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Bank ownership and efficiency in China: what lies ahead in the world's largest nation?

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Abstract

China is reforming its banking system, partially privatizing and permitting minority foreign ownership of three of the dominant 'big four' state-owned banks. This paper seeks to help predict the effects of this change by analysing the efficiency of virtually all Chinese banks in the years 1994–2003. Our findings suggest the big four banks are by far the least efficient and foreign banks the most efficient while minority foreign ownership is associated with significantly improved efficiency. We present corroborating robustness checks and offer several credible mechanisms through which minority foreign owners can increase Chinese bank efficiency. These findings suggest that minority foreign ownership of the big four is likely to significantly improve performance.

Keywords: China, foreign banks, efficiency, foreign ownership

JEL classification numbers: G21, G28, G34, F23

Pankkien omistus ja tehokkuus Kiinassa: mitä muutoksia edessä?

Suomen Pankin keskustelualoitteita 16/2007

Allen N. Berger – Iftekhar Hasan – Mingming Zhou
Rahapolitiikka- ja tutkimusosasto

Tiivistelmä

Kiina on uudistamassa pankkijärjestelmäänsä yksityistämällä osittain neljä suurinta valtioenemmistöistä pankkiaan siten, että se sallii ulkomaalaisten niihin tekemät vähemmistösijoitukset. Näiden vaikutusten ennustamisen helpottamiseksi tässä tutkimuksessa analysoidaan lähes kaikkien kiinalaispankkien tehokkuutta vuosina 1994–2003. Tulosten perusteella selvästi tehottomimpia ovat neljä suurinta pankkia, tehokkaimpia ovat ulkomaiset pankit ja merkittävästi tehokkuuttaan ovat parantaneet ulkomaalaisessa vähemmistöomistuksessa olevat pankit. Tehokkuuden johtuminen muista syistä on suljettu pois tarkistamalla tulosten virhesietoisuus. Tutkimuksessa esitetään useita keinoja, joilla ulkomaalaiset vähemmistöomistajat voivat lisätä kiinalaisten pankkien tehokkuutta. Vähemmistöosuuksiin perustuva ulkomaalaisomistus tulee lisäksi todennäköisesti merkittävästi parantamaan neljän suurimman pankin tehokkuutta.

Avainsanat: Kiina, ulkomaiset pankit, tehokkuus, ulkomaalaisomistus

JEL-luokittelu: G21, G28, G34, F23

Contents

1 Introduction

China's economy has been growing about 10% per year in real terms over the last decade, and is projected by some to become the world's largest economy in the coming decades. This rapid growth may be largely linked to the globalization of trade, but China has yet to 'globalize' its banking sector. Chinese banking is dominated by four very large state-owned banks – the 'Big Four' – with about three-fourths of industry assets, and very few foreign banks. As well, China's legal and financial systems are not well developed – even by the standards of most developing nations.

Research on 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 is associated with low efficiency, restricted access to credit for SMEs, and slow economic growth in developing nations. This literature also suggests that foreign bank ownership and relatively unrestricted foreign bank entry are associated with higher efficiency and SME credit availability in developing nations.

The finance-growth nexus literature consistently finds that economic growth in developing nations is highly positively related to more efficient legal systems and better financial market development (eg, King and Levine 1993, La Porta et al 1998, Djankov et al 2003, Beck et al 2005, Jappelli et al 2005). Recent findings also suggest that elements of the legal/financial infrastructure may 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 (eg, Qian and Strahan, 2005; Berger and Udell, 2006).

China has maintained 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 (eg, US Treasuries), as well as foreign direct investment (eg, the 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 the combination of poor credit allocation and high growth to continue indefinitely.

A recent study also suggests that most of the growth has been concentrated in what we might call the 'private, unlisted sector' – firms that are not state-controlled or publicly listed. Using survey information on Chinese entrepreneurs and executives, the study also finds that that firms in this sector accessed funding

through alternative financing channels and governance mechanisms, including those based on 'soft' information from reputations and relationships (Allen et al, 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 (eg, public debt and equity offerings, bank loans based on collateral) in the long run.

Another recent analysis suggests that an inefficient banking sector and poor legal/financial infrastructure may already be restraining growth and development in China. 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 for capital deepening when surplus funds are less available.

Reform of the Chinese banking industry is also important because of the size of this industry and its level of inefficiency. The banking industry is larger than the stock markets in China, and as shown below, is very inefficient – particularly the Big Four banks.

There has been significant reform of the banking system since entry into the World Trade Organization (WTO) in 2001. Recent news suggests that this reform may now be resulting in substantial bank ownership changes with important implications for the future of Chinese bank efficiency. During 2005 and early 2006, three of the Big Four banks – China Construction Bank (CCB), Bank of China (BOC), and Industrial & Commercial Bank of China (ICBC) – announced plans to partially privatize and take on minority foreign ownership. These deals were consummated in 2006. The foreign investors include financial organizations with global reach (eg, Citigroup, HSBC, Deutsche Bank, Royal Bank of Scotland). In some cases, these global banks joined forces with regional financial organizations (eg, Temasek of Singapore) and/or with international corporate giants (eg, IBM).

While these banks are opening up to foreigners as minority owners, they are also going public with sales of some of their shares through IPOs, while retaining majority state-owned bank status. The three Big Four banks that took on minority foreign ownership also had very large IPOs following the initial foreign investments. These IPOs totaled over US $40 billion in receipts, including the world's largest ever IPO offering by ICBC. The minority foreign investments may be related to the subsequent IPOs in that strategic minority foreign owners may mandate or encourage the banks to go public to increase the investors' future liquidity, to improve the accuracy and transparency of the banks' financial records, and/or to bring additional market discipline on the institutions. The

minority foreign investment may also serve as a quality signal to the capital market, increasing the revenue per share in the IPOs. The remaining Big Four bank, Agricultural Bank of China (ABC), is currently restructuring its problem loans – presumably as part of a plan to take on minority foreign owners and/or engage in an IPO in the near future.

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 it difficult to extrapolate to the likely effects of partial privatization and minority foreign ownership of the Big Four and other large Chinese banks.

Second, we are unaware of prior research using data from any nation on the effects of minority foreign ownership of banks, although there are studies of minority foreign ownership of nonbanking firms in developing nations.[1] 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 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 other developing nations in Asia, Latin America, and 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 these gaps in the research literature. First, we analyze the profit and cost efficiency of banks operating in China using 266 annual observations over 1994–2003, covering 95% of total banking assets. We compare the efficiency of the Big Four banks, Non-Big Four state-owned banks, private domestic banks, and foreign banks. The data are from a number of sources, including Bankscope and Almanac of China's Finance and Banking. Second, we examine the efficiency effects of minority foreign ownership of Chinese banks. Some of the Non-Big Four state-owned banks and some of the private domestic banks have minority foreign ownership. It seems reasonable to assume that if minority foreign ownership has strong effects on the

[1] See Stulz (2005) and Kho et al (2006) for discussion on how agency problems of domestic firms allow insiders to own large equity stakes of firms in developing nations, which limits the role of foreign investors or institutions.

efficiency of both of these types of institutions, then it is likely to have qualitatively similar effects on the Big Four banks. Finally, we provide comprehensive background information on the history, regulation, and market environment for the Chinese banking industry that has undergone substantial regulatory reforms in recent decades.

Our results suggest strong favorable efficiency effects from reforms that reduce the state ownership of banks in China and increase the role of foreign ownership. In terms of majority ownership, foreign banks are the most profit efficient, followed by private domestic banks. State-owned institutions – particularly the Big Four – are least efficient. These results are consistent with research on other developing nations. The findings for banks with majority foreign ownership must be viewed with caution as we are able to include only a small number of these banks with permission to take deposits/make loans in the local currency.

