Managerial Finance

Do Chinese banks perform better after IPOs?
Haiyan Yin, Jiawen Yang, Jamshid Mehran,

Article information:

To cite this document:
Haiyan Yin, Jiawen Yang, Jamshid Mehran, (2015) "Do Chinese banks perform better after IPOs?", Managerial Finance, Vol. 41 Issue: 4, pp.368-384, https://doi.org/10.1108/MF-06-2014-0150
Permanent link to this document:
https://doi.org/10.1108/MF-06-2014-0150

Users who downloaded this article also downloaded:

For Authors

About Emerald www.emeraldinsight.com

Received 7 June 2014
Revised 17 June 2014
Accepted 18 June 2014

Do Chinese banks perform better after IPOs?

Haiyan Yin
Judd Leighton School of Business and Economics, Indiana University South Bend, South Bend, Indiana, USA
Jiawen Yang
Department of International Business, The George Washington University, Washington, District of Columbia, USA, and
Jamshid Mehran
Department of Economics, Finance and Marketing, Indiana University South Bend, South Bend, Indiana, USA

Abstract

Purpose – As part of the banking reform, major commercial banks in China went through initial public offerings (IPOs) in the past two decades. Has this change in the ownership structure led to improvement in their performance? With a comprehensive data set of Chinese banks over 1999-2010, the purpose of this paper is to investigate the effects of IPOs on bank performance in China.

Design/methodology/approach – The authors employ a stochastic frontier approach (SFA) to measure bank efficiency and assess the selection and dynamic effects of public listing.

Findings – The authors find strong selection effects. That is, banks that choose to go public are significantly more efficient than those that do not. However, the analysis of the dynamic effects shows no evidence that bank efficiency improves after going public, either in the short run or in the long run. The authors further look into bank performance around IPO events with non-parametric analysis and find that banks significantly outperform their counterparts prior to IPOs, but this superior performance disappears immediately after IPOs. This evidence is consistent with the "window dressing" hypothesis that firms time new issues to take advantage of windows of opportunity.

Originality/value – This is the first study that addresses the performance of IPO banks measured with SFA in China after 2005 when the major Chinese banks were listed.

Keywords China, Banks, Initial public offering, Post-IPO performance

Paper type Research paper

1. Introduction

China's banking industry has gone through significant reforms in the past two decades. The industry has transformed from a monopoly of state-owned banks to a spectrum of banks with different sizes, regional orientation and ownership structure. Currently, banks operating in China are classified into four major categories: banks with majority ownership by the state (Big Four), joint-stock banks, city commercial banks and foreign-funded banks. Banks with majority ownership by the state are those that were previously wholly state-owned banks but have diversified their ownership structure during the bank reform. Initial public offerings (IPOs) have been an important part of ownership diversification and reform of state-owned banks in China. By the end of 2010, 16 Chinese banks went through IPOs and became listed in China's inland and overseas stock markets, which includes the Big Four, nine joint-stock banks and three

JEL Classification — G21, G32, G28

Managerial Finance
Vol. 41 No. 4, 2015
pp. 368-384

0307-4358
DOI 10.1108/MF-06-2014-0150

city commercial banks. Table I provides detailed IPO information of the publically listed banks of China[1].

An IPO is an important way for firms to raise equity capital and grow. It is also one of the methods to privatize state-owned enterprises. According to the World Bank, IPOs accounted for 75 percent of total privatization value in 2007 globally. In the banking industry, the most commonly used method to privatize state-owned banks include attracting foreign strategic investors to participate in domestic bank ownership and IPOs. Bank privatization in the middle- and low-income countries has been extensively examined in the literature. These studies use different measures for bank performance, cover different countries and periods and find mixed evidence on how bank performance is affected by privatization. For example, Berger *et al.* (2005) examine the privatization effect on bank performance in Argentina, and find that profit efficiency and loan portfolio quality improved after privatization, but no significant change in cost efficiency is observed[2]. Boubakri *et al.* (2005) examine the post-privatization performance of 81 banks from 22 developing countries and find that banks chosen for privatization have a lower economic efficiency and a lower solvency than banks kept under government ownership. They also find that in the post-privatization period, profitability increases but, depending on the type of owner, efficiency, risk exposure and capitalization may worsen or improve. However, they find that in the long run, privatization yields significant improvements in economic efficiency and credit risk exposure. Clarke *et al.* (2005) summarize the findings on bank privatization from a broad set of country-specific and cross-country studies, and report that at least some measures of bank performance are improved after privatization in most countries, although some other measures do not change.

Although there is extensive literature on examining the effect of privatization on bank performance, few studies have distinguished IPOs from other ways of privatization. Among studies on Chinese banks, Lin and Zhang (2009) and Jiang *et al.* (2009) both examine the effect of bank ownership reform on bank performance. Lin and Zhang use financial ratios to measure bank profitability, efficiency and asset quality

Bank name	Bank type	IPO date
China Construction Bank Corporation (CCBC)[a]	State-owned banks	October 27, 2005
Bank of China Limited (BOC)[a]	State-owned banks	June 1, 2006
Industrial & Commercial Bank of China (ICBC)[a]	State-owned banks	October 27, 2006
Agricultural Bank of China Limited (ABC)[a]	State-owned banks	July 16, 2010
Shenzhen Development Bank Co. Ltd	Joint-stock banks	April 3, 1991
Shanghai Pudong Development Bank	Joint-stock banks	November 10, 1999
China Minsheng Banking Corporation	Joint-stock banks	December 19, 2000
China Merchants Bank Co. Ltd	Joint-stock banks	April 9, 2002
Hua Xia Bank Co. Limited	Joint-stock banks	September 12, 2003
Industrial Bank Co. Ltd	Joint-stock banks	February 5, 2007
China CITIC Bank Corporation Limited	Joint-stock banks	April 27, 2007
China Everbright Bank Co. Ltd	Joint-stock banks	August 18, 2010
Bank of Communications Co. Ltd	Joint-stock banks	June 23, 2005
Bank of Nanjing	City commercial banks	July 19, 2007
Bank of Ningbo	City commercial banks	July 19, 2007
Bank of Beijing Co. Ltd	City commercial banks	October 1, 2007

Note: [a]These banks are also called Big Four in the literature

Table I.
Publically traded banks in China

and find that although banks undergoing foreign acquisitions or public listing record better pre-event performance, little change in performance is found after the ownership change. Jiang *et al.* find that banks that have gone through IPOs or otherwise diversified their ownership structure are more efficient than others, but IPOs only have some short-term effects.

