The Determinants of Bank Performance in China

July, 2008.

Abstract

China's banking system has undergone gradual reform since 1978, with a view to improving efficiency and resource allocation. Recent reforms have focused on allowing banks to list some shares on domestic and foreign exchanges, greater foreign equity participation in Chinese banks, and the establishment of new rural financial institutions. To assess whether these objectives have been achieved, this study looks at how well different types of Chinese banks have performed between 1999 and 2006, and tests for the factors influencing performance. It also evaluates four measures of performance to identify which one, if any, is superior. The independent variables include the standard financial ratios, those which reflect more recent reforms (listing, bank type, the extent of foreign ownership) and macroeconomic variables. The results suggest economic value added and the net interest margin do better than the more conventional measures of profitability, namely ROAE and ROAA. Some macroeconomic variables and financial ratios are significant with the expected signs. Though the type of bank is influential, bank size is not. Neither the percentage of foreign ownership nor bank listings has a discernable effect.

Keywords: performance measures, bank reforms, foreign ownership, listing, corporate governance

JEL Classification: G21, L25

ACKNOWLEDGEMENTS

The authors thank delegates for comments received at the Emerging Markets Group conference on International Finance, Cass Business School, City University, London (May, 2008), and the Infiniti Conference, Trinity College, Dublin (June 08). We are especially grateful for input from Claudia Giradone, John Simpson, Peter Sinclair, Huainan Zhao and Ning Zhu. All errors are the responsibility of the authors.

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1. Introduction

Since 1978, the Chinese economy has been the subject of well-documented economic reforms, designed to improve economic efficiency and resource allocation. China's banking sector also experienced regulatory changes. A two tiered banking system was introduced in 1979 with the creation of four specialized state banks that were not directly controlled by either the central bank or Finance ministry. In 1994, they were converted into state-owned commercial banks. A legal framework for bank supervision was established in 1995 when two laws[1] defined the major responsibilities of the central bank and the scope of business for commercial banks. A variety of new bank types were created, including the national joint-stocks and city commercial banks, urban and rural credit cooperatives, joint ventures, and foreign banks. To improve financial services in the country-side, three rural commercial banks were set up in 2001 (followed by another 9 between 2004 and 2007), together with 80 rural cooperative banks. Two national joint stocks listed some of their shares from as early as 1991 though the majority took place in the new century, when listing was extended to include state-owned and city commercial banks.

Contemporaneously China joined the WTO in 2001, with a commitment to open up its banking markets to foreigners by the end of 2006. Since December 2003, the China Banking Regulatory Commission has allowed foreign banks to own up to 25% of a Chinese financial institution but if their equity participation exceeds 25%, they are designated foreign/joint-venture banks.[2] At the end of 2006, there were six wholly owned foreign and five joint venture banks. Since 2005, foreigners can buy a limited number shares in three of the four big state-owned banks (marking their partial privatization - the government continues to hold controlling stakes), which were listed on the Hong Kong and Shanghai stock exchanges.[3] In addition foreign firms have purchased minority stakes in national and regional/city commercial banks. By allowing foreign

[1] The Central Bank Law and Commercial Bank Law.

[2] The equity participation of a single overseas financial institution in a Chinese cannot exceed 20 per cent. Source: China Banking Regulatory Commission (2003).

[3] Prior to these changes, the big four state owned banks had high percentages of non-performance loans (NPLs) stemming largely from loans made to state-owned enterprises. In 1997, they were re-capitalised via the issue of special government bonds (CNY270 bn or $32.5 bn), and their NPLs were transferred to 4 asset management companies. $60 bn drawn from foreign exchange reserves were injected into the 3 of the big 4. The Bank of China and China Construction Bank each received $22.5 bn in 2003; $15 bn went to the Industrial and Commercial Bank of China in 2005. For more detail on bank reforms, see Berger et al. (2008), Fu and Heffernan (2008).

bank entry, the Chinese government hopes to improve bank performance in addition to satisfying WTO conditions.

At the first two National Financial Work Conferences[4] in 1997 and 2002, policymakers emphasised the need to improve bank performance through reform. Thus, an important issue is what drives the performance of Chinese banks, and whether the increased pace of certain reforms (especially foreign equity investment, bank listing, and the growth in the number of rural commercial financial institutions make a positive contribution. This study seeks to address three key questions. What variables influence the performance of China's banks? Did the bank reforms noted have a notable influence on performance? Finally does the model improve if economic value added (EVA) is used as the performance measure rather than more standard measures of profitability such as Return on Average Assets (ROAA) or Return on Average Equity (ROAE)?