The cost efficiency findings present the anomaly that state-owned institutions have relatively high measured cost efficiency. This may be due in part to 'skimping' on underwriting and monitoring loans. This behavior may save costs with reduced expenditures on lending due diligence in the short-term, but it yields high nonperforming loans and poor loan revenues. Further investigation is consistent with 'skimping', as state-owned banks have much higher rates of nonperforming loans and lower loan revenues than other institutions. Profit efficiency includes loan revenues and so nets out some of these effects.

Our main empirical focus is on the effects of minority foreign ownership. The results suggest that such ownership increases the efficiency of both state-owned banks and private domestic banks with such ownership. This finding 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 effect in which foreigners purchase shares in relatively efficient banks. Nonetheless, we cannot completely rule out a more complex selection effect under which foreigners invest in banks that were likely to have future efficiency improvements in any event. This could occur because Chinese owners tend to allow minority foreign ownership for banks that are going to improve and/or because the foreigners are strategic in their choice of targets.

Section 2 reviews some of the research literature on bank ownership type and efficiency in developing nations generally and in China in particular. Section 3 gives background information on the Chinese banking industry. Section 4 shows our data on the Chinese banks and outlines our empirical methodology. Section 5 displays our empirical results, and Section 6 investigates the mechanisms through which minority foreign ownership may increase Chinese bank efficiency. Section 7 concludes.

2 Literature on bank ownership type and efficiency

Many studies examine the efficiency effects of bank ownership type – whether an institution is state-owned, private domestic, or foreign – with very significant differences found among these types. Here, we highlight some of the findings of this research, focusing on results for developing nations, which may give insights into the likely effects in China. We also briefly discuss the few studies on bank efficiency in China.

2.1 Evidence on bank efficiency in developing nations

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 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 et al, 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, 2007). 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 et al, 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 et al, 2005). A study of Pakistani data 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 Indian banks finds that foreign banks are more efficient on average than private domestic banks (Bhattacharya et al, 1997).[2]

[2] This study also finds the unusual result that state-owned banks are relatively efficient, which may be due to accounting practices, cross-subsidies from other government agencies, or low-cost accounts by other state-owned firms.

2.2 Evidence on bank efficiency in China

There have been a few recent studies of Chinese bank efficiency and reform with mixed or contradictory results.[3] To our knowledge, none have used the comprehensive concept of profit efficiency nor have any addressed issues of foreign ownership. One study compares the cost efficiency of Big Four banks and two smaller size classes of majority state-owned joint-equity banks over the period 1993–2000, and finds that the Big Four and smaller joint-equity banks are both cost efficient relative to the medium-sized joint-equity banks (Chen et al, 2005).[4] However, a recent working paper using an input distance function approach finds contrary results. Kumbhakar and Wang (2005) find that the Big Four are less efficient than the joint-equity banks over the period of 1993–2002, and consistent findings are reported by Fu and Heffernan (2006).

These studies also have contradictory implications regarding the effects of deregulation. Chen et al (2005) find that the financial deregulation of the mid-1990s had strong positive efficiency effects; Kumbhakar and Wang (2005) find that deregulation did not result in significant efficiency improvement; and Fu and Heffernan (2006) find that cost efficiency of the banks was higher during the first phase of bank reforms.[5]

Our empirical application is quite different. We use the more comprehensive concept of profit efficiency, which embodies revenues and loan performance, rather than just costs or inputs. More important, we study the effects of the current, potentially more significant reforms that allow for foreign bank ownership, particularly minority foreign ownership of Chinese banks.

[3] Some of the bank research literature on China compares bank performance using ratio analysis (eg, Li et al, 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 does, 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 (eg, 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 (eg, Shiria, 2001). Examples include examinations of the determinants and timing of foreign bank entry into China and the time associated with earning profitable returns by foreign branches in Shanghai (eg, Leung, 1997; Leung et al, 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.

[4] 'Joint-equity' banks in China refer to domestically-owned commercial banks with a mixed structure of equity collected from the state, state-owned enterprises, and private enterprises or individuals. Some of these banks also issue public shares in the stock market. In the literature of Chinese banks, 'joint-equity' and 'joint-stock' are equivalent concepts.

[5] Other studies in Chinese also find contradictory results (Huang, 1998; Wei and Wang, 2000; Yao et al, 2004).

3 Background on the Chinese banking industry

We 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 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, People's Bank of China (PBOC), 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 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 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) were initially limited to serve only their designated sector of the economy (ie, foreign trade and exchange; construction; agriculture; industrial and commercial lending). In 1985, the Big Four were allowed to compete 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.[6]

[6] 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 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.

3.2 The 1990s until WTO entry in December 2001

The asset quality of state-owned banks deteriorated significantly during the 1990s, as these banks made most of their loans to state-owned enterprises (SOEs), 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 RMB or yuan (US $32.6 billion) of 30-year government special bonds to recapitalize the Big Four banks in 1998. In 1999, 1.4 trillion RMB 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.

Although the asset quality of the Chinese banks has been a serious concern, there is no explicit deposit insurance. Instead, there is implicit deposit insurance in the sense that the Chinese government has almost always stepped in to either help the banks who were in financial difficulties to write-off their bad loans, or paid off the outstanding debts in case of bank failures.[7] However, things began to change in 1999, when Guangdong International Trust and Investment Corporation was closed due to inability to payout outstanding debt with amount exceeding US $5 billion. The central government did not assume the main repayment responsibilities as creditors expected, and the debt-holders finally collected an average of 12.54% back from their original investment.[8]

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.[9]

The Chinese government has been very conservative in allowing foreign bank entry. Foreign banks were allowed to open representative offices in 1979, and

[7] Examples are the Hainan Development Bank and some small credit cooperatives that went bankrupt and had to be closed, but the central government assumed the responsibilities of their outstanding debts.

[8] There are signs that the Chinese regulators moving toward formal deposit insurance. A 'Deposit Insurance Office' was established within the Financial Stability Bureau of PBOC in 2005. It is also reported that the China Banking Regulatory Commission is working on plans to introduce a system like the US Federal Deposit Insurance Corporation.

[9] China Minsheng Banking Corporation was founded in 1996 and is almost 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 RMB (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 1999, 90 such banks were operating in China, with total assets of 554.7 billion RMB (PBOC 2000).

have been allowed to open operational branches in Special Economic Zones since 1982 (eg, Hong Kong banks operating in nearby Shenzhen). This geographical restriction was somewhat relaxed in 1994 – they were allowed to operate in 23 cities based on individual applications. Foreign banks were first permitted to do business with Chinese enterprises by taking deposits and making loans in local currency (RMB) in the Shanghai Pudong New Zone in 1996 (and later in Shenzhen Special Economic Zone) on the basis of individual licenses. 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 Chinese enterprises, with totals of 21,813 million RMB (about US $2,635 million) in assets, 11,341 million RMB (about US $1,340 million) in loans, and 15,100 million RMB (about US $1,824 million) in deposits. Total assets of all foreign banks in China reached nearly 272 billion RMB (US $32,844 million) by 1999. Foreign banks were prohibited from conducting any consumer banking in local currency (RMB) with mainland residents during the 1990s.

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 (a national shareholding commercial bank, majority state-owned).[10] 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 at the end of 2001. 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.[11]

Turning our attention to the issue of bank taxes, historically, every enterprise had to negotiate a contract every year with the government on their tax burden

[10] A 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.

[11] Other 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 flexibility for commercial banks to adjust interest rates; and 4) PBOC made recommendations to improve bank risk controls, specifically to follow the Basel requirements in classifying the loans into different risk-adjusted categories in order to meet the comprehensive banking supervision requirement outlined in 'Basel Core Principles for effective supervision.'

(the 'contractual approach'), rather than following any explicit uniform tax laws or regulations (Xu and Zhang, 1995). The first reform came in 1994 and a further change was enacted in 1997 under which all domestic commercial banks were subject to a uniform 33% tax rate. Foreign banks have been subject to a relatively lower tax burden, due to the different tax-exempt incentives available to all foreign companies, especially since 1991.

