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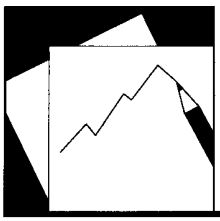

IMF Working Paper

Does Good Financial Performance Mean Good Financial Intermediation in China?

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Asia and Pacific Department

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Abstract

Chinese banks generate large profits and have relatively low nonperforming loans. However, good financial performance does not, in itself, guarantee that banks efficiently intermediate the economy's financial resources. This paper first examines how efficient Chinese banks are in financial intermediation, using the stochastic production frontier approach. Quality of loans are controlled for by focusing on net loans and correcting for nonperforming loans; Hong Kong SAR banks are included in the sample to have a more universally representative production frontier. The results suggest that Chinese banks indeed became more efficient during 2001–07. Nevertheless, a majority of banks remain quite inefficient, including several large state owned banks and many city banks. Large banks tend to hoard deposits and operate beyond the point of diminishing returns to scale, while smaller banks operate at increasing returns to scale. This suggests that reallocating deposits from large to smaller banks would increase overall efficiency. The paper finds no significant correlation between bank efficiency and profitability. Possible factors leading to large profits in the banking system, despite wide-spread inefficiencies, are low deposit interest rates, large interest margins, and high market concentration. Moving to indirect monetary policy and deepening capital markets to channel some of the savings to productive investment would help improve the efficiency of financial intermediation. This may spur loan growth, however, which will need to be handled with monetary policy and regulatory/supervisory tools.

JEL Classification Numbers: D2, D4, E44, G21, L1

Keywords: Financial intermediation, bank efficiency, bank market structure, China

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I. Introduction and Summary

Financial performance of Chinese banks has been impressive. Banks have been accumulating large profits, many have a relatively strong capital base, and their nonperforming loans are low. Their overall financial performance was comparable to banks in other large economies in 2007, and probably better in 2008, since Chinese banks were mostly insulated from the shock reverberating through the global financial system (Section II). These impressive results reflect years of financial sector reforms, including restructuring and recapitalization of China's largest banks and an increase in foreign participation.

Large profits, however, by themselves do not guarantee that banks intermediate efficiently. These profits could instead reflect other distortions in the economy. Therefore, in this paper we first analyze how efficiently Chinese banks use the resources available to them—deposits, capital, and labor—to extend performing loans. We employ the stochastic production frontier approach and apply it to data spanning 2001–07 (Section III). We control for quality of loans by focusing on net loans and correcting for nonperforming loans, and, to have a more universally representative production frontier, we include Hong Kong SAR banks. Three key conclusions surface:

- Chinese banks' efficiency improved significantly during 2001–07, and a number of joint stock commercial banks score high in efficiency. However, a majority of banks remain quite inefficient, including several large state-owned banks and many city banks.

- Large banks tend to attract too high level of deposits and operate at diminishing returns to scale. Smaller banks, on the other hand, operate at increasing returns to scale. Shifting deposits from larger to smaller banks would improve the banking system's overall efficiency.

- Banks' profits are not correlated with their efficiency.

Having found wide-spread inefficiencies and lack of correlation between efficiency and profits, we next turn to possible factors that could explain large profits despite these inefficiencies (Section IV). We focus on three possibilities: financial repression; oligopolistic market structure; and the cyclical position of the economy. We argue that financial repression guarantees low cost of funds and a large interest margin for banks to enjoy, but at the same time limits the scope for banks to increase their loans. The net impact should raise profits, but not be large enough to explain all the profits in the Chinese banking system. Next, we show that market concentration in the banking system is high, when measured appropriately. This could foster collusive behavior in lending, at least in some market segments, and support large profits. Finally, we show that while China's cyclical position was strong during most of the sample period, the link between output growth and loan growth was weak, suggesting that the economic cycle was not a major factor behind the large profits of recent years.

II. Financial Performance of Chinese Banks

Chinese banks have come a long way in a very short time. Until the 1980s, China had a rather primitive monobank system typical of centrally planned economies. The Peoples' Bank of China (PBC) handled virtually all banking activities, including extending loans. The Ministry of Finance extended loans to enterprises for their fixed asset investment, and Rural Credit Cooperatives were active in the rural areas at a much smaller scale. Interest rates were fixed, and the collected funds were channeled to different parts of the economy to support government's development plans.

The banking structure begun to change once economic reforms were initiated in 1978 and the big four banks (Agricultural Bank of China, China Construction Bank, Industrial and Commercial Bank of China, and Bank of China) were carved out of the PBC in 1979 and 1984. The PBC was designated as the central bank of China for the first time in 1983, the first mortgage was issued in 1985, Bank of Communications became the first state-owned shareholding commercial bank in 1987, and the first foreign exchange forward was written in 1997 by the Bank of China.

As signs of growing pains, in 1990s, the banking sector went through a major lending and nonperforming loans cycle as aggressive directed lending to industry led to massive nonperforming loans. A broad reform agenda was established in 1993, recognizing the need to allow banks to operate on a commercial footing (the State Council (1993)). Since then steps have been taken to gradually implement the reform agenda, as discussed in Karacadag (2003), Barnett (2004), Andersen (2008), and Okazaki (2007). Major banks were recapitalized, bad assets were carved out, bank supervision was revamped, and foreign banks' participation in the domestic markets was allowed to increase. With the IPOs of several large banks, starting in 2005, and the transformation of the boards in these banks, bank ownership structure begun to change.

Today, based on standard financial indicators, Chinese banks are doing well. Already in 2007 the ROE of banking institutions reached 16.7 percent and the ROA was 0.9 percent, high by international standards. Profitability strengthened even more in 2008 even though the PBC cut benchmark rates in the second half of the year. Capital adequacy ratio (CAR) further improved in 2007, and CAR of all banks except one reached or exceeded 8 percent by end-2008. Listed banks' CAR stood significantly higher than the minimum 8 percent requirement. Asset quality improved, reflected in the NPL ratio declining from more than 20 percent in 2002 to 6.2 percent by end-2007 and to 2.5 percent by end-2008, the latter decline mostly reflecting the restructuring of Agricultural Bank of China.

Chinese banks' financial performance also compares well against banks in other major economies (Table 1 and Figure 1). Data is, however, based on the period before the current financial crisis unfolded.

- The return on average assets in Chinese banks was significantly higher than that in the G7. Among BRIC, large banks in Brazil and Russia performed even better. Moreover, these returns were highly correlated with the net interest margin (correlation coefficient was 85 percent), with small interest margins observed in the G7 and large interest margins in BRIC countries. Banks in Hong Kong SAR had a higher return on asset, even though their interest margin was narrower.

- The CAR in China was comparable to that in other countries. Average CAR in China (13.4 percent) was higher than that of the G7 and BRIC countries (12.3 percent). Average CARs in all the economies in the sample were high compared to the minimum required 8 percent, and the lowest average CAR was among Italy's large banks (9.7 percent).

- The nonperforming loan ratio in China (4.2 percent) was almost double the level seen in the G7 (2.3) in 2007, but significantly below Brazil and Russia (6.7 percent). (The NPL ratio of these Chinese banks declined to the G7 level in 2008.)

While Chinese banks' financial performance was broadly in line with banks in other major economies, the structure of their banking activity was quite different. Specifically:

- 90 percent of operating income of large Chinese banks came from interest earnings, while the average for G7 and BRIC countries was about 70 percent. This reflects the fact that Chinese banks' primary business is the provision of loans to the corporate sector, their fee-based businesses are still small compared to their overall operations, and banks charge little, if at all, for deposit services they provide to public.

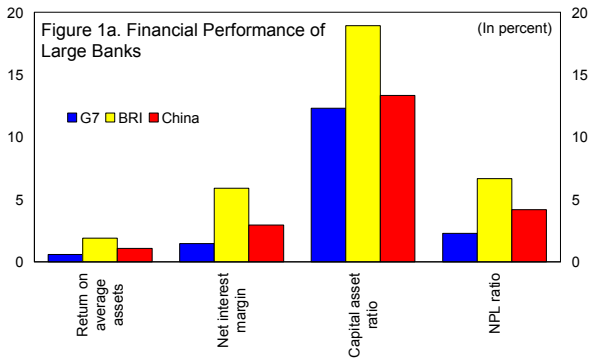
- Large Chinese banks turned a smaller share of the deposits they collect into loans, compared with other economies (loan to deposit ratio for the large Chinese banks was 56 percent). This is surprising, because lending business is much more important for Chinese banks, since they draw most of their income from it. Chinese banks lend primarily to large corporations, and much less to consumers.

