)	(-1.92)
Majority State, Minority Foreign			0.182***	0.208***			0.209***	0.229***
			(6.36)	(5.42)			(5.5)	(4.8)
Majority Private, Minority Foreign			0.258***	0.163*			0.331***	0.212**
			(3.12)	(1.86)			(3.36)	(1.99)
Medium banks		0.004		0.062		-0.017		0.044
		(0.1)		(1.52)		(-0.37)		(0.94)
Large banks		-0.392***		-0.105		-0.408***		-0.163
		(-8.41)		(-1.27)		(-7.81)		(-1.57)
N	256	256	256	256	256	256	256	256
F-statistics	33.95	95.11	302.35	207.99	24.1	75.71	169.09	124.31
R-square	0.1312	0.4847	0.5635	0.5813	0.1597	0.4486	0.5095	0.5275

Table 5
Regression on the Relative Importance of Ownership Determining Cost Efficiency

This table shows the second-stage OLS regressions results with cost efficiency as the dependent variable. The definitions of profit efficiency rank, majority ownership dummies, and size dummies are the same as described in previous tables. Majority private domestic is considered as an omitted variable in the regression; Different sample years in the data are adjusted in two ways similar to those in table 4, i.e., by fixed-effects in the cost efficiency regressions, or alternatively, by estimating the cost rank regressions. The results using time fixed-effects were qualitatively similar to estimations reported here and are available upon request. Absolute values of t-statistics of the coefficients of the independent variables are shown in the parentheses, the standard errors are consistent estimates with White's heteroscedasticity corrections. ***, **, * are significant at 1, 5, and 10 percent significance levels respectively.

	Cost Efficiency Level				Cost Efficiency Rank			
	1	2	3	4	1	2	3	4
Constant	0.582***	0.634***	0.527***	0.555***	0.258***	0.403***	0.158***	0.312***
	(23.41)	(19.26)	(23.77)	(11.92)	(6.38)	(6.78)	(5.68)	(4.37)
Majority State	0.209***	0.196***	0.228***	0.249***	0.322***	0.286***	0.338***	0.304***
	(7.81)	(6.94)	(8.82)	(5.84)	(7.15)	(5.86)	(8.99)	(4.87)
Majority Foreign	0.133**	0.082	0.188***	0.160**	0.231**	0.086	0.331***	0.177
	(2.43)	(1.38)	(3.49)	(2.36)	(2.26)	(0.77)	(3.36)	(1.49)
No-majority Ownership	0.047	0.02	0.102**	0.095**	0.032	-0.043	0.132***	0.052
	(1.11)	(0.46)	(2.48)	(2.02)	(0.58)	(-0.68)	(2.76)	(0.73)
Big Four Banks			0.088***	0.043			0.190***	0.223***
			(4.42)	(0.92)			(4.75)	(2.72)
Majority State, Minority Foreign			0.078***	0.053*			0.204***	0.146***
			(2.92)	(1.97)			(3.79)	(2.86)
Majority Private, Minority Foreign			0.107**	0.139**			0.194***	0.188**
			(2.33)	(2.42)			(2.68)	(2.09)
Medium banks		-0.073***		-0.064***		-0.186***		-0.156***
		(-3.31)		(-2.6)		(-4.39)		(-3.44)
Large banks		-0.005		-0.003		-0.062		-0.153*
		(-0.22)		(-0.07)		(-1.31)		(-1.83)
N	256	256	256	256	256	256	256	256
F-statistics	25.11	18.42	29.24	27.16	26.4	18.95	36.19	33.1
R-square	0.2296	0.2692	0.2852	0.3059	0.1854	0.248	0.2717	0.3068