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, and some existing regulations and laws, such as the 1995 Central Bank Law and Commercial Bank Law, were revised to be aligned with the WTO agreement. According to the promised agenda, there will be more liberalization of interest rates, more fair treatment of tax rates among players, less restrictions on ownership takeovers and M&As, and greater freedom of operational and geographical scope in the Chinese banking industry. For example, starting in 2002, foreign banks could provide foreign currency services for Chinese residents and enterprises, and starting in February 2004, China opened its local currency market and allowed foreign banks to provide local currency services to Chinese enterprises in designated cities and areas, while the retail market is supposed to be opened for foreign banks in December 2006, under the pledge of the WTO agreement. However, in late 2006, the Chinese regulators imposed new requirements to meet before the foreign banks are allowed to take deposits in RMB from Chinese individuals, which led to further delays of foreign banks' access to consumers.[12] A recent move on this issue occurred in April 2007, four foreign banks (Citigroup Inc., HSBC Holdings PLC, Standard Chartered PLC, and Bank of East Asia Ltd.), after obtaining approval from Chinese regulators, began to accept deposits in RMB from the country's citizens.

One attempt of the government to achieve better monitoring of the banking industry was the creation of China Banking Regulatory Commission (CBRC) in 2003 to oversee reforms and regulations. 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. In 2003, CBRC updated guidelines to encourage foreign share purchases – foreigners can

[12] Among other things, the new rules require that foreign banks incorporate their operations locally, ie, establish a stand-alone holding company, incorporated in China with its own board of directors.

own up to 25% of any domestic bank, with the ownership from any one investor allowed between 5% and 20%, subject to regulatory approval.[13]

Examples of strategic foreign investments during the post-WTO period include Citigroup's purchase of about 5% of Shanghai Pudong Development Bank (a Shanghai-based commercial bank, about 40% state-owned) in January 2003, and a consortium (including Hang Seng Bank Ltd., IFC, etc.)'s purchase of 24.98% stake in Industrial Bank (a southern Fujian Province-based bank, 34% held by Fujian Provincial Bureau of Finance) in December 2003. In 2004, Newbridge Capital Ltd. (a US investor group) bought about 18% of Shenzhen Development Bank Co. (a national Shenzhen-based listed bank), the first time that foreign investors became the largest and controlling shareholder of a national domestic bank. In August 2004, Hong Kong & Shanghai Banking Corp. (a unit of HSBC Holding PLC) also finalized its transaction to purchase a 19.9% stake of Bank of Communications (the fifth-largest bank in China, 23.76% owned by Ministry of Finance of China) US $1.75 billion, and it secured the right to double this share when regulations allow.[14] More recently, Deutsche Bank AG-led group has agreed to buy 14% stake of Hua Xia Bank, another big national majority state-owned commercial bank. On Dec 31, 2005, the first Chinese bank born with foreign minority stake (from the Standard Chartered, which bought 19.99% of the shares), China Bohai Bank, was established, and it is also the only national shareholding commercial bank that established after 1997. By October 2006, nine city commercial banks had also reached agreement with foreign investors.[15]

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,

[13] In 2004, the CBRC required that foreign investors are qualified only if they meet four principles: 'long-term equity-holdings, optimizing corporate governance, business cooperation, competition-avoidance'. In 2005, these four principles were amplified to a more detailed specification by CBRC, ie, no less than 3 years of equity holding, board member appointment, technology and network support, and investing in no more than two Chinese banks with similar business, etc. (Zhuo 2005). CBRC also requires that in order to become a 'qualified' foreign strategic investor in a new shareholding commercial bank, the foreign investors must have: (1) minimum assets of $10 billion; good standing on its long-term credit rating by international credit rating agencies; positive profits on the last two accounting calendar years; and is committed to the 2004 principles; and conforming to the 20% and 25% limits for single and multiple foreign investors in Chinese banks.

[14] 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 cautious about foreign investment in domestic banks.

[15] These nine city commercial banks are: 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, Hangzhou City Commercial Bank, and Ningbo City Commercial Bank.

2005, Bank of America reached a deal to buy a 9% stake in CCB.[16] Also in June 2005, CCB signed a deal with Temasek in which the Singapore investment firm 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. In September 2005, Royal Bank of Scotland and Temasek each agreed to buy 10% stakes in BOC.[17] In both the CCB and BOC cases, the foreign strategic investors have also been required to lock up their shares for three years. In January 2006, Goldman Sachs Group Inc., Allianz AG, and American Express Co. signed an agreement to buy a total 10% stake of ICBC for $3.78 billion, and Goldman Sachs has been providing staff training, risk-management assistance and guidance on internal control and corporate governance.

Another strategy of the regulators in order to improve Chinese banks' management is to encourage the banks to list on stock exchanges for additional external monitoring. The Bank of Communications was the first to take this route in June 2005 when it raised more than US $2 billion in an IPO in Hong Kong. Three of the Big Four banks have since issued IPOs outside mainland China. First, CCB issued IPOs in October 2005 and raised HK $62.25 billion (about US $8 billion) in Hong Kong. Next, BOC raised HK $860 billion (about US $11.2 billion) in Hong Kong in June 2006 and followed this with a listing of A-shares in Shanghai which raised 20 billion RMB (about US $2.5 billion). Finally, ICBC issued its IPOs at both Shanghai and Hong Kong in October 2006 and raised about US $21.9 billion, including HK $124.7 (about US $16.0 billion) raised in Hong Kong, and about 46.64 billion RMB (about US $5.9 billion) raised in Shanghai, making it the world's biggest IPO so far. Notably, the public shares issued in Hong Kong or any other location outside mainland China are not subject to the 25% restriction on foreign ownership.

[16] 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. In addition, Bank of America has a seven-year strategic alliance with CCB that involves committing the equivalent of 50 Bank of America employees' time to work at the Chinese bank. Also, Bank of America has one seat on a 15-person board, and the two sides have agreed to discuss a potential credit-card joint venture in China. As part of this, Bank of America agreed to withdraw from retail banking in China, though it retains its corporate and commercial-banking presence.

[17] Temasek later cut its stake to 5%, following a backlash against the sale of shares in large state banks to foreigners.

4 Data and methodology

4.1 Sample and definition of majority ownership

Our sample is an unbalanced panel which includes financials and ownership data of 38 Chinese banks during the period of 1994 to 2003, totaling 266 observations. The basic data source is Bankscope – Fitch's International Bank Database. Whenever Bankscope does not provide enough information or has questionable values, we collect or double-check the data from other official sources, such as annual issues of Almanac of China's Finance and Banking, 1994–2004; annual Issues of China Statistical Yearbook, 1994–2004. We also use annual reports provided by individual banks via their websites, and newspaper releases on the performance and financial information of the banks in tracing missing or unavailable data points. Most of the sample banks follow Chinese Accounting Standards (CAS) while a few also prepared annual reports based on International Accounting Standards (IAS). The banks following IAS standards are primarily the joint venture banks, foreign banks, and banks listed in the stock market. While there are some differences between the CAS and IAS however, it should be mentioned that the CAS was developed only in recent years following the principles of IAS. While we recognize that there may be some inconsistencies in financial data using different accounting standards, we do not find a material difference between the financial statements of the same bank while reporting under both CAS and IAS respectively. Among the 38 Chinese banks, we have full information on the Big Four state-owned banks, which have 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 10 banks. These 10 banks own 99% of the total assets of the second-tier banks. 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 (foreign ownership of at least 25%, but less than 100%) and 2 solely foreign banks. The city commercials, along with the joint venture banks and solely foreign banks, make up the 'third-tier' banks in the industry, and they took up less than 10% of the total markets in 2005. Our sample covers over 95% of the banking assets in China.