In the literature, there are two separate approaches to assess bank performance. The first focuses on parametric and nonparametric methods to estimate profit and cost X-efficiency frontiers such as data envelope analysis (DEA) or stochastic frontier analysis (SFA). Surveys can be found in Berger and Humphrey (1997) and Williams and Gardener (2003). These techniques have also been applied to emerging markets. See for example, Bonin et al. (2005) on the transition economies and for Pakistan, Bonaccorsi di Patti and Hardy (2005). Both studies find state owned banks to be the least efficient and foreign owned banks the most efficient.[5]

For China, SFA is employed by Berger et al. (2008), Fu and Heffernan (2007) and Yao et al (2007), though each paper differs in it objectives. Berger et al. (2008) estimate cost and profit efficiency frontiers to assess relative efficiency and the influence of minority foreign ownership of Chinese banks during the period 1994-2003. Covering 94% of Chinese banking assets,[6] they find the big four (wholly state-owned at the time) to be the least efficient, possibly due to a combination of poor revenues and a high percentage of non-performing loans. Minority foreign

[4] The National Financial Work Conference (NFWC). It met three times, in 1997, 2002, and 2007. Organized by the State Council, the NFWC brings together key financial and political leaders from the National Development and Reform Commission, the Ministry of Finance, the People's Bank of China, regulatory and financial institutions, various ministries, provinces and municipalities. New policy and major targets are proposed for the next economic period - usually 5 years. For example, the decision to inject capital into 3 of the big 4 banks was taken at the meetings held in 1997 and 2002.

[5] Bonaccorsi di Patti and Hardy (2005) also report that new private domestic banks out performed foreign owned banks in some cases.

[6] The big four, 9 of 11 national joint-stocks, 16 city commercial banks (out of 113 at year end 2003), 6 joint-venture banks, and 2 foreign banks.

ownership is associated with higher profit and cost efficiency. Fu and Heffernan (2007) investigate cost X-efficiency for a panel of 14 key banks (1985-2002), to assess whether different ownership types and banking reforms affect X-efficiency. On average, the joint-stocks are found to be more X-efficient than the state-owned commercial banks.

Yao et al. (2007) apply SFA to a panel of 22 banks (1995-2001) to estimate the effects of ownership structure and the implementation of a "hard" budget constraint on bank efficiency. Non-state banks are found to be 8-18% more efficient than state banks, and banks facing a hard budget constraint tend to perform better than those relying on substantial government capital injections. The clear message from all three studies is that state banks are relatively inefficient and somewhat protected by government initiatives. By contrast, Chen et al. (2005) use DEA to examine the cost, technical and allocative efficiency of 43 Chinese banks from 1993 to 2000. They find that the large state-owned and smaller banks are more efficient than medium sized banks, and financial deregulation in 1995 improves cost efficiency levels.

Two papers worthy of note depart from conventional methods. Shih et al. (2007) use principal components analysis to compare Chinese bank performance among the big four, joint-stock, and city commercial banks using cross-section data for 2002. Mid-size joint-stocks perform significantly better than state-owned and city commercial banks. There is no evidence that bank size has a positive effect on performance. Lin and Zhang (2008) estimate the effect of bank ownership on the performance of 60 Chinese banks (state owned, policy, joint stocks, city commercials and joint ventures) from 1997 to 2004. The big four are found to be less profitable, less efficient, and have worse asset quality than the others, with the exception of three policy banks.[7] Banks subject to a foreign acquisition or public listing demonstrate better pre-event performance but bank size, foreign acquisition, and/or listing have little impact on return on assets (ROA), return on equity (ROE), the cost to income ratio and non-performing loans to total assets.

The second strand of the literature considers the determinants of bank profitability, usually measured by ROA, ROE and in some cases, the net interest margin. They include bank financial ratios, regulatory changes and in a few cases, macroeconomic variables. Goddard et al. (2004)

[7] The three policy banks were created to promote China's development objectives (e.g. infrastructure) and unlike the other banks, are not expected to maximize profits. They are funded via the PBC and state bond issues.

study the performance of European banks across six countries. They find a relatively weak relationship between size and profitability - measured by ROE. Only British banks show a significantly positive relationship between off-balance-sheet business and profitability. However, there is significant persistence of cumulative abnormal returns even though competition among banks is thought to have increased over the period, 1992-1998.

Molyneux and Seth (1998) look at the performance of foreign banks in the United States (1987-91) and find the risk adjusted capital ratio to be a key determinant of these banks' performance. Williams (2003) considers the determinants of the performance of foreign banks in Australia for the period 1989-93. With ROA as the dependent variable, the main finding is that foreign banks with a full Australian license have a significantly lower market share. The coefficients that are significantly positive include a foreign banks' home country GDP growth, and the Australian net interest margin and non-interest income.