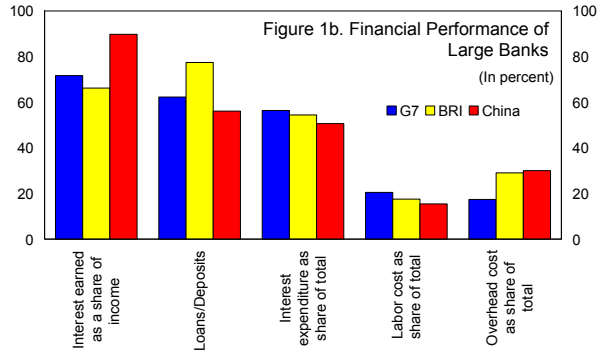
- Chinese banks' fixed costs form a much larger share of their total costs, compared with G7 (30 percent vs. 17 percent, respectively). Such high share of fixed costs are seen only in Brazil and Russia. The share of labor cost in total cost, on the other hand, is not out of line with other countries.

Table 1. Financial Performance of Largest Banks 1/
(In percent, 2007)

	Canada	France	Germany	Italy	Japan	UK	US	HK SAR	Brazil	China	India	Russia
Return on average assets	1.0	0.3	0.5	0.7	0.4	0.6	0.7	1.6	2.5	1.1	1.0	2.2
Net interest margin	1.8	0.3	0.8	2.4	1.0	1.0	3.0	2.0	10.7	3.0	2.7	4.3
Capital asset ratio	12.1	9.9	13.1	9.7	19.0	11.0	11.2	12.8	16.0	13.4	13.5	27.2
NPL ratio	0.5	2.6	3.5	5.3	1.7	1.7	0.8	0.5	8.3	4.2	3.0	8.8
Interest earned as a share of income	72.0	73.8	79.6	78.6	42.2	79.0	76.6	83.5	55.0	89.7	78.7	65.0
Loans/Deposits	57.9	45.3	45.0	104.4	52.7	52.7	78.2	60.8	64.6	56.1	69.4	98.5
Interest expenditure as share of total	60.0	47.8	68.7	54.4	45.5	65.0	53.6	68.5	49.6	50.7	67.7	45.8
Labor cost as share of total	22.1	14.2	17.2	25.7	n.a.	21.4	22.5	13.2	21.3	15.5	14.2	17.3
Overhead cost as share of total	17.9	9.6	14.1	19.9	n.a.	17.7	25.1	18.4	32.3	30.0	18.1	36.9

1/ Covers largest five banks, except Brazil, which covers four banks, and China, which includes ICBC, CCB, BoC, and BoCOM.





III. Bank Efficiency

The above analysis shows that Chinese banks accumulate large profits, even though they extend fewer loans from their deposit base, compared with banks in other economies. To understand better whether these large profits reflect high efficiency of the Chinese banks or not, we model and then estimate individual banks' efficiency level in intermediation.

A. Modeling Bank Efficiency

Banks perform a broad range of activities. They collect deposits and provide transaction services to their depositors, extend loans to enterprises and households and purchase other debt instruments, provide or demand liquidity in the interbank market, and conduct foreign exchange operations and fee-based activities. In performing these activities, they try to resolve information asymmetries and assess borrowers' ability to pay (Leland and Pyle (1977)), mitigate the ex post moral hazard problem (Diamond (1984)), provide intertemporal smoothing of risk by maintaining a maturity mismatch, participate in corporate governance, and possibly spur economic growth (Allen and Carletti (2008)). Banks also play important roles in underwriting securities and in payment systems.

In this paper we focus on banks' core activities, namely receiving deposits and making loans. This is indeed the operational definition of a bank used by regulators in general (Freixas and

Rochet (2008)) and by China in particular (the People's Bank of China (1993)). These core activities capture the banking system's main role in the economy from a macroeconomic point of view: channeling savings into investment. This role is particularly important in China, since capital markets, although growing, are small, and the only other significant source of funds for investment is retained earnings (Brooks and Barnett (2006)). Regarding other activities, banks' fee-based business is growing but forms a small share of Chinese banks' income—in 2007, net fee and commission income amounted to 12 percent of total bank income among the listed Chinese banks. A multi-output production function is possible to model, but this is not pursued in this paper because of the small size of fee-based businesses in comparison to total banking in China.

To measure how efficiently banks perform these activities, we first define a production function. Similar to other types of businesses and following the industrial organization literature, we take physical capital and labor as two critical inputs (along the lines of Sealey and Lindley (1977)). In addition, in banking, unlike other types of services and manufacturing, financial capital is a critical input because of the regulatory environment that typically constrains bank output as a function of Tier 2 capital. In China, minimum Capital Asset Ratio (CAR) is set at 8 percent, although regulators urge banks to achieve higher CARs. An added potential benefit of including financial capital as an input is that, as Mester (1996) suggests, it reflects banks' risk preferences (banks with larger capital being more risk averse). Finally, deposits are included as an intermediate input. Whether deposits should be treated as input or output is debated extensively in the literature (see for example Berger and Humphrey (1997)). Viewing banks as intermediaries, deposits are an input. This bank intermediation view is appropriate for China, where banks' main mandate have been to intermediate households' and enterprises' savings into investment. One notable exception is the Postal Bank, which collects deposits in rural areas as well as urban areas, providing transaction services in rural areas, but then deposits these funds at the PBC, extending only a very small share of these funds as loans. Like the Postal Bank, some other banks also provide transaction services to deposit holders, in which case, deposits can be considered as outputs. In this study we focus on bank intermediation rather then the services that banks provide to deposit holders. Therefore, we take deposits as an intermediate input. With this view (and also because of lack of data), Postal Bank is not included in the dataset.

For output, we take total loans net of non-performing loans (NPLs). The NPLs is a proxy for measuring banks' ability to solve information asymmetries: the higher the NPLs are, the less able a bank is in differentiating lemons from good projects. This adjustment is important to capture banks' key task of identifying and mitigating risk, but is ignored in banking sector studies that focus on production functions (e.g. Altunbas et al. (2001)). The finance literature focuses on modeling risk using portfolio theories, but ignores the production side aspects of banking (Wang (2003)). From a risk-return point of view, higher NPLs could be considered acceptable if banks price risk correctly. But, given prices, it is still the case that the fewer NPLs a bank has, the more effective it is in turning savings into investment. Moreover, in

China most loans are priced at or close to the benchmark rate, rather than at a level that fully reflects risk. Adjusting loans for NPLs makes a significant difference for some Chinese banks. For example, adjusting Agricultural Bank of China's lending lowers the loan size by 18 percent; using unadjusted loan figures would suggest that ABC was much more efficient than it really was. The timing of excluding NPLs, however, could introduce a bias. Loans that are extended in one year and become NPLs the next year would suggest that the bank was efficient the first year, despite the fact that the mistake of extending the loan was made that year. This bias is likely to be relatively small in China, because close to half of the loans have a maturity of one year or less and during the sample period NPLs were declining.

In cyclical downturns, a bank may prefer to reduce its loans and temporarily hold more securities, and this could be optimal, given increased risks. Since this is true for all banks and the overall loan levels decline, the methodology we follow would not imply increased inefficiency of one bank over another. What if the cyclical downturn is specific to a sector? A bank may be behaving optimally by reducing its loans to that sector, and if that bank focuses on that sector more (e.g. construction), then it will appear to be less efficient than others. In this case the conclusion that the bank is inefficient is warranted because if a bank does not diversify enough to avoid sectoral downturns more than other banks, than it means it intermediates less efficiently.