We define majority state-owned banks as those banks whose state and state-owned enterprises ownership is greater than 50% of total ownership; majority private domestic banks are defined as those banks whose private domestic ownership is greater than 50% of total ownership; majority foreign banks are defined as those banks whose foreign ownership is greater than 50% of total

ownership, and no majority ownership banks are those without any majority ownership. Bank size is defined based on total assets (prices are 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 $20 billion; large bank if the bank's assets are greater than US $20 billion.

4.2 Computation of efficiency levels and efficiency ranks

Cost and profit efficiency measure how well a bank is predicted to perform relative to a 'best-practice' bank producing the same outputs under the same environmental conditions. That is, efficiency measures how close to the minimum cost or maximum profit a bank is, where the minimum and maximum are determined by best performers in the sample. We estimate efficiency levels by specifying the commonly-used translog functional form for the cost and profit functions. For convenience, we show only the cost function:

$$\begin{aligned}\ln\left(\frac{C}{w_2 z_1}\right)_{it} = {} & \delta_0 + \sum_j \delta_j \ln\left(\frac{y_j}{z_1}\right)_{it} + \tfrac{1}{2}\sum_j\sum_k \delta_{jk} \ln\left(\frac{y_k}{z_1}\right)_{it} + \beta_1 \ln\left(\frac{w_1}{w_2}\right)_{it} \\ & + \tfrac{1}{2}\beta_{11} \ln\left(\frac{w_1}{w_2}\right)_{it} \ln\left(\frac{w_1}{w_2}\right)_{it} + \sum_j \theta_j \ln\left(\frac{y_j}{z_1}\right)_{it} \ln\left(\frac{w_1}{w_2}\right)_{it} \\ & + \text{year dummies}_t + \ln u_{it} + \ln v_{it}\end{aligned} \tag{4.1}$$

where i, t index the bank and year, respectively, k = 1,…4 index the four output variables, and $\delta_{jk} \equiv \delta_{kj}$. C represents the bank's total costs. There are four outputs (y); total loans, total deposits, liquid assets, other earning assets; two input prices (w): interest expenses to total deposits, noninterest expenses to fixed assets; and one fixed input (z): total earning assets. The ln u term 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 efficiencies are calculated. The normalization by the last input price (w_2) ensures price homogeneity.

A bank's cost efficiency level is determined by comparing its actual costs to 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.[18] We also use the efficiency rank based on an ordering of the banks' cost efficiency levels in each year. 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 (eg, 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 $1[(nt - 1)/(n_t - 1)]$.

Profit efficiency levels and ranks are estimated similarly. Total profits replace total costs and we add a constant before taking the log to avoid taking a log of negative number. For the ranks, we arrange the residuals in ascending order, so that the bank with the highest profit function residual has the best rank of 1.[19]

Efficiency levels are more accurate than ranks because the levels account for the measured distance from the best-practice frontier. However, efficiency ranks have the benefit of being more comparable across time. The ranks for every time period follow the same uniform [0,1] distribution, whereas the distributions of efficiency levels may differ with the economic environment over time. Neither the levels nor the ranks are clearly superior ex ante. We show both concepts below and the results are qualitatively similar.

5 Empirical results

5.1 Tests of main hypothesis

We test the differences in average profit and cost efficiency for the four main categories of majority bank ownership – Big Four, non-Big Four majority state-owned, majority private domestic, and majority foreign over the sample period. We also test for differences in average efficiency of some subcategories – specifically the non-Big Four majority state-owned banks with minority foreign ownership, and the majority private domestic banks with minority foreign-ownership. Together, these findings may help address whether the Big Four banks

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

[19] 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).

have a problem of low efficiency and whether minority foreign ownership of these institutions might help correct such a problem.

We consider profit efficiency to superior to cost efficiency as an indicator of the quality of bank management. This is because profit efficiency is the more inclusive concept – taking account of both cost and revenue performance – given that managers have some control over both revenues and costs. Any qualitative differences in the findings between profit and cost efficiency are due to differences in revenue performance.

As mentioned earlier, we measure efficiency levels and ranks from pooled observations incorporating year dummies. In doing so, we avoid any estimation biases that may arise due to potential changes in bank performance due to technological progress or changes in the economic and regulatory environments. We avoid time fixed effects again in the secondary regressions given the efficiency scores are adjusted for sample years, avoiding time adjustment twice. Importantly, if we add year dummy variables in the secondary regressions, we end up imposing different constant for each year. This is a disadvantage for capture the effects when banks convert to another types of ownership in the later years, particularly taking on minority foreign ownership. Nonetheless, we try including these time fixed effects and the results are qualitatively similar. 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 using efficiency ranks that impose the same distribution on the efficiencies each year.

Before proceeding, an important caveat is in order regarding analyzing the efficiency of state-owned banks. These institutions have historically faced pressures and directions from central and local governments to grant policy loans for political purposes, rather than for profit maximization. This is consistent with findings for state-owned banks in other nations (eg, Sapienza, 2004). One recent paper argues that despite the recent reforms, the pressure on the state-owned banks to make negative net present value policy loans remains present, and will become apparent in a future economic slowdown (Dobson and Kashyap, 2006).

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 0.476 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 0.897 suggests that the typical bank wastes about 10% of its costs relative to the best-practice bank. The means for the efficiency ranks are both 0.50 by construction. As discussed above, the levels are more accurate, but the ranks are more comparable over time – so neither concept is strictly preferred ex ante. The profit efficiencies in Table 3 clearly suggest that with regard to majority ownership, foreign banks are the most efficient, with mean level and rank of 0.692 and 0.797, respectively, followed by

private domestic banks (0.589, 0.642), non-Big Four majority state-owned institutions (0.480, 0.495), with the Big Four being measured as least profit efficient by far (0.234, 0.222). 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, suggesting that minority foreign ownership may be quite important. Non-Big Four 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 domestic banks. For example, for non-Big Four banks, minority foreign ownership is associated with almost a 20 percentage point higher profit efficiency level (61.7% versus 42.1%) and almost a 30 percentage higher profit efficiency rank (69.4% versus 41.0%). 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, although formal tests of these hypotheses await the regression analysis below.

The cost efficiencies in Table 3 suggest that non-Big Four state-owned banks and majority foreign are the most efficient, with the majority private measured as the least efficient. The Big Four are only about 2 percentage points below the most cost-efficient categories, and not much below the median cost efficiency with an average rank of 0.454. Importantly, however, both subcategories with minority foreign ownership still have higher average measured cost efficiency than the corresponding subcategories with no minority foreign ownership.

A few words are appropriate regarding some of the seeming inconsistency between the findings for cost efficiency and profit efficiency of state-owned banks, particularly the Big Four, which are measured as very profit inefficient and only slightly more cost inefficient on average. It is not likely that these institutions are reasonably adept at managing their costs but extremely incompetent in managing their revenues. A much more likely explanation is the 'skimping hypothesis' in which these banks allocate few resources on underwriting and monitoring loans, which saves costs in the short term, but yields poor loan revenues in the long run (Berger and DeYoung, 1997). That is, these banks may spend little on screening and investigating potential borrowers prior to granting credit and/or monitoring borrowers after loans are issued. As a result, many of the loans do not perform and loan revenues are very low – which may more than offset the cost savings from 'skimping'. Further investigation is consistent with this explanation – state-owned banks – particularly the Big Four – have much higher rates of nonperforming loans than other institutions.[20]

[20] We are not aware of any other evidence on the 'skimping hypothesis' in developing nations.

It is also possible that the measured cost efficiency for these institutions may reflect in part government subsidies on the cost side. For example, state-owned banks may not pay full market rent for offices, may pay below-market rates on deposits from government-owned nonfinancial firms, or may have subsidized equity capital and other protections from the government.[21]

It is beyond the scope of this paper to distinguish empirically how much of the measured cost efficiency may reflect 'skimping', cost subsidies, or other causes. Nonetheless, we generally favor the profit efficiency results because profit efficiency is the more inclusive concept and the revenue differences between state-owned and other banks appear to be more important than cost differences.