Bonin et al. (2005) estimate the effects of three ownership (strategic foreign, majority foreign, and state) variables on bank performance for eleven transition countries in an unbalanced panel of 225 banks, from 1996-2000. None is significant when ROA is the dependent variable, which, they reason, is because such measures provide mixed signals about bank performance, given the undeveloped and evolving nature of the banking sector in transition economies. Naceur and Goaied (2001) study the performance of Tunisian deposit banks (1980-95). Productivity, capitalization, and portfolio composition are significant and positively related to ROA, but not the size of the bank. Using co-integration techniques, Chirwa (2003) looks at eight banks in Malawi (1970-84) and finds a significantly positive long run relationship between concentration and performance; similarly for demand deposits.

Our study applies the second approach to a large unbalanced sample using annual data (1999-2006) from 96 Chinese banks – the big 4, 13 national joint stocks, 51 city commercials, and 8 rural commercials. Economic value added is employed as a dependent variable in addition to the standard measures of profitability, Return on Average Assets (ROAA) and Return on Average Equity (ROAE) and Net Interest Margin (NIM). Put simply, economic value added (EVA) is a value-based performance measure which includes a charge for the opportunity cost of capital, and as such measures whether shareholders gain from positive value added over time. According to Weaver (2001), EVA links economic, accounting and shareholder returns.

Our findings can be summarised as follows. The system GMM model is the superior method for estimating this panel. Economic value added and the net interest margin are the best measures of performance. Significant positive determinants of Chinese bank performance include efficiency and loan loss reserves but foreign equity investment had either no effect or significantly reduced performance, depending on which measure of profitability is used. Though bank size does not influence performance, the type of bank does - rural commercials have a positive average EVA over the period, and they significantly outperform the big four, the joint stocks, and city commercial banks, possibly because they operate as near local monopolies. Certain macroeconomic variables affect bank profits too.

The paper is presented as follows. Section 2 supplies more detail on economic value added as a measure of performance. Section 3 describes the econometric tests and data. Section 4 analyses the results, and section 5 concludes.

2. Economic Value Added as a Measure of Performance

The use of Economic Value Added as a measure of performance began with Stern, Stewart and Company (Stewart, 1991; Stern et al., 1995), an American consulting firm that claims to have developed (and trade marked) the EVA measure to improve the way companies could evaluate everything from business strategies to the relative performance of divisions. Much of the management accounting literature focuses on these areas. For example, O'Hanalon and Peasnell (1998) and Sheikholeslami (2001) look at EVA as a means of rewarding divisions that produce a positive EVA within the firm. EVA is also used to forecast stock market performance and investment decisions. Papers in this area include Farsio et al. (2002), Freedman (1998), Garvey and Milbourn (2000), and Griffiths (2006). Stern, Stewart and Co. has a database that ranks US firms according to EVA and other measures with a view to assisting with investment decisions.

Stouhgton and Zechner (2007) supply the economic foundations for economic value added, developing a theoretical model of optimal capital allocation with asymmetric information, and extend it to a multi-divisional firm, where managers are assessed based on the value they add to the firm. These authors define value added as:

$$EVA_i = \Sigma_i \mu_i(\sigma_i)\theta_i - r_D(\Sigma_i A_i \sigma_i - C_i) - r_E C_i \qquad (1)$$

where:

r_E : the cost of capital
r_D : the cost of debt or deposits

$\Sigma_i A_i \sigma_i$: total financing requirement
C_i: equity capital; the rest of the of the financing requirement is met by debt
$\Sigma_i \mu_i(\sigma_i)\theta_I$: the sum of cash flows over all divisions of the financial institution

The London Business School (LBS) and First Consulting (1992)[8] define value added as [(adjusted operating profits less a charge for shareholder equity) / (factor inputs)]. Data on 25 European banks between 1987 and 1990 show that in an average year, just five produce value added. Kay (1993) employ a similar definition to assess 11 European banks, with 8 showing a positive value added. Boyd and Gertler (1994) look at value added in the banking sector as a percentage of total value added by all financial intermediaries, using definitions and data from the US national income accounts from 1947-87. Banks are found to slightly increase their share of value added over the period.

Fiordelsi (2007) develops a shareholder value efficiency frontier, using EVA. Based on data from France, Germany, Italy, and the UK (1997-2007), he concludes it is superior to either relative cost or profit efficiency measures of performance. On average, banks from these countries are 36% value inefficient. While the approach is interesting, it is beyond the scope of this paper to compare similar measures for China.