In the IPO literature, the performance of IPO firms in non-financial industries has been well documented. Some IPO studies focus on the post-issue stock price performance (e.g. Ritter, 1991; Loughran and Ritter, 1995), while others address the operating performance of firms after IPOs (e.g. Jain and Kini, 1994; Degeorge and Zeckhauser, 1993). In a study on IPOs in China, Kao *et al.* (2009) find that on average firms experience a decline in post-IPO profitability and poor long-run stock performance.

However, studies focussing on bank performance after IPOs are still rare. Houge and Loughran (1999) examine a sample of 393 bank IPOs in the USA from 1983 to 1991 and find poor post-IPO performance, especially among larger institutions with more aggressive loan growth. Their evidence suggests that the market may have fixated on the rapid growth of these institutions. To the best of our knowledge, there is no study in the literature that examines the post-IPO performance of Chinese banks. Although Lin and Zhang (2009) and Jiang *et al.* (2009) both cover bank IPO in their studies as one way of ownership structure reform in China, as is reviewed earlier, their coverage of the IPO banks is very limited. Their sample period is up to 2004 and 2005, respectively, and the number of publically listed banks covered in their study is very limited. As is shown in Table I, most of the major bank IPOs took place after 2005. The lack of comprehensive studies of IPOs in the banking industry, especially in China, leaves us space for more research on this issue.

In this study, we examine the post-IPO performance of banks in China over the period 1999-2010. We measure bank performance with technical efficiency (TE) scores and TE ranks that are estimated with the stochastic frontier approach (SFA) and a production function. With the method developed by Berger *et al.* (2005), the regression analysis shows that banks that choose to go for public listing are significantly more efficient than others that do not. We call this the selection effect. However, we do not find any dynamic effect. That is, banks do not gain efficiency after IPOs, either in the short run or the long run.

By further looking into the performance of IPO banks and their matched industry counterparts based on bank size and ownership characteristic year by year, we find that the IPO banks significantly outperform their industry counterparts in the year prior to IPO, but underperformed the control banks for three of the four years immediately after IPO (Years 0-3). The most pronounced decline in performance is from the year prior to IPO (Year −1) to the year of IPO (Year 0). This provides support for the window-dressing hypothesis in the literature, which states that IPO firms attempt to window dress their accounting numbers before IPO and manipulate investors' expectations to attract more investors and sell their stocks at higher prices. The superior performance prior to IPO is also consistent with the timing hypothesis, which argues that IPO firms might time their public offerings to coincide with the time when their performance is extremely good but not sustainable. The poor performance at the year of IPO could be explained by the fact that some of the one-time expenses associated with IPOs are incurred in the year of IPOs which adversely affect their performance. By comparing to their pre-IPO performance, we do not see efficiency gains after IPO. However, we do observe gradually increasing efficiency for the three years following IPO. This finding is consistent with the conjecture that bank performance may turn around in a few years because the

costly restructuring may lead to a temporary increase in costs or reduction in profits in the early years following their IPOs.

Our findings of the selection effects and dynamic effects are consistent with those in the literature (e.g. Lin and Zhang, 2009). More importantly, our study sheds further light on bank performance around the IPO year. The rest of the paper is organized as follows. We describe the methodology and data in Section 2 and discuss the empirical results in Section 3. The final section concludes.

2. Empirical model and data

2.1 Our empirical model

This study focusses on the effect of IPO event on bank efficiency. We follow the methodology originally developed by Berger *et al.* (2005) and recently applied by other studies such as Lin and Zhang (2009) and Jiang *et al.* (2009). In these studies, the static, selection and dynamic effects of bank ownership changes are jointly tested in one model. Static effects refers to the long-run performance effects associated with constant ownership structure. In other words, it refers to the performance differences among banks that have observed no change in governance. Selection effects are the performance differences between banks that have experienced governance changes and those that are not. Dynamic effects of governance change deals with the performance effects associated with governance change. Berger *et al.* (2005) find that state-owned banks have poor long-term performance (static effect), banks that underwent privatization had poor performance beforehand (selection effect) and privatized banks dramatically improved their performance following privatization (dynamic effect). In this study, we focus on the selection effects and dynamic effects associated with IPOs of Chinese banks[3]. The empirical model is specified as follows:

$$\begin{aligned}\text{Bank efficiency measures} = {} & \alpha + \beta 1 \times \text{selection IPO indicator} \\ & + \beta 2 \times \text{dynamic IPO indicator\_dummy} \\ & + \beta 3 \times \text{dynamic IPO indicator\_years since} \\ & + \beta 4 \times \text{control variables} \\ & + \beta 5 \times \text{year fixed effects} + \text{error term} \qquad (1)\end{aligned}$$

The variable definitions are reported in Table II and discussed in detail.

2.2 Variables and measurements

2.2.1 Bank efficiency measures. The existing literature takes two approaches to measure bank operating performance: financial ratios generated from financial accounting statistics and more sophisticated models. Financial ratios often include return on equity, return on assets, costs to assets ratio and other profitability, asset quality or efficiency measures. More sophisticated measures involve different models to estimate bank performance. In their study of the relationship between bank ownership and performance, Berger *et al.* (2005) compile efficiency ranks from efficiency scores that are estimated with a translog profit or cost function. The efficiency scores are ranked in ascending order and then converted to a uniform scale over [0, 1]. Jiang *et al.* (2009) employ a stochastic distance function approach to calculate the TE score for each bank and examine the effect of ownership change on bank efficiency in China. In this paper, we use TE scores and ranks to measure bank efficiency.