Tables 4 and 5 present regressions with the formal tests of all of these efficiency differences. The first four columns in Table 4 show regressions of profit efficiency levels on the ownership types. The last four columns use profit efficiency ranks. The regressions vary according to whether bank size class dummies are included and whether the subcategories of the minority foreign ownership are specified. Table 5 presents the corresponding findings for cost efficiency. In all cases, the omitted dummy variable is Majority private domestic, so all of the efficiencies are measured relative to this category. The t-statistics are based on standard errors clustered at the bank level.

The results in Table 4 are consistent with the findings for the raw data on efficiency means discussed in Table 3. In columns (1) and (2) for both profit efficiency levels and ranks, the Big Four are the least profit efficient by far, with the non-Big Four state-owned banks being second-to-least efficient. In columns (3) and (4), minority foreign ownership is included. In all cases, these indicators are positive and statistically significant, consistent with the hypothesis that the addition of minority foreign owners to either majority state-owned banks or majority private domestic banks increases efficiency.

The cost efficiency results in Table 5 are also consistent with the hypothesis that minority foreign ownership increases bank efficiency in all cases. The majority ownership results again show the anomaly that state-owned banks are measured as more cost efficient than private domestic banks, consistent with 'skimping' behavior. In all cases, regression 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 very profit inefficient, and that minority foreign ownership may be expected to improve their efficiency.

Given the importance and urgency of reducing nonperforming loans (NPLs) within the banking system, we conduct a robustness test on the 'asset quality'

[21] We argue that the quality of the financial statements of our sample banks is not likely the primary force that drives the results, based on the fact that the accounting standards that these banks follow are not significantly different. Even in cases where IAS (International Accounting Standards) is adopted rather than CAS (Chinese Accounting Standards), the signature of a co-auditing Chinese Certified Public Accountant is required.

(1 – NPL ratio) separately as another measure for efficiency. The results are reported in Table 6. Due to missing values of NPL, the size of the sample is reduced to 118 observations. Nonetheless, we find that minority foreign ownership is associated with significantly higher asset quality in both majority private domestic banks and majority state-owned banks. These results extend and complement our main efficiency results.

5.2 Tests of an alternative hypothesis (selection effects)

We recognize the possibility that our main empirical result – that minority foreign ownership is associated with higher efficiency – could reflect selection effects, rather than efficiency benefits. For instance, foreign owners could have 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 compute the average efficiency change from the 4 years prior to the foreign investment to as many as the 4 years after taking on minority foreign ownership (although there are usually fewer than 4 ex post years in the data set). We compare this with the change in average efficiency for the exact same years for the peer group of banks with no foreign ownership. That is, we examine the change in average efficiency between periods $T - 4 \leq t_{before} < T$ and periods $T \leq t_{after} \leq T + 4$ for banks that take on minority foreign ownership in period T. We do this comparison separately for majority private domestic banks and non-Big Four majority state-owned 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 does not simply reflect selection effects.

The results of these comparisons are shown in Table 7. Panel 1 focuses on the three majority private domestic banks that took on minority foreign ownership during the sample period and their peer group comparison. Panel 2 shows the corresponding information for the two majority state-owned banks with ownership change and peer comparison. The table explicitly excludes from all comparisons the Big Four banks, majority foreign-owned banks, no majority banks, and banks with minority foreign ownership that took on this ownership prior to the start of the sample period in 1994. We also exclude observations more than 4 years removed in either direction from the ownership change to reduce the influence of extraneous events further away in time. Thus, Table 7 has many fewer observations than are shown in Tables 3–5 in order to focus on the cleanest possible comparisons to address the question of whether our main finding reflects only selection effects rather than efficiency benefits.

The findings suggest that minority foreign ownership is associated with efficiency improvements above and beyond any selection effects, although we do not rule out selection effects. As shown in Panel 1 of Table 7, for all four ways in which we measure efficiency – profit levels and ranks and cost levels and ranks – the change in efficiency from periods $T - 4 \leq t_{before} < T$ to periods $T \leq t_{after} \leq + 4$ is statistically significantly greater for private domestic banks that take on minority foreign ownership than their peer group that remains entirely domestically-owned over the same time interval. For example, the profit efficiency level for private domestic banks that add minority foreign ownership rises from 0.589 to 0.740, which rounds to an average of 0.150 or 15.0 percentage points higher after investment than it was for these same institutions prior to the investment, (Difference A). The peer group average efficiency actually decreased over this same time interval by 12.7 percentage points from 0.554 to 0.428 (Difference B). As shown in the bottom row of Panel 1, the difference between these two differences of 0.277 or 27.7 percentage points is statistically significant, as well as large in magnitude (Difference C). The other three differences in the bottom row are also large, positive, and statistically significant, supporting the beneficial average effects of the foreign investments. Interestingly, although we focus on the changes in efficiency after investment as the correct tests for value enhancement associated with minority foreign ownership, we do observe that the private domestic banks selected for foreign investment had a higher efficiency ex ante than their peers.

The findings for state-owned banks other than the Big Four in Panel 2 are qualitatively similar. For all four ways we measure efficiency, the change in efficiency is statistically significantly greater for the state-owned institutions that take on minority foreign ownership than their peer group. Although the differences relative to peer groups shown in Table 7 are small relative to the minority foreign ownership effects shown in the regressions above, these are stringent tests using subsets of the data chosen for only the cleanest comparisons. While we do not rule out selection effects, the data do show improvements associated with adding minority foreign ownership.

5.3 Additional robustness tests

We also run an additional set of robustness checks of the effects of minority foreign ownership that are not shown for reasons of brevity. Specifically, we run efficiency regressions with fixed effects for every private domestic bank and every non-Big Four domestic bank and include dummies for minority foreign ownership of these institutions to capture the average effect of minority foreign ownership, controlling for the characteristics of the bank that remain constant. For

these fixed-effects regressions, we exclude observations on the Big Four, majority foreign, and no majority banks, and drop their indicator variables.[22] The results again suggest positive efficiency effects for minority foreign ownership – all of the dummies for minority foreign ownership are positive and significant.

We run a number of additional robustness tests of our main findings in which we specify alternative dependent variables and alter the data sample and specification. First, we rerun the efficiency analysis and comparisons exclusive of the Big Four banks. These four banks are so large relative to the other banks that they may be characterized by substantially different production technologies and thus different profit and cost functions. The results are consistent with the reported results for the combined sample – we continue to find minority foreign ownership to be associated with relatively high efficiency and improving efficiency after taking on minority foreign ownership. We also re-estimate all the profit models using pre-tax bank profits in order to be sure that the results are not driven by the differential tax rates among different groups of banks.[23] We still find our main results hold – the Big Four banks are still the least profit efficient banks, and minority foreign ownership improves the efficiency of both majority domestic and majority private banks. Further, we re-estimate all profit and cost efficiencies based on disaggregating noninterest expenses into separate prices for labor and physical capital by using exogenous labor cost in the market and find our results are not significantly changed.[24] These robustness checks are available upon request from the authors.

[22] We cannot include fixed effects and indicators for these groups because the fixed effects would be perfectly correlated with the indicators, as their ownership does not change over time.

[23] Chinese banks are subject to different tax rate and taxation regulations. For example, the Big Four banks had been subject to 55% income tax rate before the regulators decided to reduce their tax burden in January 1997 to 33% level, while the 33% income tax rate has been enjoyed by other domestic commercial banks since 1994. For the foreign banks in China, it is reported that their average income tax rates are below 20% due to favorable tax-exempt policies in their early business years (Wang 2003). Nonetheless, while there are important differences in tax rates based on majority ownership, to our knowledge, there are no tax differences based on minority foreign ownership, the main focus of our investigation.