Loans are banks' gross output, and include banks' value added as well as intermediate goods (in this case deposits). Wang (2003 (a) and (b)) develops and estimates a measure of bank value added based on theories of financial intermediation, asset pricing and production, and finds that this new measure is smaller and more cyclical than the measure stipulated in System of National Accounts. Wang, Basu, and Fernald (2008) extend this work to a general equilibrium framework. While this is the right approach in measuring bank value added, to estimate banks' efficiency in intermediation we need to not only look at the way banks resolve information asymmetries but also at how efficiently they turn intermediate inputs (deposits) into outputs (loans). In other words, even if a bank might create high value added compared to its capital and labor, the value added might be relatively small compared to its deposits, and this inefficiency can be captured only if we include deposits and loans in the analysis. This approach is also more appropriate in China because prices (interest rates) are mostly administratively determined and it is not possible to separate "pure interest" that reflects a general risk premium from that which reflects banks' value added as calculated by Wang (2003). Looking at banks' gross output, rather than value added, is also consistent with using loan and deposit stocks.

The production function is defined as follows:

$$nl = \mathrm{p}(k, l, e, d)$$

where *nl* = net loans, *k* = fixed assets, *l* = labor, *e* = equity, *d* = deposits, and p(.) is the bank's production function.

A bank's output could deviate from this production function for two main reasons. First, idiosyncratic factors not captured by the four inputs could lead to a level of net loans that is different from that implied by the function. It is assumed that these factors have a stochastic distribution and are not correlated with the inputs. This assumption does not always hold: if the error term includes productivity shocks, it could be correlated with the inputs since banks with large positive productivity shocks would use more inputs, biasing standard OLS or ML estimates. Nevertheless, Levinsohn and Petrin (2003) show that including intermediate goods—as is the case in this study—could eliminate this bias. Second, not all banks can solve the optimization problem adequately and produce maximum output given the inputs. It is assumed that the deviations from optimum follow a non-negative stochastic distribution, along the lines by Aigner, Lovell, and Schmitt (1977) and Meeusen and van den Broeck (1977).

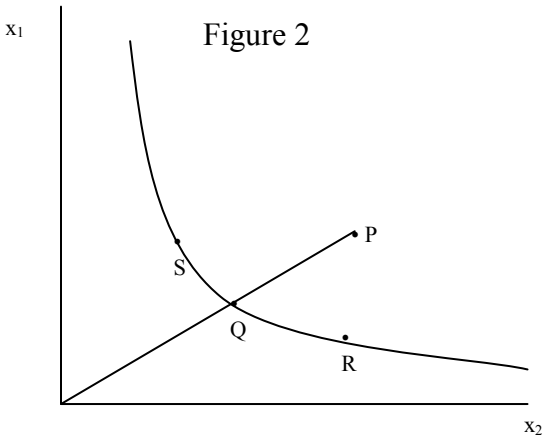
The resulting stochastic frontier production function is as follows:

$$nl_{it} = p(k_{it}, l_{it}, e_{it}, d_{it}) + u_{it} - v_{it}$$

where u_{it} denotes the idiosyncratic stochastic error term, normally distributed with mean zero and variance σ_u^2, and v_{it} captures bank *i*'s deviation from the efficient frontier at time t. v_{it} is assumed to follow a non-negative normal distribution, truncated at zero, with mean m_{it} and variance σ_v^2, for bank *i* at time *t*. Larger *v* means less efficiency.

The inefficiency modeled here is one of technical inefficiency, in the sense that there is in general a maximum amount of loans banks can originate given available capital, labor, and deposits and less efficient banks originate fewer loans given similar levels of input. The advantage of this approach over investigating cost inefficiency is that technical efficiency does not depend on prices (interest rates and wages), some of which are not market determined in China. We follow the original definition of technical efficiency by Koopmans (1951): an output-input vector (y,x) is technically efficient if and only if (y', x') is not feasible for $(y', -x') \geq (y, -x)$. In other words, no increase in output or decrease in input without changing the other is feasible. We also consider the Debreu-Farrell measure of technical efficiency that measures efficiency radially (Ray (2007)): an input oriented measure of technical efficiency is a function $TE(y,x) = \min\{\theta: \theta x \in L(y)\}$, where $L(.)$ is a feasible

Figure 2



set of outputs. In other words, equiproportionate contraction of inputs without reducing output is not feasible. In Figure 2, which depicts an input isoquant, P represents an inefficient combination of inputs and Q represents a radially efficient combination of inputs in the Debreu-Farrell sense. The more general Koopmans definition also includes points S and R and all points in between on the same isoquant.

In addition to idiosyncratic factors for inefficiencies, we identify two factors that could potentially affect the efficiency of banks. One factor is quantitative macroeconomic tightening, including window guidance, credit quotas and higher reserve requirements. These measures, if binding, would lower the "output" of the banks. But this would lead inefficiencies only if banks do not lower their inputs commensurately. To capture the potential impact of quantitative macroeconomic tightening, a proxy that is 1 during periods when GDP growth exceeded average growth is included in m_{it}. Ideally, instead of a dummy variable as a proxy for quantitative macroeconomic measures, we should use a variable that captures the magnitude of window guidance and credit quotas, but such a variable is not publicly available. The changes in the reserve requirement is not necessarily a good proxy either because higher reserve requirement may reduce window guidance and vice versa. Another potential restriction on production is the prudential regulation that outstanding loans cannot exceed 75 percent of outstanding deposits (Article 39, Commercial bank Law, China). But since this is a well-established prudential regulation that was in place for a number of years, which allows banks to adjusts other inputs if this rule become binding, and since this rule does not seem to be binding for the sample we use, we do not include this factor in our analysis. The second potential factor we consider is the ongoing financial sector reform, which could work in the opposite direction to credit quotas and improve efficiency as reforms progress. To capture the potential effect of financial reforms, a trend is included in m_{it}. In sum,

$$u_{it} \sim N(0, \sigma_u^2)$$

and

$$v_{it} \sim \text{Truncated } N_+(m_0 + m_1 t + m_2 qm_i, \sigma_v^2)$$

where t is the time trend, and qm_i is the proxy for quantitative measures. Kumbhakar and Lovell (2000) argue that efficiency ranking is not very sensitive to the exact distributional assumption.

We complete the model by assuming that the production function is in translog form:

$$\ln(nl_{it}) = a_0 + \sum_j a_j \ln(x_{jit}) + \tfrac{1}{2}\sum_h \sum_j a_{hj} \ln(x_{hit}) \ln(x_{jit}) + u_{it} - v_{it} \qquad (1)$$

where $x_{it} = \{k_{it}, l_{it}, e_{it}, d_{it}\}$. The translog function is nonhomothetic and does not impose any restrictions on the degree of returns to scale (Kim 1992), which is measured by

$$rts_{it} = \sum_j \partial \ln(nl_{it})/\partial \ln(x_{jit})$$

and depends on the input levels and technology and varies across time and banks.

B. Estimation and Results

Data

The database covers 7 years (2001–07) and 69 banks, downloaded from Bankscope. A number of banks were eliminated from a larger database because of lack of data on critical variables. This could potentially bias the results toward concluding that the banking system is more efficient than it actually is, because banks with poorer governance and technical capacity tend to be the ones that do not report data and these banks are also suspected to be less efficient. Policy banks and trust banks were also excluded from the database because policy banks did not function on a fully commercial basis during the sample period, and trust banks' business platform is quite different from commercial banks. The banks remaining in the sample come from a broad range and include all the state commercial banks, joint stock commercial banks, and a number of city banks and rural banks. In addition to the Chinese banks, the sample includes 8 large banks based in Hong Kong SAR. The reason for including Hong Kong banks is to ensure that the bank efficiency frontier is as universal as possible. Hong Kong banks in particular have the added benefit that the two economies and financial systems are strongly linked, making the comparison easier and minimizing the differences in performance for other factors, and are, by global standards, considered to be well supervised and well managed banks. There are nevertheless differences in the environments banks operate in and so, to capture this, a dummy variable that is equal to 1 for Hong Kong banks is included in the mean of the estimated efficiency variable.