Symbol	Definition
Endogenous variables	
Technical efficiency (TE)	Based on the residuals from production functions for each year. Estimated with stochastic frontier approach (SFA)
Technical efficiency rank (TE rank)	Based on the residuals from production functions for each year. Estimated with SFA. Technical efficiency scores are ranked in ascending order for a year and converted to a uniform scale over [0, 1]
Exogenous variables	
Selection IPO indicator (selection_IPO)	Dummy indicating a bank that underwent an IPO over the 1999-2010 period. Equals zero for all other banks
Dynamic IPO indicator_dummy (dynamic_IPO)	Dummy that takes the value of one for all publically listed banks for all time periods following the IPO event, and equals zero for the periods prior to IPO and for all periods for all the other banks that have not gone public
Dynamic IPO indicator_years since (dynamic_IPO_time)	Time variable that equals one for the year following the bank IPO, two for the second year following the IPO and so on. It equals zero for the years before the IPO and for all other banks
Control variables	
Joint-stock bank	Dummy that equals 1 for joint-stock banks and 0 for all others
City commercial bank	Dummy that takes the value of 1 for city commercial banks and zero for all others
Foreign bank	Dummy that equals 1 for foreign banks and 0 for all others
Lnasset	Log of total assets in period t–1 for each bank
LnCAP	Log of capital asset ratio
Fee-based asset share	Share of other earning assets (than loan) in total earning assets
Year fixed effects	Year dummies, with 1999 excluded as the base case

Table II. Variables employed in the regression models

TE gauges a firm's ability of optimal utilization of available resources either by producing maximum output with a given amount of inputs or by using a minimum amount of inputs to produce a given output. We take the SFA to estimate the TE scores. SFA was first developed by Aigner *et al.* (1977) and Meeusen and van den Broeck (1977). The approach specifies a functional form for the cost, profit or production function, which allows inefficiencies to be included in the error term. For example, a production function for a fully efficient firm can be specified as:

$$\ln y_{it} = f(x_{it}, \beta) + v_{it} \quad i = 1, \ \ldots, \ n; \ t = 1, \ \ldots, \ T, \tag{2}$$

where y_{it} is the observed output of producer i at time t, x_{it} and β are vectors of inputs and the corresponding coefficients, respectively. v_{it} is a zero-mean random error that describes random shocks affecting the production process. Equation (2) defines the stochastic frontier of the production function. As a firm's efficiency is less than or equal to the efficiency of a fully efficient firm, we subtract a non-negative term u_{it} from the production function and get a stochastic production frontier model as:

$$\ln y_{it} = f(x_{it}, \beta) + v_{it} - u_{it} \tag{3}$$

where $u_{it} > 0$ is the effect of technical inefficiency and is assumed to have a half-normal distribution[4]. The non-negative u_{it} in Equation (3) guarantees that the observed log of output, $\ln y_{it}$, is bounded below the frontier. The value of $100 \times u_{it}$ is the percentage by which output can be increased to reach maximum output potential using the same inputs. The score of TE can be expressed as:

$$TE_{it} = \exp\{-u_{it}\} \tag{4}$$

where TE_{it} represents the ratio of observed output of producer i at time t to maximum output potential. Therefore TE is within the range of [0, 1]. When $TE_{it} = 1$, the ith firm obtains maximum feasible output at time t; when $TE_{it} < 1$, there is a shortfall in efficiency – the firm does not reach its maximum feasible output.

The SFA was first used in manufacturing industries in early studies. Later its application was extended to the studies of banking industry and has become a commonly used approach to study bank efficiency. Berger and Humphrey (1997) provide a comprehensive survey on 130 financial institution efficiency studies in which SFA is one of the five main approaches used in the literature. However, the special feature of banking industry imposes some challenges in the application of SFA to bank efficiency studies. Different from manufacturing firms, the output of banks (intermediation service) is difficult to identify or measure. In the existing literature, some studies treat banks as firms producing different deposit and loan accounts – the production approach, and use the number and type of transactions and documents as a measure of bank output. However, such data are usually unavailable to the public. Some others treat banks as financial intermediaries channeling funds between depositors and borrowers – the intermediation approach, and use bank loan and investment as output. In this study, we follow Yao *et al.* (2007) and use the intermediation approach to measure bank output.

Although both loans and profits can be proxies for bank output (Yao *et al.*, 2007), profits are thought to be superior to loans as a measurement of bank output in the estimation of bank efficiency. Earning assets such as loans are only intermediate outputs with an ultimate purpose of income generation. As is found in the literature, bank efficiency scores with loan-based models could be higher than that with profit-based models (Yin *et al.*, 2013; Yao *et al.*, 2007). The efficiency estimates with loan model could be inflated by imprudent lending. A bank may be very efficient in generating income-earning assets, but less efficient in generating profit with poor asset quality control. In China, government-directed or policy-oriented lending has caused high levels of non-performing loans (NPLs) on banks' balance sheets. As a result, using total loans as bank output might exaggerate the efficiency of banks in China if NPLs are not separated from total loans. This problem can be remedied by profit models as no income could be generated from NPLs. Thus, we use pre-tax profits rather than loans to measure bank output in this study. Bank inputs include fixed assets, deposits and equity. The empirical model that we employ for our study is specified as follows:

$$\ln(profit_{it}) = \beta_0 + \beta_1 \ln(fixed\ asset_{it}) + \beta_2 \ln(deposit_{it}) + \beta_3 \ln(equity_{it}) + year\ dummies_t + v_{it} - u_{it} \tag{5}$$

where subscripts i and t denote individual banks and time, respectively. We add year dummies in the model to avoid any estimation biases that may arise due to potential

changes in banking performance due to technological progress or changes in the economic and regulatory environments.

With Equation (5), the efficiency score of each bank is estimated for each year over the sample period. We also use bank efficiency rank as an alternative measure of bank TE. We follow Berger *et al.* (2005) and construct efficiency rank based on an ordering of the banks' efficiency scores in each year: $(Order_{it}-1)/(n_t-1)$, where $Order_{it}$ is the place in ascending order of the ith bank in the tth year in terms of its efficiency score and n_t is the number of banks in year t. The ranks are converted to a uniform scale over [0, 1]. Thus, bank i's efficiency rank in year t gives the proportion of the other sample banks in tth year with lower efficiency level, i.e., a bank with a rank of 0.80 in year t implies that 80 percent of other banks in China have efficiency level lower than the bank. The bank with the highest efficiency score in year t has a rank value 1, and the bank with the lowest efficiency score has a rank value 0.