Millar (2005) is the only study that compares EVA with the better-known performance measures, ROAA and ROAE, for 16 British banks over the period 1998-2003. He uses the LBS definition of EVA. Millar finds that on average, the UK banks add value over this period, which could be due to low yields on 10 year government bonds and a period of relatively strong economic growth in the UK, which boosted banks' profits.

Using panel data and a fixed effects model, Millar's GLS regressions suggest EVA does better overall than either ROAA or ROAE when employed as the dependent variable. Much lower t-ratios are found for the conventional measures, and their overall fit (measured by adjusted R^2) is only slightly better – 99% as compared to 94% for the EVA equation. Furthermore, with EVA as the dependent variable, inflation, real GDP growth, unemployment, and the output gap are found to be significant with the expected signs, whereas no macro variable has any explanatory power in the ROAA/ROAE regressions. Thus bank performance appears to improve in an environment of low inflation, zero output gap (on average), falling employment, and rising GDP growth rates.

[8] As reported in *The Economist* (1992).

The cost to income ratio (a significantly negative coefficient) and net interest margins (positive and significant) are the financial ratios that do best in all estimations. The number of branches improved performance but the capital adequacy coefficient is significantly negative. The size coefficient, measured by total assets, is significantly negative in the ROAA/ROAE regressions, suggesting smaller banks perform better.

There do not appear to be any published studies on the use of EVA in emerging markets. One contribution of our study is to compute the EVA for Chinese banks and test for the determinants of bank performance using ROAA, ROAE, NIM, and EVA as dependent variables. The next section explains the methodology and dataset.

3. Methodology and Dataset

3.1 Economic Value Added

Though the theoretical concept of economic value added is straightforward, actually measuring it is more controversial, at least in the management accounting literature. Weaver (2001) reports that in a survey of Stern, Stewart and Company clients, not one of the respondents[9] measures EVA in exactly the same way, even though they hold a consistent view of its meaning. In particular, there is pronounced disparity in key measures such as net operating profit after tax and the components of the capital charge.

In light of Weaver's finding, and to ensure comparability with ROAA and ROAE, we employ the LBS-First Consulting (1992) bank value added formula together with adjustments recommended by Uyemura et al. (1996):

$$EVA_{i,t}=(\text{operating profits after tax}_{i,t} - \text{capital charge}_{i,t})/\text{factor inputs}_{i,t} \qquad (2)$$

where:

$\textit{capital charge}_{i,t}$ = $\text{capital}_{i,t}$ * cost of $\text{capital}_{i,t}$
$\textit{factor inputs}_{i,t}$ = operating $\text{costs}_{i,t}$ + interest $\text{costs}_{i,t}$

EVA is normalised by factor inputs[10] to minimise possible heteroskedasticity and scale effects in the model.

[9] Weaver (2001) reports a response rate of 40%, or 29 firms.
[10] It is notable that no study in the management accounting literature adjusts for factor inputs. In the banking literature, only Fiordelisi (2007) standardizes EVA by capital invested.

The LBS - First Consulting (1992) add a 10% general risk premium to the "risk free" long-term government bond yield. Millar (2005) refines this measure somewhat by assigning AAA rated banks a 10% premium, then adding .25 for every drop in the rating. For China, the calculation presents a greater challenge because Fitch does not publicly rate the banks, and Capital Intelligence (CI) assigns ratings to only 10 banks, ranging from BBB to B.[11] However, Wang (2006) uses principal component analysis on 20 financial indicators to estimate a relative risk index for 118 Chinese banks, with scores between 0 (least risky) and 10 (high risk). The index covers a wide range of risks including liquidity, credit, capital, profit, and price risks. The advantage of this index is that it includes all 76 banks in the sample except for several new small banks. Thus, for this study, two benchmarks measure the cost of shareholder capital for bank *i* at time *t*:

$$Cost\ of\ Capital_{i,t} = BY_t + fixed\ risk\ premium + W\text{-}risk\ premium_i \qquad (3)$$

where:

BY_t: average (inflation adjusted) long-term government bond yield in year *t*

fixed risk premium: 10.5%, which is based on the 10% employed in the LBS study for European banks plus 50 basis points based on the CI ratings of 10 Chinese banks. The 50bp is obtained from the Basel II risk weight for banks rated from BBB to BBB- or 50%

W-risk premium: This is derived from Wang's original formula for the risk index:

$$(X_i - X_{min})/(X_{max} - X_{min}) * 10$$

where X_i is the risk score for a given bank *i*. Wang's index is divided by 10, and expressed as a percentage.