Net loans data provided by banks are used, where loan loss reserves are netted from total loans. Total loans do not include loans in the interbank market. However, if loan loss reserves fall below 80 percent of nonperforming loans, this suggest under provisioning, and to correct for that the difference is subtracted from total loans. Net loans are deflated with the GDP deflator, as is common practice. Fixed assets and equity data are used as reported by banks, and fixed assets are deflated with the fixed asset investment deflator and equity with the GDP deflator. Labor data are used as is. All data are in natural logs.

Coefficient and efficiency estimates

The model depicted in (1) is estimated by maximum likelihood method developed by Battese and Coelli (1995), using programs available from Coelli (1996). The parameter estimates are in Table 2.

Table 2. Stochastic Frontier Production Function Estimates 1/

	Coefficient	T-stats
Variables in the production function		
constant	-0.54	-0.63
fixed assets (x1)	-0.48	-1.41
equity (x2)	0.20	0.77
labor (x3)	0.51	2.06
deposits (x4)	0.60	1.94
x1^2	-0.09	-2.14
x2^2	-0.05	-1.31
x3^2	0.04	1.39
x4^2	0.26	4.44
x1*x2	0.06	1.05
x1*x3	0.02	0.28
x1*x4	0.09	1.29
x2*x3	0.23	4.18
x2*x4	-0.26	-2.74
x3*x4	-0.31	-4.44
Variables in the (negative) efficiency term 2/		
constant	0.10	0.69
time trend	-0.07	-1.79
proxy for window guidance	0.05	0.54
proxy for Hong Kong banks	-1.57	-1.26
Variances 3/		
sigma-squared	0.07	2.26
gamma	0.86	10.26

Source: Author's calculations.

1/ The dependent variable is net loans. All variables are in natural logs.
2/ A negative coefficient implies an improvement in efficiency.
3/ sigma-squared = σu2 + σv2 and gamma = σv2/(σu2 + σv2),
as defined in Battese and Corra (1977).

The coefficient results on average are reasonable and statistically significant. Some of the coefficients have negative signs, but within the sample the partial derivative of the production function with respect to each input is on average positive (and vary with explanatory variables). Variance estimates suggest that most of the variation in the sample could be attributable to the efficiency variable (gamma is close to 1, suggesting that σ_v^2 is significantly larger than σ_u^2).

Coefficient estimates in the efficiency term suggest the following (a positive coefficient in the efficiency term means that the variable associated with that coefficient reduces efficiency):

- The coefficient of the time trend is negative and statistically significant, implying that efficiency improved during the sample period, consistent with the expectations that financial sector reforms are improving efficiency in the banking system.

- The coefficient of the proxy for quantitative macroeconomic policies is positive, suggesting that financial repression has hindered efficiency, but the coefficient is not statistically significant. Lack of statistical significance likely reflects the shortness of the time dimension, and the fact that the proxy is a dummy variable rather than a variable that captures the magnitude of the impact of this quantitative measure.

- Finally, the negative coefficient of the proxy for Hong Kong banks suggest that the banking sector environment in Hong Kong is helpful in bank efficiency, although this coefficient is also not statistically significant.

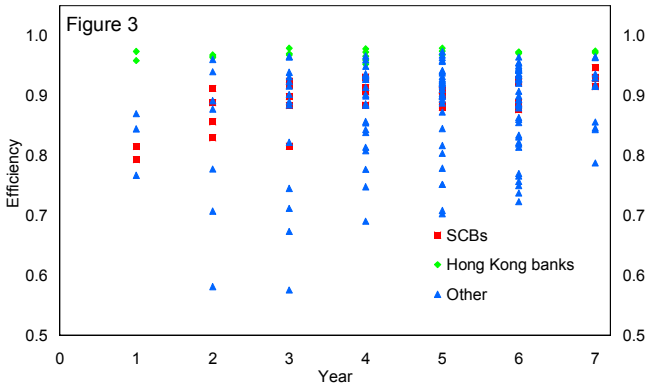
The estimated deviations from the efficient stochastic production frontier are presented in Figure 3 and Table 3. The results suggest the following:

- Banks were on average about 90 percent efficient (excluding idiosyncratic factors), somewhat below banks in India (Ray (2007)), about the same level as some banks in Europe (Brissimis et al (2008)), and above banks in South Africa (O'Donnell and Van Der Westhuizen (2002)) and Turkey (Isik and Hassan (2002)).

- There were large variations in efficiency among banks. Most efficient banks' efficiency level stood at 98 percent, and least efficient banks' efficiency levels were as low as 60 percent. These results are consistent with other studies that look at cost efficiency in the Chinese banking system (Laurenceson and Qin (2008), Berger, Hasan, and Zhou (2007), and Fu and Heffernan (2005)) and find large cost inefficiencies, especially in large state banks.

- Five largest state commercial banks' efficiency was about average. Several of them improved their efficiency significantly during the sample period, but no discernable change in efficiency was observed for several others, including Agricultural Bank of China, which consistently remained the least efficient state commercial bank.

- A number of smaller joint stock commercial banks (e.g. Merchants Bank, Hua Xia Bank, Shanghai Pudong Development Bank, CITIC Bank) were significantly more efficient than the large state commercial banks, and some were as efficient as Hong Kong banks,



which consistently operate closest to the production frontier. But not all joint stock commercial banks were as efficient, an a few were among the least efficient banks in the sample.

- Many city banks were as inefficient or worse than Agricultural Bank of China. Nevertheless, there were a few city banks (Hangzhou, Huzhou) that were among the most efficient banks in the sample.

- Average efficiency appears to have improved over time both as individual banks become more efficient and some of the least efficient banks gain efficiency more rapidly, consistent with the coefficient estimate of the time trend. But the estimated improvement could be biased upward somewhat because fewer of the inefficient banks had reported their more recent balance sheets and therefore more recent years tend to sample more efficient banks.

Table 3. Bank Efficiency

2001		2002		2003		2004		2005		2006		2007	
Bank no	Efficiency	Bank no	Efficiency	Bank no	Efficiency	Bank no	Efficiency	Bank no	Efficiency	Bank no	Efficiency	Bank no	Efficiency
65	0.97	67	0.97	65	0.98	67	0.98	62	0.98	63	0.97	64	0.97
64	0.96	65	0.97	64	0.97	68	0.97	63	0.97	69	0.97	63	0.97
47	0.87	64	0.96	67	0.97	55	0.97	55	0.97	64	0.97	17	0.96
19	0.84	50	0.96	61	0.96	63	0.97	66	0.97	48	0.96	20	0.96
34	0.81	47	0.94	28	0.96	36	0.96	26	0.97	45	0.96	4	0.95
18	0.79	6	0.91	36	0.94	69	0.96	31	0.96	19	0.95	35	0.94
17	0.77	17	0.89	47	0.93	66	0.95	21	0.96	30	0.95	18	0.93
		34	0.89	18	0.92	59	0.95	48	0.96	31	0.95	43	0.93
		19	0.88	50	0.92	31	0.94	57	0.94	11	0.95	50	0.93
		18	0.86	4	0.92	46	0.93	30	0.94	56	0.94	34	0.93
		4	0.83	19	0.92	20	0.93	20	0.94	47	0.94	19	0.92
		20	0.78	17	0.90	19	0.93	19	0.93	32	0.94	47	0.92
		56	0.71	34	0.90	4	0.93	59	0.93	17	0.94	31	0.92
		42	0.58	31	0.89	47	0.93	32	0.93	33	0.94	6	0.91
				46	0.88	50	0.93	50	0.92	43	0.93	10	0.86
				6	0.88	56	0.91	7	0.92	15	0.93	9	0.85
				20	0.82	1	0.91	58	0.92	12	0.93	5	0.84
				1	0.82	18	0.91	60	0.92	20	0.93	8	0.79
				10	0.75	44	0.90	17	0.92	49	0.93		
				25	0.71	57	0.90	47	0.92	4	0.93		
				42	0.67	58	0.89	29	0.91	54	0.93		
				53	0.58	6	0.88	4	0.91	18	0.92		
						35	0.88	18	0.91	34	0.92		
						9	0.86	56	0.90	27	0.92		
						17	0.85	38	0.90	50	0.91		
						21	0.84	34	0.90	60	0.90		
						13	0.84	40	0.90	58	0.89		
						3	0.81	37	0.90	16	0.89		
						25	0.81	52	0.89	6	0.89		
						10	0.78	27	0.89	38	0.89		
						42	0.75	1	0.88	24	0.88		
						53	0.69	6	0.88	9	0.88		
								14	0.87	13	0.88		
								22	0.84	1	0.88		
								35	0.82	37	0.86		
								9	0.80	35	0.86		
								10	0.78	39	0.86		
								46	0.75	2	0.83		
								3	0.75	46	0.83		
								13	0.71	5	0.82		
								53	0.70	23	0.82		
										41	0.81		
										10	0.77		
										3	0.77		
										25	0.76		
										8	0.75		
										51	0.74		
										53	0.72		

Source: Author's calculations.