Table III shows the summary statistics of the variables used in the stochastic frontier model (Equation (5)), and the regression results are reported in Table IV. It shows that banks' pre-tax profit is positively related to all the input variables – fixed assets, deposits and equity, as expected. All the coefficients are statistically significant at 1 percent level. The estimated coefficients for fixed assets, deposits and equity measure their elasticity with respect to bank profits. The reported likelihood ratio (LR) tests whether there is technical inefficiency component in the model, and the result confirms that there exists inefficiency when banks in China transform inputs into profit.

2.2.2 IPO effect indicators. As is discussed earlier, we focus on the selection and dynamic effects of IPOs on bank performance in China. The selection IPO indicator identifies those banks that went public over the sample period. It equals one for the corresponding banks for all time periods. The regression coefficient for this dummy variable indicates the efficiency difference between the listed banks and non-listed banks. We use two indicators to test the dynamic effects of IPOs on bank performance. We first define a dummy variable (dynamic IPO indicator_dummy) that takes the value of one for all publically listed banks for all time periods following the IPO event, and equals zero for the periods prior to IPOs and for all periods for all the other banks that have not gone public. This dummy variable captures the performance difference before

Table III. Summary statistics of the variables in the stochastic frontier model 1999-2010 (million US$)

Year	Pre-tax profit	Fixed assets	Deposit	Equity
1999	238.03	929.35	43,294.15	2,559.76
2000	257.17	1,001.24	42,099.78	2,592.42
2001	291.66	1,083.00	46,470.14	2,786.54
2002	310.50	942.80	41,709.77	1,602.28
2003	459.66	853.20	44,630.85	604.50
2004	519.83	710.31	40,624.39	511.24
2005	505.09	569.83	35,900.46	1,966.99
2006	475.79	485.73	32,414.37	2,215.13
2007	731.01	450.32	33,239.83	1,916.43
2008	950.79	625.23	48,887.92	4,043.27
2009	1,079.69	708.04	61,040.39	4,632.74
2010	1,849.85	1,014.12	90,854.88	7,524.36
Total	771.41	707.72	48,062.75	3,062.69

	Pre-tax profit
Intercept	−2.654***
	(0.178)
Fixed assets	0.109***
	(0.029)
Deposit	0.359***
	(0.030)
Equity	0.570***
	(0.024)
No. of observations	824
LR test	49.98 (p-value = 0)
Sigma_u	0.783
Sigma_v	0.395
λ	1.98

Notes: This table presents the regression results of the stochastic frontier model. Profit is measured with pre-tax profit of banks; Fixed assets, deposit and equity are measures of bank inputs. Year dummy variables are included in the regressions with year 1999 as the omitted variable, although not reported here. All variables are in natural logarithms except for the year dummies. Sigma_u is the SD of inefficiency term and Sigma_v is the SD of random noise. λ is the ratio of SD of the half-normal inefficiency term and random noise, that is Sigma_u/Sigma_v. Data are obtained from Bankscope. SEs in parentheses. *,**,***Significance at the 10, 5 and 1 percent levels, respectively

Table IV. Regression results of the stochastic frontier model

and after public listing. To investigate the long-term effects of bank IPOs, we include a variable that measures the number of years that has lapsed since a particular bank went through its IPO (dynamic IPO indicator_years since). This time variable equals one for the year immediately following the bank IPO, two for the second year following the bank IPO and so on. It equals zero for the years of and before its IPO and for all other banks.

2.2.3 Control variables. We control for bank size, bank type and include year fixed effects in the analysis to account for the differences in bank size, bank ownership and the changes in market and regulatory conditions, respectively. The average bank total assets over the sample period range from 86.9 million to 942.3 billion US dollars. The variation of bank size could have an impact on bank efficiency. We use the natural logarithm of total assets in year $t-1$ to control for bank size in the regressions. In addition to the state-owned Big Four, our sample also has 13 joint-stock banks, 116 city commercial banks and 38 foreign-funded banks. It has been widely documented that bank ownership is an important determinant of bank efficiency and state-owned banks are the least efficient[5]. We control for bank type by including bank type dummies in the regression, with state-owned banks excluded as the base case. We also include bank equity ratio and fee-based asset share in our analysis to control for a bank's risk attitude and business orientation, respectively. Banks that maintain a higher level of capital tend to be more risk averse and are found to be less efficient in the literature (Yao *et al.,* 2007). Lin and Zhang (2009) observe that banks' fee income ratio is negatively associated with cost to income ratio, suggesting that banks engaging in more non-banking business are less efficient. With fee-based asset share as a measure of business structure, we conjecture that banks with higher fee-based asset share are less efficient.

2.3 Data

We retrieve data for all the banks in China from 1999 to 2010 from the Bankscope and keep only commercial banks for the analysis. We obtain an unbalanced sample of 171

banks with annual data available, which yields a total of 2,052 observations. However, due to missing values for some of the variables, fewer observations are included in some regressions. Table V shows the distribution of observations. Our sample includes four state-owned banks (Big Four) with 48 observations, thirteen joint-stock banks with 156 observations, 116 city commercial banks with 1,392 observations and 38 foreign-funded banks with 456 observations. The number of banks varies from 32 (in 1999) to 127 (in 2007) over the sample period. As of 2010, all Big Four state-owned banks had finished public listing; nine of the 13 (69 percent) joint-stock banks had gone public; among the 48 city commercial banks in 2010, only three were publically listed. The number of banks that underwent public listing goes from two in 1999 to 16 in 2010[6].

3. Empirical results

The regression results for Equation (1) are reported in Table VI. The dependent variables are bank efficiency measurements – TE score and TE rank estimated with production function and stochastic frontier model. With each measure, we first test the IPO selection effect only, and then add the dynamic dummy and dynamic time variables to the model one by one. All the regressions control for year fixed effect and bank characteristics such as bank type dummies, bank size, capital ratio and fee-based asset share. Column (1) shows that there is a strong selection effect of bank IPOs on efficiency. The positive coefficient for the selection dummy is significant at the 1 percent level, indicating that banks that are selected for public listing are more efficient than the others that have not gone public. After we add the dynamic dummy in the model (Column (2)), and include both the dynamic dummy and time variables (Column (3)), the select effect still exists at the 5 percent significance level.