It should be stressed that EVA is a relative measure (as is the Wang index), so the apparent arbitrary nature of computing the cost of capital is not s serious concern.

3.2 Econometric Model

In the banking literature, fixed and/or random effects models are usually employed for panel data. However, a difficulty arises with these models when a lagged dependent variable (or possibly other regressors) is important, particularly in the context of few time periods and many observations (Nickell, 1981). Their coefficients may also be seriously biased if the regressors are correlated with the lagged dependent variable to some degree.

To address this problem, Arellano and Bond (1991) develop the difference GMM model by differencing all regressors and employing Generalized Method of Moments (Hansen, 1982).

[11] The CI rating in terms of domestic strength is applied here.

Arellano and Bover (1995) and Blundell and Bond (1998) augment the difference GMM model by developing the system GMM estimator which includes lagged levels as well as lagged differences. The system GMM estimator assumes that first differences of instrumental variables are uncorrelated with the fixed effects. It allows the introduction of more instruments, and can substantially improve efficiency.

Roodman (2006), among others,[12] argues that both difference and system GMM estimators are suitable for situations with "small T, large N" panels; independent variables that are not strictly exogenous; fixed individual effects; heteroskedasticity and autocorrelation among, in this study, individual banks. However, the difference GMM estimators can be subject to serious finite sample biases if the instruments used have near unit root properties. Use of the system GMM results in notably smaller finite sample bias and much greater precision when estimating autoregressive parameters using persistent series (Bond, 2002). Since the sample in this paper shares many of these features,[13] this study employs the system GMM model to assess the determinants of Chinese bank performance.

To establish an optimal lag length, the moment selection criteria and downward testing procedures developed by Andrews and Lu (2001) are employed. Based on the Hansen test statistics, the optimal lag is found to be one year.[14] The exogenous variables and the difference of the lagged dependent variable are used as instruments in the level equation; the lagged dependent variable is the instrument in the first-difference equation. Thus, each regressor appears in the

[12] Arellano and Bond (1991), Arellano and Bover(1995), Baltagi (2005), Baum (2006), and Bond (2002).

[13] Once lagged variables are introduced, the sample is reduced from 76 to 70 banks over 7 years (2000-2006), hence posing, potentially, a large N small T problem. Fixed individual effects could include the sample of banks sharing some time invariant factors such as certain organizational and ownership structures; Heteroscedasticity may be present because although the study only includes commercial banks, the differences among them is substantial, both in terms of size and business scope. For example, only the city and rural commercial banks are prohibited from setting up branches overseas. Autocorrelation could be a problem if current bank performance is correlated with past profitability to some degree. Or shocks affecting performance could be serially correlated and relative bank-specific factors (cost to income, capital to assets, etc) might respond to these shocks. Thus, though the coefficient on the lagged dependent variable is not of direct interest, allowing for dynamics in the underlying process may be crucial for recovering consistent estimates of other parameters.

[14] The limited number of banks in the study meant only two lags could be tested; otherwise, instruments would exceed the number of banks. The one lag model generated the lowest Hansen test statistic when the dependent variables are EVA, ROAA or NIM. The 2 lag specification is slightly better for ROAE, with the respective Hansen test statistics almost the same at 30.1 and 32.5. But the signs on the lagged ROAE coefficients are counter-intuitive: positive for ROAE lagged by one year, but negative when lagged by 2 years. On this basis, we proceed with the one lag model.

instrument matrix. Employing the system GMM approach, the reduced form estimating equation[15] for each performance measure is as follows:

$$Y_{i,t} = \alpha Y_{i,\,t-1} + \beta X_{i,t} + \gamma Z_{t-1} + (\mu_i + v_{i,t}) \qquad (4)$$

where:

$Y_{i,t}$: bank i's performance in year t, namely, $EVA_{i,t}$, $ROAA_{i,t}$, $ROAE_{i,t}$, and $NIM_{i,t}$, which are, respectively, economic value added, return on average assets, return on average equity, and the net interest margin.
$Y_{i,\,t-1}$: bank i's performance in year $t-1$, measured as above.
$X_{i,t}$: a vector of current values of bank-specific explanatory variables.
Z_{t-1}: a vector of lagged macroeconomic variables.
μ_i: an unobserved bank-specific time-invariant effect which allows for heterogeneity in the means of the $Y_{i,t}$ series across banks.
$v_{i,t}$: a disturbance term which is independent across banks.

A fixed effects panel data model is also estimated (despite its limitations), to allow comparison of results, and as a robustness check.