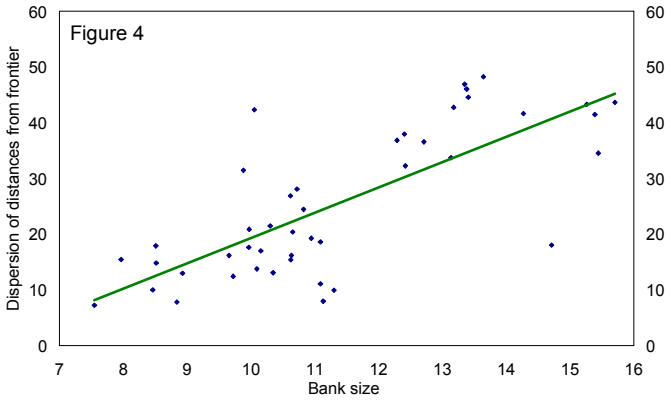
Inefficiency

The deviations from the estimated stochastic production frontier suggest that in 2006 (the most populated year in the sample) mainland Chinese banks could have increased their net loans by on average 15 percent without changing their technology or their input levels. This figure for large state commercial banks is only marginally lower at 13.8 percent, and even when the Agricultural Bank of China is excluded, the average remains at 12 percent. It is important not to draw the conclusion that loans should be increased by this amount at all costs. If more loans are extended but these loans become nonperforming, there would be no efficiency gain in intermediation.

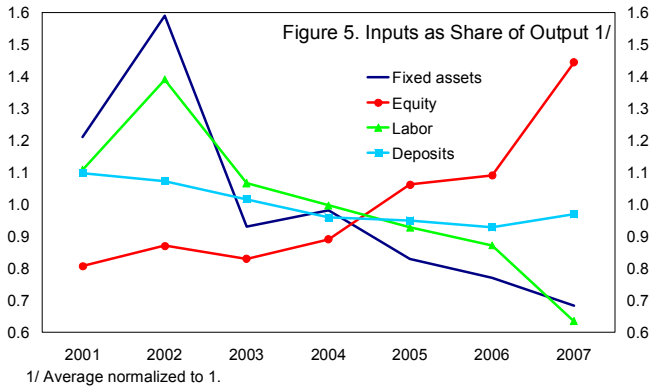
Looking from the input side, Table 4 shows how far actual inputs were from the production frontier (since there are four inputs, it is not possible to graph the estimated stochastic production frontier). The distances associated with individual inputs are the percent changes in each input, keeping other inputs constant, required to eliminate the inefficiency (the fraction of the estimated error term for each bank at each time period that corresponds to the truncated normal distribution). This is analogous to moving from point P to point S or point R in Figure 2. The radial distances are the proportional percent changes in all inputs jointly required to eliminate the inefficiency. This is analogous to moving from point P to point Q in Figure 2.

The distances in Table 4 suggest that large banks tend to have too many deposits. Given the amount of loans they make, these large banks can become more efficient and reach the production frontier by reducing their deposits. Theoretically, they can also reach the efficiency frontier by lowering other inputs, and the best combination of inputs would be determined by the relative prices of inputs. However, for many of these banks, the amount of reduction of other inputs is not reasonable or even feasible. For example, no matter how much they lower employment, without lowering other inputs banks cannot achieve efficient intermediation. Also, the amount of reduction needed in capital is usually more than what would be allowed by prudential regulations. Relative prices are not very helpful either, because we do not know what the relative prices of inputs would be in an environment when interest rates are market determined. Indirectly, the importance of deposits in achieving efficiency can be observed by comparing the radial distance with distance associated with deposits. Banks that have more than Y 100 billion deposits can reach the production frontier by reducing their deposits by on average 12.5 percent, regardless whether they reduce other inputs or not, while smaller banks can reach the production frontier by either reducing only their deposits by 22 percent or reducing all their inputs by 12 percent. In other words, the marginal benefit of a one percentage point reduction in deposits is much larger in larger banks than in smaller banks.

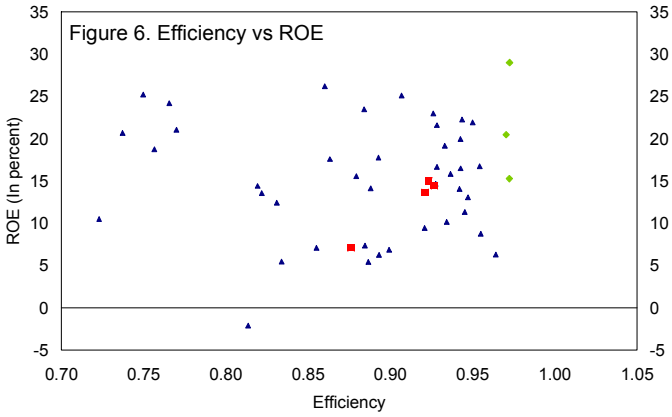
Another way to look at this is by comparing a measure of dispersion of distances with the size of banks. The measure of dispersion that we use in this case is the standard error of the distances for each input; the further some of the inputs are from the production frontier compared with other inputs, the larger the calculated measure of dispersion is. For a bank that needs to either dramatically lower its equity or fixed assets or lower by much less its deposits, the measure of dispersion is high. Figure 3 plots the measure of dispersion for Chinese banks against their deposit size and confirms that larger banks have substantially higher measures of dispersion and would benefit from reducing their deposits and the added benefit of reducing other inputs would be marginal.



The potential benefits of reducing deposits is consistent with historical developments. Figure 5 shows that during 2001–07 the ratio of fixed assets and labor to total loans declined steadily, while the ratio of deposits remained broadly flat for a number of years and increased in 2007. This suggests that efficiency gains were achieved in capital and labor, but not in deposits. The share of equity also increased, but this is desirable from a prudential point of view.



Finally, we compare banks' profits with their efficiency (Figure 6 compares efficiency of each bank with its ROE in 2006). Some results are as expected: Hong Kong banks are both more efficient and more profitable, and SCBs are less efficient and less profitable, especially the Agricultural Bank of China. But what is remarkable is that there are many banks which are quite inefficient but still accumulate large profits. In fact,



once Hong Kong banks are taken out, the correlation between efficiency and profitability is close to zero for Chinese banks. This begs the question why.