With TE rank as the dependent variable, Columns (4)-(6) show strong evidence of IPO selection effect – all coefficients are significant at the 1 percent level. The selection effects we observe here suggest that the IPO banks in China outperform other banks that have not gone public. Banking reform has been an important part of China's economic reform. In the process, more efficient banks are chosen for public listing. Alternatively, the better performance of IPO banks may be attributable to the government support that these IPO banks receive before their IPOs. For example, the Big Four

Table V. Distribution of observations

						Banks that underwent public listing			
Year	State-owned banks	Joint-stock banks	City commercial banks	Foreign-funded banks	Total	State-owned banks	Joint-stock banks	City commercial banks that	Total
1999	4	10	10	8	32	0	2	0	2
2000	4	10	15	7	36	0	3	0	3
2001	4	10	16	5	35	0	3	0	3
2002	4	10	25	6	45	0	4	0	4
2003	4	10	29	6	49	0	5	0	5
2004	4	12	39	6	61	0	5	0	5
2005	4	12	57	8	81	1	6	0	7
2006	4	13	80	10	107	3	6	0	9
2007	4	13	85	25	127	3	8	2	13
2008	4	13	71	27	115	3	8	3	14
2009	4	13	70	30	117	3	8	3	14
2010	4	13	48	30	95	4	9	3	16

	Technical efficiency			Technical efficiency rank		
	(1)	(2)	(3)	(4)	(5)	(6)
Selection_IPO	0.086***	0.082**	0.082**	0.160***	0.183***	0.183***
	(0.027)	(0.034)	(0.034)	(0.050)	(0.063)	(0.063)
Dynamic_IPO		0.012	0.027		−0.022	−0.014
		(0.033)	(0.040)		(0.060)	(0.074)
Dynamic_IPO_time			−0.003			−0.001
			(0.004)			(0.008)
Joint-stock banks	0.121**	0.128**	0.130**	0.225**	0.242***	0.243***
	(0.048)	(0.050)	(0.050)	(0.088)	(0.092)	(0.092)
City commercial banks	0.081**	0.085**	0.089**	0.136**	0.150**	0.152**
	(0.035)	(0.038)	(0.039)	(0.065)	(0.070)	(0.071)
Foreign banks	0.163***	0.170***	0.171***	0.295***	0.316***	0.317***
	(0.044)	(0.046)	(0.046)	(0.080)	(0.085)	(0.085)
Lnasset	0.004	0.004	0.004	0.000	0.001	0.001
	(0.005)	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)
LnCAP	−0.040***	−0.040***	−0.041***	−0.072***	−0.067***	−0.068***
	(0.013)	(0.013)	(0.013)	(0.024)	(0.024)	(0.025)
Fee-based asset share	−0.086*	−0.086*	−0.089*	−0.241***	−0.235***	−0.237***
	(0.048)	(0.048)	(0.048)	(0.088)	(0.089)	(0.089)
Constant	0.500***	0.504***	0.509***	0.512***	0.439**	0.442**
	(0.091)	(0.099)	(0.099)	(0.167)	(0.182)	(0.183)
n	667	656	656	667	656	656
R^2	0.104	0.105	0.105	0.091	0.092	0.092

Notes: This table shows the regression results of bank efficiency measures on IPO selection and dynamic indicators, controlling for bank type, size, risk attitude, business orientation and year fixed effect (not reported here), which are measured with bank type dummies, logarithm of total assets for year $t-1$, logarithm of bank capital asset ratio, fee-based asset share and year dummies, respectively. Variable definitions are reported in Table II. SEs are in parentheses. *,**,***Significance at the 10, 5 and 1 percent levels, respectively

Table VI.
IPOs and bank efficiency

received capital injection from the government and transferred significant portions of their NPLs to state-owned asset management corporations before they became publicly listed.

With respect to the dynamic effects of public listing, none of the coefficients are statistically significant, regardless of the regression specifications (dynamic dummies or time variables) or measures of bank efficiency. The results indicate that bank efficiency did not improve after going public, either in the short term or in the long term. These findings are consistent with those by Lin and Zhang (2009), who do not observe dynamic effect of ownership change on bank performance that is measured with financial ratios. The insignificant dynamic effects of Chinese bank IPOs may be explained by two reasons. First, banks that go through IPOs usually outperform those that do not prior to IPOs (the selection effect). As is argued by Lin and Zhang (2009), it is more difficult to improve bank efficiency of better banks than to improve the performance of worse banks. Second, the improvement of bank efficiency takes time. The time might be too short to expect significant efficiency gain as most of the publically listed banks in China went public after 2005.

We control for bank type by including bank type dummies in our regressions and exclude state-owned banks (Big Four) as the base case. Table VI shows that joint-stock banks, city commercial banks and foreign banks are all significantly more efficient than state-owned banks (Columns (1)-(6)). With bank size being controlled with one

year lag of the logarithm of total assets, we fail to find significant relationship between bank efficiency and size. Table VI also reports that bank capital ratio is negatively associated with bank TE score and rank. In the literature, bank capital ratio is considered as a measurement of a bank's attitude toward risk, with higher ratio implying less risk tolerance of a bank. The negative relationship we observe here suggests that banks that are reluctant to take risk maintain a higher level of capital and are less efficient than those that are more willing to take risk. Bank business structure is controlled with fee-based asset ratio. With the development of banking system, more products are offered by banks than the traditional deposit-taking-and-loan-making business, such as investment banking, insurance and credit card, etc. With all specifications and efficiency measurements, we find that banks that rely more on fee-generating business are less efficient than those that focus more on the traditional loan-making business.

Although the regression analysis discussed above suggests no dynamic effect of bank IPOs in general, that is, post-IPO bank efficiency is not significantly different from pre-IPO performance, it does not provide year by year information about the performance around the year of IPO. Next we examine the effects of IPOs on bank performance by comparing a bank's performance between the year before IPO (Year −1), of IPO (Year 0) and the first three years after IPO (Years +1, +2 and +3).