[24] A bank's price of labor is defined as the weighted average of annual wages per employee, and it is constructed based on two factors, (i) concurrent market price of bank employees in each region, and (ii) the bank's geographical allocation of its employees across regions. The price of physical capital is constructed as (noninterest expenses – personnel expenses)/fixed assets, where personnel expenses are the number of employees times the imputed wage rate.

6 Mechanisms through which minority foreign ownership may increase efficiency

Before concluding, we briefly investigate the mechanisms through which minority foreign ownership may increase Chinese bank efficiency. To the extent that we can identify one or more such credible mechanisms and provide evidence consistent with them, the case for minority foreign ownership being the driving force behind the performance improvements may be considerably strengthened. However, if we cannot identify credible mechanisms and/or cannot find supporting evidence, it may be difficult to argue that minority foreign ownership is the key exogenous factor resulting in observed efficiency gains.

One mechanism that may be employed by minority foreign owners is to take positions on the board and in the management of Chinese banks and 'leverage' these positions to improve the corporate culture and management of these banks. Anecdotal evidence suggests that foreign owners often obtain one or two board seats on Chinese banks (out of a total of 6 or more), and that corporate governance and risk management improves significantly thereafter. 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 the 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. See Ling and Lu (2004), Wall Street Journal (2004), Lin (2005), and Liu (2005) for specific examples of this mechanism at work in various Chinese banks.

The finding that foreign owners have superior skills that may be transferred to Chinese banks is consistent with the research literature on other nations – as well as with the empirical results here of relatively high efficiency for majority foreign banks. The Chinese government also believes that strategic foreign investors can bring substantial improvements for the Chinese banks with respect to their corporate governance, technological advancement, and risk management, and encourages these transfers of techniques from minority foreign owners. For example, authorities recently examined the changes in Chinese banks that introduced foreign investors. They report finding that strategic foreign investors are playing active, positive roles in improving the Chinese banks' corporate governance, cost control, operation technologies, and growth sustainability (CBRC, 2005). Consistent with these benefits, several of the banks with partial foreign ownership have had recent upgrades of their credit ratings by international credit rating agencies (Li, 2005).

Research on other nations reinforces this favorable role of large minority shareholders. Studies of corporate governance of nonfinancial corporations in

developed nations suggests that large, minority shareholders such as institutional investors and individual block shareholders may improve monitoring of managers and mitigate free-rider problems (eg, Shleifer and Vishny, 1986; McConnell and Servaes, 1990, 1995; Agrawal and Knoeber, 1996). Tests of these governance effects on US bank efficiency find positive effects of institutional holdings in some cases (eg, Berger and Bonaccorsi di Patti, 2006). Finally, a study of partial privatization in India is consistent with favorable effects of minority private ownership of state-owned nonfinancial companies. The findings suggest that allowing non-controlling shares of state-owned enterprises to be privately held has positive effects on profitability, productivity, and investment (Gupta, 2005).

A second method through which strategic minority foreign owners may increase Chinese bank efficiency is by mandating or encouraging the banks to go public and list their shares on major stock exchanges. An IPO requires directors and managers to improve the accuracy and transparency of their financial records to international standards. Use of IPOs may increase bank efficiency by bringing market pressure to bear to maximize value, and by giving the strategic minority foreign owners and other investors more accurate information on which to base their discipline. To the extent that IPOs transfer more ownership from state control to private control, additional efficiency benefits are likely, given our results above showing the lowest efficiency for majority state-owned banks. As discussed above, several large state-owned banks, including three of the Big Four, have already engaged in IPOs that raised large amounts of capital.

A third mechanism through which foreign organizations may be able to exercise effective managerial control is by leading consortiums that take over majority ownership of Chinese banks. This method allows a foreign financial entity to act in effect as a majority owner – picking directors and senior managers and potentially restructuring the bank – all from a position of minority ownership. To illustrate, a consortium led by Citigroup recently signed a deal to take control of Guangdong Development bank. The consortium will have 85.6% ownership, with Citigroup having the limit or close to the limit of 20% for any one foreign investor, and IBM would hold less than 5%, so that total foreign ownership remains under the 25% government limit. The remaining shares would be held by four Chinese companies.

7 Conclusions

The future growth of China's economy may depend in important ways on the reform of its banking industry – reform that is currently taking place at a rapid rate. The most important changes are to its dominant 'Big Four' state-owned banks that control about three-fourths of the nation's banking assets. The Chinese government is partially privatizing three of the Big Four, taking on minority foreign ownership of these institutions, and going public with some of the shares. The fourth is currently being restructured for likely partial privatization in the near future. 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 of banks in any nation; and 3) background information on the Chinese banking system is not widely known.

The main goals of this paper are to try to help 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 using 266 annual observations over 1994–2003 on 38 commercial banks in China with different majority ownership – Big Four, non-Big Four state-owned, private domestic, and foreign. The data cover 95% of the commercial banking assets in the country. We emphasize the profit efficiency findings because profit efficiency is a more inclusive concept than cost efficiency – the latter neglects operating revenues and loan losses. We also examine minority foreign ownership of some of the non-Big Four state-owned banks and private domestic Chinese institutions. In addition, we provide background information on the history, regulation, and market environment of the Chinese banking industry.

Our empirical results suggest strong favorable efficiency effects from reforms that reduce state ownership of banks in China and increase the role of foreign ownership. The Big Four are by far the least profit efficient, due in large part to poor revenue performance and high nonperforming loans. The majority foreign banks are the most profit efficient, so shifting resources from state-owned banks – particularly the Big Four – to foreign ownership is likely to raise China's banking system efficiency appreciably.

Our most important findings concern the effects of minority foreign ownership. The data are strongly consistent with efficiency gains for this type of foreign investment. For both efficiency concepts (profit and cost) and for both categories of domestic ownership that have minority foreign ownership (non-Big Four state-owned and private domestic), minority foreign ownership is associated with higher efficiency. These results are also robust to checks for selection effects. These checks suggest that efficiency improves after foreign investment, rather than just selecting efficient Chinese banks in which to invest. However, we cannot entirely rule out a more complex selection effect in which foreigners invest in

banks that were going to have efficiency improvements even without minority foreign ownership. This selection may occur because these institutions are made available for minority foreign ownership and/or because foreigners identify and target these banks.

We also identify several potential mechanisms through which minority foreign ownership may increase Chinese bank efficiency. These include 'leveraging' of minority positions to improve the corporate culture and management of the banks; requiring or persuading the banks engage in IPOs to improve reporting and increase market discipline; and leading consortiums that take over majority ownership of Chinese banks.

In terms of policy implications, the very poor efficiency of Big Four banks and the efficiency benefits to minority foreign ownership of both non-Big Four state-owned banks and private domestic banks suggest that the partial privatization of the Big Four banks with minority foreign ownership are likely to improve efficiency substantially. Additional benefits may be forthcoming if other non-Big Four state-owned banks and private domestic banks also add foreign owners, although this conflicts with the practice often demonstrated by the Chinese government to protect its domestic institutions, particularly state-owned banks, from competition. In the long run, there may also be benefits in terms of continued growth of the Chinese economy when the excess of funds available for investment is not as large as it is currently. Although little more can directly extrapolated from the current empirical exercise, based on findings in the literature for other developing nations, there are likely even bigger improvements in efficiency forthcoming if China allows unfettered foreign majority ownership of current state-owned and private domestic banks, removes other remaining restrictions on foreign banks, and eventually totally privatizes the state-owned banks. The 'real' reward of such reforms may be continued economic growth because an open and flexible banking environment not only provides more credit, but a better allocation of credit, funding more positive net present value projects that contribute to economic growth.