Table 4. Distance from Frontier 1/

Bank no	Deposits (ml rmb)	Single input				Radial
		Fixed assets	Equity	Labor	Deposits	
				(In percent)		
1	5,093,940	81.0	52.0	na	12.2	12.3
2	10,870	76.0	30.0	na	na	16.5
3	244,372	71.5	97.4	na	22.6	23.8
4	4,262,082	67.0	94.7	27.1	9.8	8.5
5	29,818	73.2	51.7	na	30.2	18.0
6	1,580,284	71.0	92.4	na	12.0	12.1
8	50,380	70.8	79.7	na	33.6	24.9
9	40,955	69.2	50.5	na	16.2	11.9
10	217,568	74.1	96.7	na	24.6	23.9
11	15,663	41.3	14.4	43.3	12.3	5.5
12	4,739	33.1	13.1	na	22.4	6.8
13	25,718	53.6	31.8	na	20.1	11.7
15	6,902	29.7	15.1	na	17.5	6.4
16	2,881	49.1	20.0	na	25.4	10.1
17	648,950	51.7	97.3	na	5.2	6.2
18	4,837,113	46.7	93.0	41.2	10.3	8.6
19	844,123	26.3	97.2	na	5.1	5.0
20	664,305	44.9	95.0	na	6.1	7.3
23	21,305	65.6	41.7	na	31.2	17.4
24	4,436	80.0	19.3	na	na	11.6
25	42,478	75.0	66.4	na	36.2	24.1
27	7,538	41.9	30.7	49.8	16.0	8.2
30	41,670	36.3	33.3	na	6.9	5.2
31	331,167	43.9	78.0	na	4.9	5.4
32	56,735	46.4	19.7	na	9.0	5.8
33	4,974	46.5	11.8	na	21.8	6.3
34	6,625,344	53.3	97.0	41.8	9.7	9.0
35	528,398	57.2	97.6	na	12.1	14.2
37	4,997	54.1	28.6	na	28.4	13.0
38	19,624	78.0	25.5	na	21.7	11.3
39	21,465	67.2	32.9	na	29.4	14.3
41	5,843	79.0	27.0	na	na	18.0
43	3,804	86.0	8.3	18.7	na	6.6
45	1,898	24.6	22.7	na	11.3	4.8
46	65,572	52.3	56.4	na	22.3	16.2
47	628,536	38.2	97.6	na	5.0	6.0
48	81,008	24.0	22.3	29.5	6.0	3.7
49	45,391	65.0	27.4	na	10.1	7.3
50	248,209	50.2	72.2	na	8.7	9.1
51	41,209	77.0	68.9	na	47.3	26.5
53	65,502	78.0	73.1	na	56.9	28.3
54	24,211	40.6	27.4	na	13.0	7.5
56	23,254	83.0	11.2	na	8.3	5.5
58	31,204	48.1	28.8	na	23.2	10.6
60	16,706	47.3	25.5	na	26.1	10.0
63	507,240	50.0	na	55.0	2.3	3.1
64	2,454,986	28.2	na	23.2	2.6	3.5
69	68,459	14.7	na	14.7	3.4	3.1

Source: Author's calculations.

1/ The four columns under "single input" reflect the percent decline in a given input necessary to reach the stochastic production frontier. The last column reflects the percent decline radially (same proportion in all inputs) in inputs necessary to reach the stochastic production frontier. NA means it is not possible to reach to the stochastic production frontier by only reducing that input.

Returns to scale

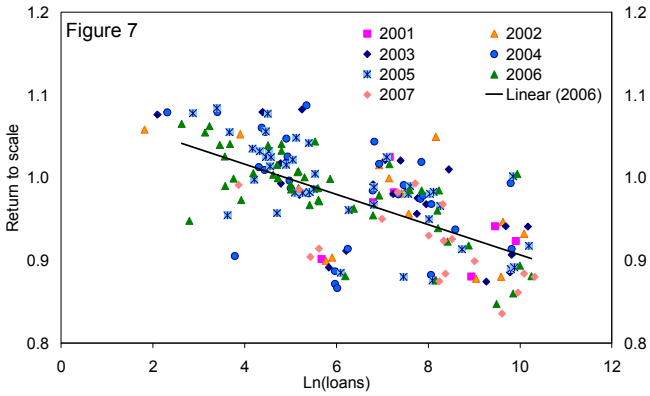
The estimated production function implies that the Chinese banks on average operate close to constant returns to scale (average returns to scale 0.97). The translog production function does not impose any restriction on the magnitude of the returns to scale for individual banks, and the estimated returns to scale vary between 0.84 and 1.09 (Table 5).

Table 5. Return to Scale

2001		2002		2003		2004		2005		2006		2007	
Bank no	RTS	Bank no	RTS	Bank no	RTS	Bank no	RTS	Bank no	RTS	Bank no	RTS	Bank no	RTS
19	1.03	42	1.06	46	1.08	46	1.09	59	1.08	16	1.07	31	0.99
17	0.98	56	1.05	61	1.08	59	1.08	37	1.08	12	1.06	43	0.99
47	0.97	6	1.05	42	1.08	42	1.08	52	1.08	37	1.05	5	0.99
18	0.94	50	1.02	50	1.02	13	1.06	56	1.06	46	1.04	50	0.98
34	0.92	20	1.00	28	1.02	56	1.06	26	1.05	56	1.04	47	0.97
65	0.90	17	0.99	25	1.02	57	1.05	57	1.05	15	1.04	10	0.95
64	0.88	47	0.98	6	1.01	3	1.04	46	1.04	41	1.04	35	0.93
		19	0.96	36	0.99	25	1.03	40	1.04	23	1.04	19	0.93
		18	0.95	10	0.99	58	1.02	60	1.03	13	1.03	20	0.92
		34	0.93	20	0.99	17	1.02	14	1.03	33	1.03	9	0.91
		65	0.90	31	0.98	50	1.02	13	1.02	50	1.02	8	0.90
		67	0.90	53	0.98	44	1.01	38	1.02	39	1.02	6	0.90
		4	0.88	47	0.98	55	1.01	50	1.02	25	1.01	18	0.88
		64	0.88	19	0.97	36	1.00	58	1.02	58	1.01	17	0.88
				17	0.96	1	0.99	29	1.02	2	1.01	34	0.88
				1	0.94	35	0.99	55	1.01	1	1.00	63	0.87
				34	0.94	9	0.99	32	1.00	60	1.00	4	0.86
				65	0.91	10	0.98	1	1.00	8	1.00	64	0.84
				18	0.91	53	0.98	22	1.00	11	1.00		
				67	0.89	31	0.98	35	0.99	38	1.00		
				4	0.89	47	0.98	3	0.99	43	1.00		
				64	0.87	20	0.97	53	0.99	32	1.00		
						19	0.97	20	0.98	54	0.99		
						6	0.94	30	0.98	24	0.99		
						68	0.91	9	0.98	51	0.99		
						18	0.91	7	0.98	49	0.99		
						21	0.91	47	0.98	5	0.99		
						4	0.89	31	0.98	31	0.98		
						66	0.89	10	0.97	35	0.98		
						63	0.88	19	0.97	20	0.98		
						69	0.87	48	0.96	3	0.98		
						67	0.87	21	0.96	27	0.97		
								27	0.95	30	0.97		
								17	0.95	53	0.97		
								34	0.92	9	0.97		
								6	0.91	48	0.96		
								18	0.89	47	0.96		
								4	0.89	10	0.95		
								66	0.88	45	0.95		
								62	0.88	17	0.94		
								63	0.88	19	0.92		
										6	0.92		
										18	0.89		
										34	0.88		
										69	0.88		
										63	0.88		
										4	0.86		
										64	0.85		

Source: Author's calculations.

There is, however, an important difference between large and small banks. In 2006, for example, larger banks on average operated at diminishing returns to scale and smaller banks at increasing returns to scale (Figure 7). This result suggests that large banks are too large, contrary to the view that larger banks benefit from scale economies. A similar result is obtained by Altunbas et al. (2001) for European banks. They show that most large banks in Europe exhibit constant or diminishing returns to scale and small banks exhibit wide spread scale economies. Ray (2007) finds that many banks in India operate in the region of diminishing returns to scale and thus are too large, but this in itself does not necessarily mean that these banks are candidates for break up, as discussed in Maindiratta (1990). Loukoianova (2008) finds that global banks operate both at the region of diminishing and increasing returns to scale.



The variation of return to scale between banks has implications for the efficiency of the banking system as a whole. Specifically, moving deposits from large banks that operate at diminishing returns to scale to small banks that operate at increasing returns to scale would increase the efficiency of the whole banking system. To see this, we run a simulation where deposits of banks that operate below the average return to scale for the industry are reduced by 10 percent, and these deposits are distributed proportionally to the remaining banks, everything else remaining constant. Since in general large banks operate at diminishing return to scale, this implies that other banks' deposits increase by on average 25 percent. This shift in deposits from larger to smaller banks (without any net increase in deposits) increases total loans of the banking system by 2.6 percent. Moreover, this relationship is not linear at the sample point and as more deposits are shifted from diminishing return to scale banks to increasing return to scale banks, the gain in loan origination is even larger.