The change in efficiency of the issuing banks is measured relative to Year −1. We measure the change in bank efficiency as the median change in efficiency measures, i.e., the median value of $\{efficiency_i(t) - efficiency_i(-1)\}$, where i represents the bank, −1 represents the year prior to the IPO, and t represents a post-IPO year end. Table VII reports the median changes in bank efficiency for different time windows. Panel A of Table VII shows that the median changes of bank efficiency are −0.092 and −0.080 for Years 0 and +1 relative to Year −1, which are significantly different from zero at the 1 and the 5 percent levels, respectively. The median changes of bank efficiency are −0.027 and 0.010 for Years +2 and +3 relative to Year −1, but they are not statistically significant. This result indicates that bank efficiency deteriorates after going public relative to the year prior to IPO, especially in Years 0 and +1. For the

Measure of operating performance	Year relative to completion of IPO From −1 to 0	From −1 to +1	From −1 to +2	From −1 to +3
Panel A: technical efficiency score				
Median level in year −1 = 0.685				
Median change	−0.092***	−0.080**	−0.027	0.010
Number of observations	11	9	9	9
Panel B: technical efficiency rank				
Median level in year −1 = 0.620				
Median change	−0.211***	−0.281***	−0.084**	−0.100
Number of observations	11	9	9	9

Notes: This table reports the efficiency changes of the IPO banks in China. Although there are 16 Chinese banks that have gone public at the end of the sample period, due to missing data, the number of IPO banks we can use to investigate the performance change before and after IPO varies from nine to 11. We compare efficiency measures from the year immediately before IPO to the three years after the IPO event. Year −1 is the year prior to the year of IPO. The significance tests are based on the Wilcoxon signed rank test. *,**,***Significance at the 10, 5 and 1 percent levels, respectively

Table VII.
IPOs and bank efficiency changes in China

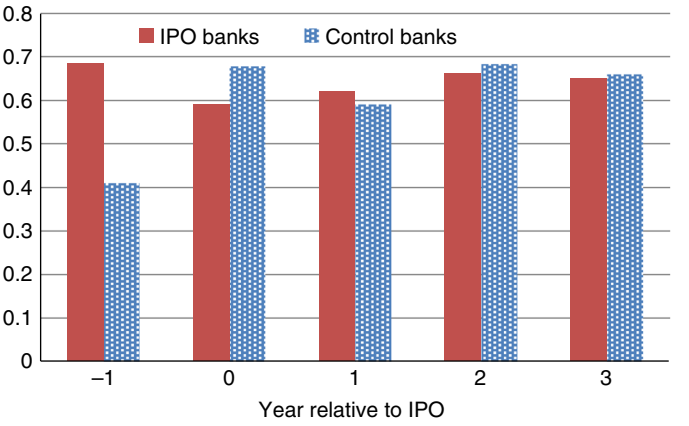
second and third year, bank efficiency scores are not significantly different from the pre-IPO performance.

With TE rank as the measure of bank efficiency, Panel B of Table VII shows similar results. The median changes in efficiency rank are −0.211, −0.281 and −0.084 for Years 0, +1 and +2 relative to Year −1, all significantly different from zero at either the 1 or the 5 percent level. The median change in efficiency rank for Year +3 is −0.100, but not statistically significant. This provides additional evidence that bank performance decline relative to their pre-IPO levels for years immediately after their IPOs. Both panels of Table VII show that bank performance improves gradually and reaches their pre-IPO level in Years +2 or +3.

Although the results reported in Table VII suggest that bank efficiency of IPO banks deteriorates for the first few years after IPO and picks up in later years, it is not clear whether this path is due to general industry trend or specific for the IPO banks. Loughran and Ritter (1995) match each IPO firm with a control firm of similar size. As it has been documented in the literature that bank ownership is an important determinant of bank efficiency, we match each IPO bank with a counterpart based on bank size and ownership structure. Specifically, a bank with total assets closest to the IPO bank and same ownership type at the end of the IPO year is selected as the matched control bank, e.g., a joint-stock IPO bank is matched with a joint-stock bank that has the closest total assets with the IPO bank and is not publically listed during the IPO event window, i.e. Years −1 to +3. Presented in Figures 1 and 2 are the median levels of bank efficiency measures (TE score or rank) for the IPO banks and their industry counterparts for Years −1 to +3. In Figure 1, the median levels of bank efficiency score are illustrated for the IPO banks and the control sample. It shows that the performance of IPO banks declines substantially for Year 0 from Year −1, then improves gradually for the next three years compared to Year 0, although the performance is still not up to the pre-IPO level at the end of Year +3. However, Figure 1 shows a different picture for the control banks. We do not observe any obvious trend for the control banks from Year −1 to Year +3. It is noteworthy that the IPO banks substantially outperform their counterparts for Year −1, yet underperform their counterparts for Year 0 due to the pronounced decline in bank efficiency of IPO banks and improved performance of the control banks. For the next three years following the IPOs, the IPO banks have similar performance as their counterparts.

With efficiency rank as the measure of bank performance, Figure 2 shows the same pattern that the IPO banks' performance decline substantially from Year −1 to Year 0, while their industry counterparts gain efficiency for the same time period. IPO banks outperform their counterparts prior to IPO, but underperform the control bank at the year of IPO. For the next three years from Year +1, the IPO banks' efficiency is higher relative to that at Year 0, but still lower than the pre-IPO level, while the control group's efficiency is lower relative to that at Year 0, but substantially higher than the pre-IPO level.