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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 266 observations (38 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, ie, 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, non-Big Four majority state-owned banks without minority foreign ownership, and non-Big Four majority state-owned banks with minority foreign ownership. By the same token, majority private domestic banks refer to those banks whose private domestic 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, at constant price level of 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 $20 billion; large bank if the bank's assets are greater than US $20 billion. Sources of Data: Bankscope, annual issues of Almanac of China's Finance and Banking, 1994-2004; individual bank's financial statement, etc.

	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Bank Observations	266	16	20	21	25	27	32	33	33	31	28
Observations According to Ownership											
1. Majority State-owned	189	13	16	16	19	19	20	23	24	21	18
a. Big Four banks	40	4	4	4	4	4	4	4	4	4	4
b. Non-Big Four Majority State-owned banks *without* foreign minority	104	5	8	8	10	11	11	14	15	13	9
c. Non-Big Four Majority State-owned banks *with* foreign minority	45	4	4	4	5	4	5	5	5	4	5
2. Majority Private Domestic	43	1	1	2	2	3	7	7	6	7	7
a. Majority Private domestic banks *without* foreign minority	36	1	1	2	2	3	7	7	5	5	3
b. Majority Private domestic banks *with* foreign minority	7	0	0	0	0	0	0	0	1	2	4
3. Majority Foreign	21	1	2	2	2	3	3	2	2	2	2
4. No majority ownership	13	1	1	1	2	2	2	1	1	1	1

	Total	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Market share of assets by ownership groups											
1. Majority State-owned	0.965	0.998	0.997	0.996	0.994	0.993	0.982	0.975	0.970	0.935	0.914
a. Big Four banks	0.847	0.934	0.918	0.903	0.878	0.878	0.863	0.836	0.813	0.791	0.771
b. Non-Big Four Majority State-owned banks *without* foreign minority	0.093	0.055	0.068	0.077	0.095	0.095	0.085	0.102	0.111	0.116	0.099
c. Non-Big Four Majority State-owned *with* foreign minority	0.029	0.009	0.012	0.015	0.020	0.020	0.034	0.039	0.044	0.029	0.043
2. Majority Private domestic	0.031	0.002	0.002	0.004	0.005	0.006	0.018	0.023	0.031	0.065	0.086
a. Majority Private domestic *without* foreign minority	0.018	0.002	0.002	0.004	0.005	0.006	0.018	0.023	0.030	0.042	0.023
b. Majority Private domestic *with* foreign minority	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.023	0.063
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	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
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 $20 billion	120	6	10	10	12	13	15	17	16	13	8
Large Banks: assets > US $20 billion	67	5	5	5	5	5	5	6	8	10	13
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	0.066	0.027	0.043	0.054	0.072	0.076	0.090	0.098	0.084	0.073	0.036
Large Banks	0.931	0.969	0.956	0.943	0.926	0.923	0.905	0.899	0.911	0.925	0.963

Table 2. **Variables used in profit and cost efficiency estimations**

This table shows the descriptive statistics of basic variables used in the profit and cost efficiency 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 noninterest expenses to total fixed assets. The outputs are normalized by total earning assets. All financial values are inflation-adjusted to the base year 1994.

	Mean	Standard Deviation	Median	Minimum	Maximum
Profit (Cost) (in billion US$)					
Total Profits	0.076	0.128	0.027	-0.081	0.844
Total Costs	2.708	8.861	0.191	0.001	69.797
Output Quantities (in billion US$)					
Total Loans (y1)	24.285	53.295	1.578	0.005	293.437
Total Deposits (y2)	35.854	78.127	3.049	0.002	427.082
Liquid Assets (y3)	9.073	20.703	1.047	0.005	142.941
Other Earning Assets (y4)	14.362	30.319	1.684	0.005	146.719
Input Prices					
Unit Interest cost of deposits (w1)	0.057	0.088	0.035	0.006	0.726
Unit Price of physical inputs (w2)	1.188	0.974	0.868	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 estimated mean.

Ownership Type	Profit Efficiency		Cost Efficiency	
	Profit Efficiency Level	Profit Efficiency Rank	Cost Efficiency Level	Cost Efficiency Rank
1. Big Four banks	0.234	0.222	0.892	0.454
	(0.212)	(0.230)	(0.068)	(0.242)
2. Non-Big Four majority state-owned banks	0.480	0.495	0.915	0.587
	(0.198)	(0.267)	(0.042)	(0.273)
a. Non-Big Four majority state-owned banks without foreign minority	0.421	0.410	0.906	0.528
	(0.161)	(0.200)	(0.045)	(0.280)
b. Non-Big Four majority state-owned banks with foreign minority	0.617	0.694	0.938	0.722
	(0.209)	(0.296)	(0.023)	(0.200)
3. Majority Private domestic	0.589	0.642	0.828	0.235
	(0.215)	(0.305)	(0.076)	(0.309)
a. Majority Private domestic without foreign minority	0.558	0.599	0.802	0.109
	(0.219)	(0.312)	(0.050)	(0.114)
b. Majority Private domestic with foreign minority	0.748	0.868	0.964	0.884
	(0.089)	(0.119)	(0.009)	(0.068)
4. Majority foreign	0.692	0.797	0.915	0.563
	(0.086)	(0.109)	(0.041)	(0.281)
5. No majority ownership (mixed ownership)	0.454	0.458	0.896	0.427
	(0.234)	(0.331)	(0.048)	(0.228)
Full sample	0.476	0.500	0.897	0.500
	(0.231)	(0.300)	(0.062)	(0.300)

Table 4. **Regressions on the relative importance of ownership determining profit efficiency**

This table shows the OLS regressions of profit efficiency (level and rank), with standard errors clustered at the bank level. 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 the regression. Absolute values of t-statistics of the coefficients of the independent variables are shown in the parentheses, and the standard errors are clustered at the bank level. ***, **, * 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	0.589***	0.576***	0.558***	0.495***	0.642***	0.614***	0.599***	0.499***
	(8.55)	(5.69)	(7.17)	(5.90)	(6.60)	(4.21)	(5.41)	(4.17)
Big Four	-0.355***	-0.304***	-0.324***	-0.250**	-0.421***	-0.366**	-0.377***	-0.292**
	(4.60)	(3.08)	(3.80)	(2.48)	(3.90)	(2.70)	(3.14)	(2.08)
Non-Big Four Majority State	-0.109*	-0.108*	-0.137*	-0.134*	-0.147*	-0.145*	-0.189*	-0.186*
	(1.71)	(1.73)	(1.73)	(1.76)	(1.76)	(1.76)	(1.80)	(1.77)
Majority Foreign	0.102**	0.116**	0.133*	0.196**	0.155**	0.183*	0.198*	0.298**
	(2.47)	(2.14)	(1.70)	(2.36)	(2.57)	(1.75)	(1.78)	(2.50)
No Majority	-0.135	-0.122	-0.104	-0.041	-0.184	-0.156	-0.140	-0.041
	(1.58)	(1.07)	(1.12)	(0.42)	(1.45)	(0.93)	(1.02)	(0.28)
Majority State, Minority Foreign			0.196***	0.220***			0.284***	0.321***
			(2.92)	(3.19)			(3.01)	(3.18)
Majority Private, Minority Foreign			0.190***	0.221***			0.269***	0.302***
			(2.98)	(3.45)			(2.81)	(3.37)
Medium banks		0.029		0.089*		0.048		0.136*
		(0.36)		(1.70)		(0.41)		(1.78)
Large banks		-0.037		-0.011		-0.027		0.015
		(0.34)		(0.12)		(0.17)		(0.11)
N	266	266	266	266	266	266	266	266
Number of clusters	38	38	38	38	38	38	38	38
F-statistics	50.78	33.69	42.25	0.0000	45.24	30.02	38.88	33.39
R-square	0.2736	0.2811	0.3737	0.3997	0.2447	0.2515	0.3685	0.3984

Table 5. **Regressions on the relative importance of ownership determining cost efficiency**