IV. Explaining Profitability

Chinese banks are very profitable, as discussed in Section II, but the above analysis showed that there are wide inefficiencies in the banking system. Moreover, less efficient banks are not necessarily less profitable. Then what explains Chinese banks' large profits? There are three potential factors that could explain these large profits: financial repression; oligopolistic market structure; and the cyclical position.

Financial repression

One factor that affects banks' profits is financial repression, in the sense of McKinnon (1973) and Shaw (1973). Deposit interest rates are kept artificially low, and loan growth is limited with quantitative and administrative measures. The impact goes two ways: interest rate controls provide a large interest margin for banks to enjoy but sterilization operations and administrative measures limit the volume of loans banks can extend to increase their profits.

Specifically, interest rates on banks' main source of funds, deposits, are constrained by benchmark interest rate ceilings and these ceilings are binding. This provides ample cheap funds to banks. Low deposit rates are not necessarily lowering deposit volumes because these deposits reflect mostly precautionary savings (Aziz and Li (2007)) and alternative investment vehicles are few and risky. Interest rates on banks' main product, loans, are also constrained by benchmark floor rates, which are also mostly binding (as of 2008, about half of the loans were extended with rates at or 10 percent below the benchmark rates, although short-term discount bills, which do not have interest rate restrictions, provide a way to circumvent this constraint). These ceilings on deposit rates and floors on lending rates create a large interest margin for Chinese banks. According to Chu and Wen (2008), in H1 2008, loan-deposit spread stood at 4.8 percent, high by international standards (this figure is higher than the interest margin in Table 1, because this calculation takes into account the different maturities in deposits and loans).

At the same time, sterilization operations, window guidance, and administrative restrictions on loan growth limit lending and return on assets (e.g. required reserves are remunerated below market rates). Lardy (2008) and Fitch (2008) point out that there is indeed excessive loan demand during most of the sample period, as evidenced by informal lending markets in China, where annual rates for loans had increased to about 50 percent in 2008. There is excess demand from Chinese households too; Prasad and Chamon (2008) show that Chinese household do not smooth consumption partly because they cannot borrow.

Combined, Lardy (2008) puts the implicit tax imposed on household savings at 4 percent of GDP and estimates that about a quarter of this is captured by banks (the rest is shared by enterprises and the PBC). This figure is equal to about half the after-tax profits of the banking system in 2008.

Market structure

Banks in China are categorized into 9 groups (Table 6):

- State-owned commercial banks (SCBs). At end-2008, the four SCBs had a dominating position in the banking sector, holding 48 percent of the assets in the banking system. Moreover, these assets amounted to 103 percent of GDP, showing

the importance of these banks in the whole economy. They collect more than half of all the deposits in the country, but extend only 43 percent of the loans.

- Joint-stock commercial banks (JSCBs). There are total 12 JSCBs, and hold 18 percent of the total assets in the banking system. These banks are more active at the provincial or regional level. Although Bank of Communication is the largest among these banks, many of them are comparable in size.

- Policy banks (PBs). There are three policy banks in China. Unlike the other banks, these policy banks collect few deposits (less than 1 percent of total), but provide more than 15 percent of the loans in China.

- City commercial banks (CCBs) and urban credit cooperatives (UCCs). These are small financial institutions that operate in urban areas. In 2007, there were 124 CCBs, and 42 UCCs, reflecting consolidation efforts undertaken during the decade to transform more than 1,000 small UCCs into larger CCBs.

- Rural credit cooperatives (RCCs). There are several thousand RCCs that provide loans to the rural population. Each RCC has local monopoly power, in the sense that a farmer can borrow only from the RCC of her village and cannot shop around for better conditions (theoretically a farmer can request a loan from a city commercial bank, but this is not done in practice). RCCs are net creditors, as they collect more deposits from the rural population than provide loans to.

- Foreign banks (FBs). At end-2007, there were only 29 foreign banks in China (there were many more foreign bank branches), and their total assets was only 2 percent of total assets of the banking system. These banks are active in the interbank market as they lend much more than their deposit base.

- Postal bank (PB). The Postal Bank has the fifth largest deposit base in China; but its lending operations are minimal. It parks its deposits mostly at the PBC. It was incorporated into a bank in 2007 and there are efforts to increase its lending to rural areas, which suffer from lack of bank lending.

- Finance companies (FC). These companies are non-bank financial institutions that provide financial management services to enterprises, and are regulated by the CBRC and included in monetary survey.

Table 6. The Banking System, 2008
(In percent of total)

	Assets	Loans	Deposits
State commercial banks	48.4	43.2	53.3
Joint stock commercial banks	18.4	19.4	17.5
Policy banks	9.0	15.6	0.9
City commercial banks	6.5	7.0	7.5
Urban credit cooperatives	0.1	0.1	0.2
Rural credit cooperatives	7.8	6.0	9.7
Foreign banks	2.1	2.5	0.9
Finance companies	1.5	1.9	1.7
Postal saving bank	3.4	1.4	4.9

Source: Monetary survey.

A number of different techniques can be employed to understand the market structure of the Chinese banking system. One method that is commonly used was formulated by Panzar and Rosse (1987), which involves regressing total bank revenue on input prices and judging the intensity of competition from the sensitivity of total bank revenue to changes in input prices (the more sensitive total bank revenue is to input prices, the more competitive the market is). Using this method, Zhao et al (2005) and Yuan (2006) suggest that the Chinese banking system can be characterized as monopolistic competition. However, there are two critical problems with applying the standard Panzar and Rosse method to the Chinese banking system. First, both the deposit and the lending rates are determined by the PBC, and historically these rates have moved in tandem; therefore, as input price (deposit rate) changes, output price (lending rate) simultaneously changes, highly correlating total revenue with input prices, and biasing the results toward accepting a more competitive structure over a monopolistic structure. Second, the Panzar and Rosse method is based on long-run behavior, which is difficult to estimate when the banking sector is going through major structural changes, as is the case in China.

An alternative method is to look at the Herfindahl-Hirschman Index (HHI). This index sums the squares of the market shares of the firms in the market, and ranges from 0 to 1. From international experience, an index below 0.1 suggests that the market is not concentrated and no individual enterprise dominates the market, while an index above 0.18 suggests that the market is highly concentrated. An index in between suggest moderate concentration.

The HHI for the whole Chinese banking system was 0.07 in 2007, suggesting that market concentration was very low and competition strong (Table 7). This result is driven by the fact that there are thousands of financial institutions in China, and the sheer number of these institutions appear to overcome the large size of the SCBs and JSCBs. However, there is one important problem with applying the index in this fashion: the index shows the correct market concentration level only when enterprises that compete in similar markets are included in the equation. In China, financial markets are segmented in a number of ways. First, SCBs and JSCBs cater to urban enterprises and households, and large enterprises in rural areas (e.g. power companies). CCBs and UCCs cater to SMEs and households. RCCs

cater only to local population and do not compete with other banks (except the Postal Bank in a very limited way). Policy banks do not directly compete with other banks either because they operate in a different environment, providing trade credit or policy related support to the population, usually not in fully commercial terms. Foreign banks compete more directly with SCBs and JSCBs, but they are very small. To better reflect the true level of market contestability, the HHI that includes SCBs and JSCBs should not include RCCs, PBs, and FCs. It can also be argued that CCBs and UCCs do not directly compete with SCBs and JSCBs, because the former group operates at a very small scale, while the latter group operates at large scale.

Table 7. Herfindahl-Hirschman Index 1/

	2001	2002	2003	2004	2005	2006	2007
All financial institutions							
Loans	0.11	0.10	0.08	0.08	0.08	0.07	0.07
Deposits	0.16	0.14	0.12	0.11	0.10	0.10	0.10
Banks competing in urban areas 2/							
Loans	0.18	0.15	0.13	0.12	0.12	0.11	0.11
Deposits	0.17	0.15	0.14	0.13	0.13	0.12	0.12
JSCBs							
Loans	0.12	0.11	0.11	0.10	0.10	0.10	0.11
Deposits	0.13	0.11	0.11	0.10	0.10	0.10	0.10

1/ An index less than 0.1 implies low concentration, between 0.1 and 0.18 moderate concentration, and more than 0.18 high concentration.
2/ Includes state commercial banks (SCBs), joint stock commercial banks (JSCBs), city commercial banks (CCBs), and foreign banks (FBs).