In summary, Figures 1 and 2 suggest that the IPO banks' performance as measured with TE score or rank is significantly better than that of their industry counterparts for Year −1, but worse for Year 0. The IPO banks lose efficiency from Year −1 to 0, although their industry counterparts gain efficiency over the same time horizon. For the years subsequent to Year 0, the IPO firms do not significantly outperform or underperform their industry counterparts. This suggests that the efficiency change path we observe, i.e., the exceptional pre-IPO performance and subsequent efficiency loss in the early years immediately after IPOs, is not because of industry trend, but

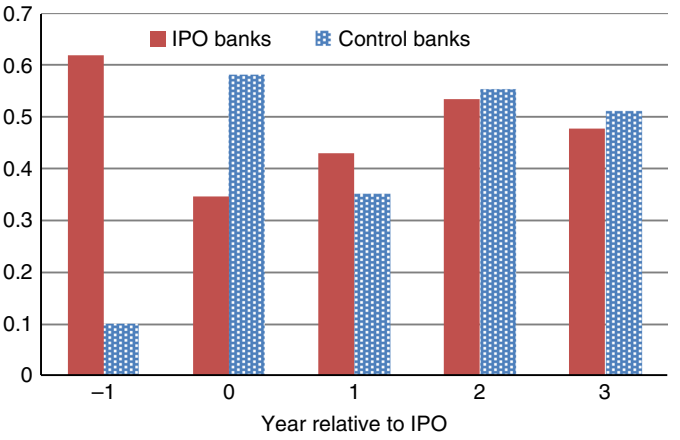


Notes: This chart displays the median level of technical efficiency scores for the IPO banks in China from 1999 to 2010 and their industry counterparts for Years –1 to +3 relative to the IPO. Technical efficiency score is estimated with stochastic frontier approach and production function. It measures the performance of a bank relative to the best-practice frontier, with higher values representing better performance. The solid bars represent IPO banks, while the shaded bars represent the control group of banks that match the IPO banks based on bank size and ownership type. The IPO banks are matched with an industry counterpart based on bank size which is measured with total assets and bank ownership type at the time of IPO, e.g., an IPO bank that is a joint-stock bank is matched with a counterpart that is also a joint-stock bank and has the similar bank size at the time of its IPO. The counterpart bank must not be publically listed in the event window of Years –1 to +3 relative to the IPO

Figure 1.
Technical efficiency

specific to the IPO banks. We investigate the efficiency change path with median instead of mean as reported in Table VII and Figures 1 and 2 because efficiency measures may be skewed and the mean is particularly sensitive to outliers. For robustness check purpose, we also use the mean and obtain similar results as that with the median.

The observed superior pre-IPO performance may be explained by the window-dressing hypothesis, which states that managers might attempt to window-dress their accounting numbers prior to going public. By pumping up pre-IPO earnings, managers manipulate investors' beliefs so as to attract more investors and sell their stocks at higher prices (Jain and Kini, 1994). As the efficiency measures we use in this study are estimated with a production function and a SFA, and the before-tax profit is the output in the production model, the inflated earnings prior to IPOs can lead to the overstated pre-IPO performance and understated post-IPO performance. Another explanation for the decline in bank performance is that managers may time their issues to coincide with periods of unusually good performance levels that cannot be sustained in the future. The third possible explanation for the findings is the agency problem described in Jensen and Meckling (1976), which argues that agency costs might increase when a firm makes the transition from private to public ownership. As the public offering



Notes: This chart displays the median level of technical efficiency rank for the IPO banks in China from 1999 to 2010 and their industry counterparts for Years −1 to +3 relative to the IPO. Technical efficiency rank is derived from technical efficiency score which is estimated with stochastic frontier approach and production function. Technical efficiency scores are ranked in ascending order for a year and converted to a uniform scale over [0, 1]. Technical efficiency rank measures the percentage of other banks that have efficiency level lower than the bank, with higher values representing better performance relative to the industry. The solid bars represent IPO banks, while the shaded bars represent the control group of banks that match the IPO banks based on bank size and ownership type

Figure 2.
Technical efficiency rank

reduces the ownership of original owners, managers have more incentive to increase perquisite consumption and/or invest the proceeds from IPOs into non-value-maximizing projects. In addition, from Figures 1 and 2, we observe the worst performance at Year 0. This may be due to the costs associated with IPOs such as legal fees, consultant expenses, due diligence costs, etc. that are incurred in the year of the IPOs.

4. Summary and conclusions

We investigate the effects of IPO on bank performance in China. We follow the SFA to measure bank performance. Our regression analysis finds support for the selection effects documented in the literature: banks that are chosen to go public are significantly more efficient than those that are not selected. However, we find no dynamic effects of public listings, that is, IPO banks do not gain efficiency after their IPOs, either in the short or the long run.

We also find that state-owned banks (Big Four) are the least efficient bank category compared to joint-stock banks, city commercial banks and foreign banks. Bank size does not matter to bank efficiency; banks that are more willing to take risk and maintain lower capital are more efficient. We use the share of fee-generating assets in total assets as a measure of a bank's business orientation and find that banks that rely more on fee-generating business are less efficient in China.

We compare performance between the IPO banks and their industry counterparts at different times: the year prior to IPOs, the year of IPOs and each of the first three years after IPOs. We observe that the IPO banks significantly outperform their industry counterparts which match the IPO banks based on bank size and ownership type in the year before their IPOs (Year −1). This is consistent with the results we find from the regression analysis (the selection effects). However, the superior performance of the IPO banks disappears upon their IPOs, especially for the year of IPOs (Year 0) when the IPO banks' performance is significantly worse than the control banks. However, for the first three years after IPOs, the performance of the IPO banks improves relative to Year 0, but the efficiency levels are still not up to the pre-IPO performance. Compared with the industry counterparts, the IPO banks' performance is not significantly different from their counterparts for Years +1 to +3. The IPO banks' worst performance in Year 0 might be attributable to the one-time expenses related to the IPOs. The generally poor post-IPO performance is consistent with some of the studies in the literature, and could be explained by the window-dressing hypothesis, timing hypothesis and/or agency theory, although we cannot pinpoint exactly the specific theory to explain the phenomenon observed in this study[7].

Although the effect of privatization on bank performance has been well documented in the literature, the performance of the IPO banks in China is still understudied. There are a few studies addressing the relationship between governance changes and bank performance in China, but the coverage of IPO banks is very limited as their sample period is not beyond 2005 while most of the IPO banks are listed after 2005[8]. This study supplements the existing literature by providing more recent evidence on the effects of IPOs on bank efficiency with a more comprehensive data set. Furthermore, no study in the literature examines the detailed performance change around IPOs. We fill in this gap in our study and find that bank performance deteriorates for the first three years immediately after their IPOs. Our study adds additional evidence to literature on the effect of IPOs on bank performance in China and provides some insights to the policy makers, bank regulators and investors.