3.3 Data

The original sample includes 76 banking institutions based in China between 1999 and 2006. Though it includes banks with shareholders, only eight have publicly quoted shares.[16] The sample banks include the big four, 13 national "joint stock" commercials, 51 city[17] and 8 rural commercial banks. Eleven foreign banks (5 joint ventures and 6 wholly foreign owned banks at the end of 2006) are treated as branches for regulatory purposes, even though they are subsidiaries. They were dropped from the sample because over this period, they were restricted to offering foreign exchange facilities to foreign businesses operating in China, limiting their business scope and customer base.[18] Rural coops together with the urban and rural credit unions are also excluded.[19]

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[15] Arellano-Bond tests for AR(1) and AR(2) in first differences. The test for no second-order serial correlation of the disturbances of the first-differenced equation is important for the consistency of the GMM estimator. In addition, the Hansen (1982) *J* test for the joint validity of the moment conditions (the presence of over-identification) is crucial to the validity of GMM estimates.
[16] The listed banks include the Industrial and Commercial Bank of China, Bank of China Limited, China Construction Bank Corporation, China Merchants Bank Co. Ltd., China Minsheng Banking Corporation, Shanghai Pudong Development Bank, Hua Xia Bank, and Shenzhen Development Bank Co. Ltd.
[17] Out of a possible 113 city banks at the end of 2006.
[18] Even by the end of 2006, only a select number (3) were allowed to offer CNY denominated services and/or establish a limited number of branches. They continue to complain of discrimination.
[19] No data are available for urban credit unions; there are some data for just 2 rural coop banks (out of 80) and 3 rural credit unions (out of 19,348). They provide very basic banking services to local members. Based on average assets in 2006, the rural coops (CNY5.82 bn) and credit unions (CNY0.18bn) are much

Most of the data used here come from Bankscope – Fitch's International Bank Database. Some are collected from the various editions of the *Almanac of China's Finance and Banking, China Statistical Yearbook*, and the websites of the sample banks. The majority employ Chinese Accounting Standards (CAS). Only the joint ventures, foreign banks, and listed banks prepare financial statements based on International Accounting Standards (IAS). Any inconsistencies in CAS or IAS financial statements are relatively minor because CAS is modeled along the IAS principles. Furthermore, one of the stated goals of Bankscope is to produce comparable financial ratios across all banks, taking account of any differences in accounting standards.

These 76 banks cover 95% of total commercial banking assets. The number drops to 70 (265 observations) for the system GMM model because some variables are lagged. The big four state[20] commercial banks offer a full range of commercial banking activities. A similar range of bank services is supplied by the smaller national joint stocks to customers in the major/developed cities, the city commercials to local customers in their respective cities, and the rural commercials to agriculture and small and middle-size enterprises located in a particular area.[21] The city and rural banks are prohibited from having overseas branches, and the rural commercials are largely confined to CNY based services. The numbers of customers at year-end 2006 were roughly 1.4 million, 179,000, 114,000 and 20,000 for the respective types of bank.[22] Though the system appears somewhat segmented, city based customers can bank at the big four, the joint stocks or city commercials. Rural customers are largely dependent on the rural banks (or coops, which only offer a basic banking service) after the big four began closing rural outlets in 1999.

The dependent variables for bank *i* at time *t* are:

- $EVA_{i,t}$: economic value added, as explained in section 3.1.
- $ROAA_{i,t}$: return on average assets
- $ROAE_{i,t}$: return on average equity

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smaller than the city (CNY22.95 bn) and rural (CNY38.76 bn) commercial banks. Source: *Almanac of China's Finance and Banking*, 2007.

[20] Roughly 20% of shares are listed on the Hong Kong stock exchange for three of these banks, but they remain largely state-owned. The Agricultural Bank of China was confined to providing services to the rural sector but following reforms in 1999, it has been allowed to expand its customer base, on a par with the other state banks. According to the *Annual Report* of the China Banking Regulatory Commission (CBRC) the Bank of Communications was re-classified as a state commercial bank sometime in 2007.

[21] Since the end of 2006, a few (e.g. Bank of Beijing, Bank of Shanghai) have been allowed to establish branches in other cities/regions.

[22] Sources: www.cbrc.gov.cn and Bankscope.

- $NIM_{i,t}$: net interest margin or net interest income divided by average earning assets, and measures a bank's interest spread. In the West, NIM is usually dismissed as too narrow a measure because of the expansion into off-balance-sheet (OBS) activities. Although Chinese banks have OBS income, it is largely derived from the more traditional forms, such as income from service charges. In 2004, the ratio of net fee income to net operating income ranged from 5.45% to 8.85% for the big four and 2.49% to 7.35% for the joint stock banks.[23] Thus, their main focus is on asset-liability management.