This table shows the OLS regressions of cost efficiency, with standard errors clustered at the bank level. 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. Absolute values of t-statistics of the coefficients of the independent variables are shown in the parentheses, and the standard errors are clustered at the bank level. ***, **, * 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	0.828***	0.817***	0.802***	0.788***	0.235***	0.187**	0.109***	0.035
	(45.21)	(41.45)	(71.26)	(50.47)	(2.99)	(2.05)	(4.76)	(0.59)
Big Four	0.064***	0.035	0.090***	0.075***	0.219**	0.112	0.345***	0.306***
	(2.81)	(1.30)	(5.13)	(3.91)	(2.38)	(0.88)	(6.47)	(4.17)
Non-Big Four Majority State	0.088***	0.090***	0.105***	0.103***	0.352***	0.358***	0.419***	0.415***
	(4.63)	(4.85)	(7.60)	(7.37)	(4.02)	(4.21)	(7.27)	(7.00)
Majority Foreign	0.087***	0.098***	0.114***	0.127***	0.328**	0.376***	0.454***	0.528***
	(3.75)	(4.02)	(6.23)	(5.99)	(2.70)	(2.85)	(4.73)	(4.77)
No Majority	0.068***	0.079***	0.094***	0.108***	0.192**	0.240**	0.318***	0.392***
	(3.53)	(3.84)	(7.50)	(6.50)	(2.45)	(2.64)	(13.92)	(6.60)
Majority State, Minority Foreign			0.032***	0.037***			0.194***	0.222***
			(3.25)	(3.65)			(2.88)	(3.52)
Majority Private, Minority Foreign			0.162***	0.153***			0.775***	0.746***
			(15.40)	(12.93)			(24.96)	(16.17)
Medium banks		0.007		0.016		0.034		0.089
		(0.45)		(1.20)		(0.40)		(1.25)
Large banks		0.040*		0.029**		0.155		0.113
		(1.74)		(2.13)		(1.29)		(1.56)
N	266	266	266	266	266	266	266	266
Number of clusters	38	38	38	38	38	38	38	38
F-statistics	6.12	4.76	71.01	40.01	5.59	4.07	121.68	86.42
R-square	0.2628	0.2924	0.4468	0.4605	0.1832	0.2012	0.3800	0.3917

Table 6. **Regressions on the relative importance of ownership determining asset quality**

This table shows the OLS regressions of asset quality (ie, 1-NPL ratio) level and rank, where NPL stands for nonperforming loans, with standard errors clustered at the bank level. Table 6 is equivalent to Table 4 except that here we use (1-NPL ratio) instead of profit efficiency as dependent variable in the regressions. The definitions of ownership dummies, and size dummies are the same as described in the paper. Majority private domestic is considered as an omitted variable in the regression. Absolute values of t-statistics of the coefficients of the independent variables are shown in the parentheses, and the standard errors are clustered at the bank level. ***, **, * are significant at 1, 5, and 10 percent significance levels respectively.

	Asset Quality (ie, 1-NPL Ratio) Level				Asset Quality (ie, 1-NPL Ratio) Rank			
	1	2	3	4	1	2	3	4
Constant	0.880***	0.917***	0.872***	0.900***	0.534***	0.642***	0.498***	0.592***
	[54.05]	[19.16]	[52.82]	[19.09]	[8.18]	[3.97]	[7.60]	[3.60]
Big Four	-0.062*	-0.044	-0.054*	-0.026*	-0.313***	-0.265*	-0.277***	-0.184
	[1.79]	[1.02]	[1.73]	[1.81]	[3.13]	[1.93]	[2.76]	[1.40]
Non-Big Four Majority State	-0.007	-0.006	-0.012	-0.008	-0.047	-0.045	-0.038	-0.026
	[0.38]	[0.32]	[0.59]	[0.38]	[0.65]	[0.59]	[0.50]	[0.32]
Majority Foreign	0.112***	0.075	0.120***	0.092*	0.436***	0.329**	0.472***	0.378**
	[6.83]	[1.56]	[7.24]	[1.94]	[6.59]	[2.03]	[7.10]	[2.29]
No Majority	-0.060***	-0.097**	-0.052***	-0.080*	-0.534***	-0.642***	-0.498***	-0.592***
	[3.70]	[2.03]	[3.14]	[1.71]	[8.18]	[3.97]	[7.60]	[3.60]
Majority State, Minority Foreign			0.047**	0.042*			0.098**	0.083**
			[2.24]	[1.94]			[2.15]	[2.19]
Majority Private, Minority Foreign			0.118***	0.133***			0.502***	0.550***
			[7.10]	[6.00]			[7.64]	[6.42]
Medium banks		-0.039		-0.030		-0.112		-0.098
		[0.87]		[0.69]		[0.75]		[0.64]
Large banks		-0.055		-0.057		-0.155		-0.186
		[1.12]		[1.18]		[0.92]		[1.11]
N	118	118	118	118	118	118	118	118
Number of clusters	25	25	25	25	25	25	25	25
F-statistics	4.923	6.195	4.461	6.575	8.319	10.173	11.656	12.374
R-square	0.172	0.187	0.235	0.250	0.256	0.265	0.307	0.319

Table 7. **Changes in average efficiency after taking on minority foreign ownership relative to peer groups**

The table compares the average change in efficiency after taking on minority foreign ownership during the sample period relative to peer groups with the same majority ownership type that do not take on foreign investors. We do comparisons separately for majority private domestic banks and majority state-owned banks (other than the Big Four), and explicitly exclude Big Four banks, majority foreign-owned banks, no majority banks, and banks with minority foreign ownership prior to the start of the sample period in 1994. 'Before taking minority foreign ownership' period is defined as $T - 4 \leq t_{before} < T$; and 'After taking minority foreign ownership' period is defined as $T \leq t_{after} \leq T + 4$, where T is year when the bank took on foreign investors. Absolute values of t-statistics for differences of means are also reported. ***, **, * represent 1, 5, and 10 percent significance levels respectively.

Panel 1: Majority private domestic banks

		Profit efficiency		Cost efficiency	
	Obs	Level	Rank	Level	Rank
Banks that take on minority foreign ownership during the sample period					
(I): Before taking minority foreign ownership	14	0.589	0.627	0.842	0.235
(II): After taking minority foreign ownership	14	0.740	0.860	0.960	0.855
Difference A: (II) - (I)		0.150***	0.233***	0.118***	0.620***
t-statistic		4.972	4.200	8.573	19.860
Peer group					
(III): Before taking minority foreign ownership	32	0.554	0.562	0.796	0.097
(IV): After taking minority foreign ownership	32	0.428	0.417	0.811	0.051
Difference B: (IV) - (III)		-0.127***	-0.145***	0.015**	-0.046***
t-statistic		6.271	3.477	2.413	3.534
Difference C: (Difference A) - (Difference B)		0.277***	0.377***	0.103***	0.667***
t-statistic		7.618	5.446	6.855	19.676

Panel 2: Non-Big Four majority state-owned banks

		Profit efficiency		Cost efficiency	
	Obs	Level	Rank	Level	Rank
Banks that take on minority foreign ownership during the sample period					
(V): Before taking minority foreign ownership	24	0.544	0.554	0.938	0.748
(VI): After taking minority foreign ownership	24	0.714	0.864	0.956	0.880
Difference D: (VI) - (V)	24	0.170***	0.310***	0.019*	0.132*
t-statistic		8.614	14.598	2.000	1.979
Peer group					
(VII): Before taking minority foreign ownership	155	0.351	0.364	0.900	0.491
(VIII): After taking minority foreign ownership	155	0.427	0.403	0.910	0.528
Difference E: (VIII) - (VII)	155	0.075***	0.039**	0.010***	0.037
t-statistic		5.442	2.322	2.834	1.578
Difference F: (Difference D) - (Difference E)		0.095***	0.271***	0.009*	0.095*
t-statistic		3.928	10.046	1.872	1.850

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