Notes

1. See Berger *et al.* (2009), Lin and Zhang (2009), Jiang *et al.* (2009) and Yao *et al.* (2007) for detailed description of the development of China's banking system.
2. Some other examples of country case studies are Beck *et al.* (2005) for Nigeria, di Patti and Hardy (2005) for Pakistan and Haber (2005) for Mexico.
3. Different from some of the studies in the literature (e.g. Lin and Zhang, 2009), we do not include the static effects of IPOs in our analysis because all Big Four have gone public during the sample period, while static effects refers to the performance difference among banks that have no change in governance over the sample period.
4. There are several different assumptions on the distribution of u_{it}, such as half-normal, truncated normal and exponential. There is no discussion in the literature on which distribution assumption is better, although half-normal distribution is most often used.
5. See Yin *et al.* (2013) and Berger *et al.* (2009) for some examples.
6. As Shenzhen Development Bank Co. Ltd was first listed in 1991, it cannot be included in the analysis of the dynamic effects of IPO on bank performance. Similar issue exists with Shanghai Pudong Development Bank, which was first listed in 1999.

7. Jain and Kini (1994) observe that earnings per share decline with time; Loughran and Ritter (1995) also document poor performance of the IPO firms.
8. See Lin and Zhang (2009) and Jiang *et al.* (2009) for examples.

References

Aigner, D.J., Lovell, C.A.K. and Schmidt, P. (1977), "Formulation and estimation of stochastic frontier production functions", *Journal of Econometrics*, Vol. 6 No. 1, pp. 21-37.

Beck, T., Cull, R. and Jerome, A. (2005), "Bank privatization and performance: empirical evidence from Nigeria", *Journal of Banking & Finance*, Vol. 29 No. 8, pp. 2355-2379.

Berger, A., Clarke, G.R.G., Cull, R., Klapper, L. and Udell, G.F. (2005), "Corporate governance and bank performance: a joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership", *Journal of Banking and Finance*, Vol. 29 No. 8, pp. 2179-2221.

Berger, A.N. and Humphrey, D.B. (1997), "Efficiency of financial institutions: international survey and directions for future research", *European Journal of Operational Research*, Vol. 98 No. 2, pp. 175-212.

Berger, A.N., Hasan, I. and Zhou, M. (2009), "Bank ownership and efficiency in China: what will happen in the world's largest nation?", *Journal of Banking & Finance*, Vol. 33 No. 1, pp. 113-130.

Boubakri, N., Cosset, J., Fischer, K. and Guedhami, O. (2005), "Privatization and bank performance in developing countries", *Journal of Banking and Finance*, Vol. 29 No. 8, pp. 2015-2041.

Clarke, G., Cull, R. and Shirley M. (2005), "Bank privatization in developing countries: a summary of lessons and findings", *Journal of Banking and Finance*, Vol. 29 No. 8, pp. 1905-1930.

Degeorge, F. and Zeckhauser, R. (1993), "The Reverse LBO decision and firm performance: theory and evidence", *Journal of Finance*, Vol. 48 No. 4, pp. 1323-1348.

di Patti, E.B. and Hardy, D.C. (2005), "Financial sector liberalization, bank privatization, and efficiency: evidence from Pakistan", *Journal of Banking and Finance*, Vol. 29 No. 8, pp. 2381-2406.

Haber, S. (2005), "Mexico's experiments with bank privatization and liberalization, 1991-2003", *Journal of Banking and Finance*, Vol. 29 No. 8, pp. 2325-2353.

Houge, T. and Loughran, T. (1999), "Growth fixation and the performance of bank initial public offerings, 1983-1991", *Journal of Banking and Finance*, Vol. 23 No. 8, pp. 1277-1301.

Jain, B.A. and Kini, O. (1994), "The post-issue operating performance of IPO firms", *The Journal of Finance* , Vol. 49 No. 5, pp. 1699-1726.

Jensen, M.C. and Meckling, W. (1976), "Theory of the firm: managerial behavior, agency costs and ownership structure", *Journal of Financial Economics*, Vol. 3 No. 4, pp. 306-360.

Jiang, C., Yao, S. and Zhang, Z. (2009), "The effects of governance changes on bank efficiency in China: a stochastic distance function approach", *China Economic Review*, Vol. 20 No. 4, pp. 717-731.

Kao, J.L., Wu, D. and Yang, Z. (2009), "Regulations, earnings management, and post-IPO performance: the Chinese evidence", *Journal of Banking and Finance*, Vol. 33 No. 1, pp. 63-76.

Lin, X. and Zhang, Y. (2009), "Bank ownership reform and bank performance in China", *Journal of Banking and Finance*, Vol. 33 No. 1, pp. 20-29.

Loughran, T. and Ritter, J. (1995), "The new issues puzzle", *Journal of Finance*, Vol. 50 No. 1, pp. 23-51.

Meeusen, W. and Van den Broeck, J. (1977), "Efficiency estimation from Cobb-Douglas production functions with composed error", *International Economic Review*, Vol. 18 No. 2, pp. 435-444.

Ritter, J.R. (1991), "The long-run performance of initial public offerings", *Journal of Finance*, Vol. 46 No. 1, pp. 3-27.

Yao, S., Jiang, C., Feng G. and Willenboackel, D. (2007), "WTO challenges and efficiency of Chinese banks", *Applied Economics*, Vol. 39 No. 5, pp. 629-643.

Yin, H., Yang, J. and Mehran, J. (2013), "An empirical study of bank efficiency in China after WTO accession?", *Global Finance Journal*, Vol. 24 No. 2, pp. 153-170.

Further reading

Tang, S. (2005), "Review and outlook of China's banking reforms", speech at the *Caijing Magazine* Leadership Forum, world and China.

Teoh, S., Welch, I. and Wong, T.J. (1998a), "Earnings management and the long-run market performance of initial public offerings", *Journal of Finance*, Vol. 53 No. 6, pp. 1935-1974.

Teoh, S., Wong, T.J. and Rao, R. (1998b), "Are accruals during initial public offerings opportunistic?", *Review of Accounting Studies*, Vol. 3 Nos 1-2, pp. 175-208.

Corresponding author
Dr Haiyan Yin can be contacted at: haiyin@iusb.edu