The bank-specific independent variables include:

- *CI*: cost to income ratio. This is a measure of operational efficiency reflecting the cost of running the banks as a percentage of income. The higher this ratio the less efficient the bank will be, which should adversely affect bank profits, depending on the degree of competition in the market. But generally, a negative relationship with performance is expected.
- *EA*: equity/total assets. This measures the banks' ability to withstand losses. Banks with substantial EA ratios may be over-cautious, passing up profitable investment opportunities. Alternatively, a declining ratio may signal capital adequacy problems. Hence, the sign of the coefficient cloud be either positive or negative.
- *LIQ*: liquid assets/deposits plus short-term funding. A measure of liquidity, bank managers have to strike an optimal balance given the risk/return trade-off of holding a relatively high proportion of liquid assets. Too little liquidity might force the bank to borrow at penal rates from the interbank market and/or central bank, depending on its reputation. On the other hand, a high ratio could result in lost profitable investment activities, making the sign of the coefficient unclear.
- *LLR*: loan loss reserves/gross loans, the percentage of the total loan portfolio that has been set aside for bad loans. Higher provisioning signals the likelihood of possible future loan losses, though it could also indicate a timely recognition of weak loans by prudent banks. So the expected sign on this coefficient is ambiguous.
- *LOGTA*: natural logarithm of total assets. As a proxy for bank size, it assesses whether the size of the bank is related to performance. It is well known that small profitable banks exist, making the sign of the coefficient unclear.

[23] Other banks have even lower net fee income ratio due to fewer branch networks (Wang, 2006).

- *NLA*: net loans/total assets, or the percentage of assets that comprise the loan portfolio.[24] Higher ratios may be indicative of better bank performance because of increases in interest income. However, very high ratios could also reduce liquidity and increase the number of marginal borrowers that default. Again, its affect on bank performance is ambiguous.
- OIA: the ratio of other operating income to average assets. A proxy for off-balance-sheet (OBS) activities, it also provides an indicator on how much the bank has diversified away from the traditional intermediary function. A positive coefficient is expected.
- *DL*: a dummy for the listing of a bank's shares, 1 for listed bank, 0 otherwise. Research on corporate governance suggests listed firms which are monitored by (especially institutional) investors increase managerial accountability.[25] Thus, it is expected that the listed banks will outperform the non-listed banks.
- DB_i: dummy for type of bank: i = 1 (big 4), 2 (national joint stocks); 3 (city commercials), 4 (rural commercials); 0 otherwise. This bank dummy variable will provide a measure of the relative performance of the four bank types. The time invariant nature of the bank type dummies means they are only tested in the system GMM model.
- *FEI*: the percentage of foreign equity investment in a bank. Again, on the assumption that foreign investors will monitor their investment, banks are expected to be more efficient, and perform better than those with little or no foreign equity participation.

In view of the earlier discussion on recent reforms DL, DB, and FEI are treated as the key indicators of recent reforms.

The macroeconomic explanatory variables are lagged by one year on the assumption that it will take time for their effects to filter through to customers and banks. They include:

- INF_{t-1}: annual inflation rate. This measures the overall percentage increase in the consumer price index for all goods and services. The People's Bank of China uses interest rates to target inflation. They are increased if inflation is expected to rise, to reduce expenditure and borrowing by firms and households, which could raise default rates. Both will affect a bank's performance adversely.
- $RGDP_{t-1}$: annual real GDP growth rate - the growth of China's total goods and services adjusted for inflation. The greater demand for bank services coupled with a lower risk of default on loans in periods of real GDP growth should mean the coefficient is positive.

[24] Net loans equal gross loans minus loan loss reserves.
[25] See, among others McConnell and Servaes (1990) and Shleifer and Vishny (1986).

- U_{t-1}: annual unemployment rate. Rising unemployment could reduce aggregate demand and increase the loan default rate, so a negative sign is expected.

In addition, an annual time trend (TT) was added to ensure these macroeconomic variables are not masking an omitted time trend, which will be confirmed if the TT coefficient is insignificant and those on at least one of the macro variables is significant. Table 1 summarises the descriptive statistics for all variables used in the study.[26] It shows that about 10% of the sample banks are listed. Roughly 15.5% are foreign owned though the average for the sample as a whole is 2.28%. The correlation matrix is reported in the appendix table A1.