The revised HHI (HHI-R) that includes banks that compete in similar markets is 0.11, which indicates that bank concentration level is moderately high and the market structure is conducive to less competition among banks. This result is supported by another important factor: there has been no entry or exit among the large or medium size banks (SCBs, JSCBs, CCBs) in the last 10 years. The number of foreign banks has increased recently, but their size remain small compared to the market. Lack of any meaningful entry and exit suggests high barriers, a condition that fosters oligopolistic behavior.

HHI-R also shows that the banking sector was even more concentrated at the beginning of the decade. In 2001 HHI-R was 0.18, as the four SCBs completely dominated the market. Since then, the HHI index has been declining steadily, reflecting the government's efforts to restructure the SCBs and JSCBs ability to gain market share. The HHI that covers only JSCBs hovers around 0.10 during this period, suggesting that market concentration among these banks had not changed much, but as a group become more important in the Chinese banking system.

A third method to understand the market power of banks is to look at how other banks behave in response to a bank's move in the market. A Cournot competition model is appropriate to use in this case because the underlying assumptions match the Chinese banking system: there is more than one firm; firms produce a homogeneous product (loans); the number of firms is fixed; firms compete in quantities; and firms act strategically to maximize profit. If firms behave competitively, total output of the sector does not change when a firm decreases its output, because other firms compensate to ensure perfectly competitive equilibrium is maintained. If the firms collude as a perfect cartel, then all move at the same time and rate and equilibrium level changes. Comparative statics on the sensitivity of quantity changes to changes in costs could indicate whether firms behave more as perfect competitors or as part of a cartel. Sullivan (1985) uses these notions to test firm behavior in the cigarette industry.

It is very difficult to apply this method in China because of data limitation. However, a set of data on the banks in Jiangsu Province provides some hints to the market structure in that province. The data provide information not only on the size of loans extended in different sectors but also whether these loans originate from SCBs or other banks. This way, we can observe how other banks react when the SCBs increase or reduce their loans in a particular sector.

Comparative statics suggest that market conditions vary quite a bit cross different sectors in Jiangsu (Table 8). The first two columns in Table 8 show average loan growth extended in different sectors during 2000-07, decomposed into SCBs and JSCBs. A negative loan growth by SCBs and a positive loan growth by JSCBs would suggest, all else being equal, a competitive market structure, where banks fill in the gaps left by others that leave a market. The third column looks at the same issue from a slightly different perspective and indicates if deviations from long-term trends are correlated or not. A negative correlation suggests that when SCBs slow down their loan growth in a particular sector, JSCBs accelerate their loans in that sector. A switch in sign between the first and second columns and a negative figure in the third column is a stronger indication that the loan market is competitive in that sector. The fourth column indicates how loan growth is correlated with output in that sector. A positive figure could indicate that output growth is providing lending opportunities for all banks at the same time. Therefore, positive figures in the first three columns (which suggest that banks adjusts their loans simultaneously) and a negative figure in the fourth column (which suggests that this simultaneity is not because of overall growth opportunities) jointly imply that banks act oligopolistically. The actual figures suggest the following:

- Competition appears relatively strong in lending to the commerce sector. As SCBs reduce loans to firms in commerce, non-SCBs increase their loans in this sector, a sign of competitive behavior. Also, deviations from trends are negatively correlated, in the sense that when SCBs reduce their loans more than the long-run trend, non-SCBs increase their loans more. Lending to foreign joint ventures also appears to be

competitive for similar reasons, although the case is weaker because deviations from trends are negatively correlated.

- On the opposite end, banks appear to be behaving oligopolistically in lending to private companies and individuals as well parts of the service sector ("others"). SCBs and non-SCBs increase or decrease their loans in these areas in tandem. Moreover, deviations from trend are also positively correlated. While such positive correlation could be attributed to demand factors, this is not the case in these sectors because total lending in these areas is negatively correlated with output.

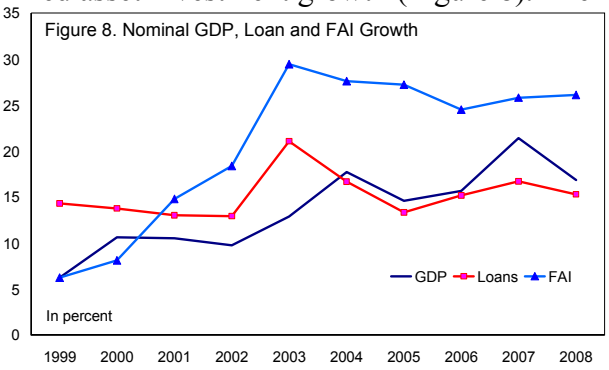
- Comparative statics are inconclusive regarding lending to industry, construction, and agriculture. Both in industry and construction, lending by SCBs and non-SCBs increase in tandem, but we cannot rule out the possibility that the positive correlation is because of demand conditions, since lending is positively correlated with output in these sectors.

Table 8. Bank Loan Growth in Jiangsu, 2000–07
(In percent)

	Trend growth SCBs	Trend growth Non-SCBs	Correlation of deviations from trend	Correlation with output growth
Total, short term	6.7	19.9	62.8	23.6
Industry	14.8	25.9	4.1	39.6
Commerce	-7.1	9.7	-25.8	63.1
Construction	10.5	41.1	-48.9	11.5
Agricultural	-14.9	25.9	30.8	-36.4
Foreign joint ventures	-1.4	8.3	-33.0	12.4
Private enterprises and individuals	31.4	55.9	19.3	-19.8
Others	15.1	23.3	83.3	-33.2

Cyclical position

As the economy grows at an increasingly rapid pace, it is natural for profits to increase. Do the increase in bank profits reflect this breakneck growth in China rather than financial repression or oligopolistic market structure? To answer this question, we need to capture the impact of GDP growth on loan growth rates. During 2004–07, loan growth was lower than nominal GDP growth, and even more so from fixed asset investment growth (Figure 8). The difference was particularly stark in 2007, when loan growth was limited to 16.7 percent while nominal GDP grew 21.4 percent. Moreover, there was no significant upward trend in banks' loans during this period when the GDP growth rate was accelerating. Turning to late 2008 and early 2009, despite the very sharp deceleration in economic activity in Q4



2008, banks continued to make profits, and sharply increased their lending. This pattern continued in Q1 2009. During this period interest margin narrowed marginally, but higher lending is expected to more than compensate for this decline in the interest margin, provided non-performing loans do not increase. These factors together suggest that strong profits of banks was not strongly linked to the cyclical upturn in economic activity.

V. CONCLUSIONS

While the financial performance of the Chinese banks has been good recently, these banks do not intermediate particularly efficiently. Nevertheless, they still make large profits, reflecting more market concentration in the banking sector and the administratively determined low deposit rates and large interest margins. Banks' loan growth is also quantitatively or administratively constrained, contributing to inefficient financial intermediation and also suppressing profits. These factors create little incentives for banks to improve efficiency.

Eliminating the various controls over the financial system, while maintaining effective bank supervision, could significantly improve financial intermediation. Lifting the ceiling on deposit rates could facilitate movement of deposits from large to smaller banks, as smaller banks are more efficient in turning these deposits into performing loans and will be able to compete for these funds. This will also help lower the market concentration level, boosting competition among the banks. Just as lower deposit rates have not lowered household savings, it is unclear whether higher deposit rates will increase savings, particularly given the strong precautionary savings motive behind household deposits.

However, increased efficiency in bank intermediation could increase the supply of loans given the large deposit base, which will need to be monitored carefully both from a macroeconomic but also financial stability perspective. Therefore, measures to lower liquidity in the system through indirect monetary policy, channel some of the savings to other capital markets, and ensure regulation/supervision is sufficiently strong to contain reckless loan growth should also be a part of the reform agenda.

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