(Table 1 inserted here)

Chart 1 reports the mean of the four performance measures by bank type. The average performance of each bank group is roughly the same for NIM and ROAA, but there are notable differences for ROAE – the rural commercial banks average 25%, compared to the big 4, which are just under 5%, while the joint stocks and city banks average 13 and 11%, respectively. On average, With the exception of the rural commercials, China's banks did not add value to their shareholders over the period. Two of the big 4, six joint stocks and eight city commercial banks have a slight value positive value added (ranging from 0.010 to 0.17) in certain years but they are very much the exception. Though the average EVA is positive for the rural banks (due to higher net income) two had negative average EVAs (-0.06 and -0.22), and one had a negative EVA at the beginning and end of the period. These findings are consistent with most studies on European banks. Fiordelisi (2007), among others, reports negative average EVAs for banks in France, Germany, Italy and UK. There is no discernable upward trend in any of these measures: most banks do well in some years but worse in others.

(Chart 1 inserted here)

4. Analysis and Discussion of Econometric Results

Table 2 reports the key empirical results[27] based on the estimation of a system GMM and Fixed Effects (FE) model for panel data. The system GMM yields the best overall results because the

[26] The consumer price index is the deflator with 2000 as the base year.

[27] In all, 5 versions of the GMM and two of the Fixed Effects (FE) were tested using different specifications. For example, the log of total assets (LOGTA) was tested in other GMM estimations and

lagged dependent variable is significant for all four dependent variables. The Hansen test is insignificant as shown by the p-values, suggesting the model does not suffer from overidentification, while the significant F-test (1) confirms the joint significance of the independent variables. The null of no first order correlation is rejected based on a significant AR (1) while the insignificant AR (2) means the null of no second order serial correlation cannot be rejected, a finding which is expected in a first-differenced equation, where it is assumed that the original disturbance terms are not serially correlated. Given these findings and the limitations of the fixed effect model, most of the discussion focuses on the results of the GMM estimation.

The cost to income ratio (CI) is negatively signed and significant for all types of performance (except for ROAA) suggesting that more efficient banks perform better. The coefficient on EA, the ratio of equity to assets, is significant for the EVA and NIM performance measures but negatively and positively signed, respectively. The EVA measure may be more sensitive to the effects of too much capital being set aside because it includes the cost of shareholder capital, whereas the measure for net interest margins does not. If so, its negative coefficient is consistent with the view that holding too much capital can result in lost profit opportunities.

The coefficient on the dummy for whether a bank is listed or not (DL) is positive for EVA and ROAE, negative for ROAA and NIM, but insignificant in all cases. In China, banks that have been allowed to list shares effectively undergo partial privatisation, since the state reduces its ownership through a share issue. This result is at odds with some findings that privatization improves bank performance.[28] A likely explanation is that in China, only a small proportion of shares is listed and the state, as the major shareholder, continues to influence management decisions. Other studies are consistent with our results. Boubakri et al. (2005) undertake a study of 81 banks in 22 developing countries, most of which were partly privatised by the state. They find that privatization itself does not significantly improve profitability. Likewise, Otchere (2005) finds little evidence that 21 privatised banks (from low-middle income countries) show a significant improvement in operating performance. Also, recall that Lin and Zhang (2006) find banks performed better prior to being listed but not subsequently. This is consistent with the large capital injections and other subsidies received by key Chinese banks prior to listing which meant many of their NPLs were moved off balance sheet. Post-listing, state subsidies tail off. They also

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found to be insignificant. Likewise for the lagged inflation rate. In the fixed effects model it is not possible to test for time invariant dummies such as type of bank. The reported estimations are based on the best results in terms of AR(1), AR(2), and the Hansen test for GMM, and for FE, the F-tests and adjusted R^2.

[28] See Megginson (2005) and Clarke et al. (2005) on the privatization experience in developing countries.

suggest "creative" accounting may have made these banks appear to be performing better than they actually did.

The FEI coefficient is only significant when NIM is used as the proxy for performance but appears to be wrong signed - though the coefficient is just 0.01. Again these results are consistent with the Bonin et al. (2005) and Lin and Zhang (2008) – for the reasons given above. Boubakri et al. (2005) report that foreign ownership is unrelated to ROE. Nor are our findings at odds with those of Berger et al. (2008), where minority foreign ownership makes banks more profit (and cost) efficient, since we employ absolute measures of performance but their work estimates efficiency frontiers, making their ranking of banks is all relative – the bank on the profit for X-efficiency frontier could be unprofitable.

Other explanations for our FEI result include the lack of any real influence by foreign investors on the corporate governance of the Chinese banks they invest in. For example, most foreign banks hold 5-10% of shares giving them little real control. In 2007, HSBC owned nearly 20% of the Bank of Communications but had just 2 seats on the board and 12 HSBC employees in China. Alternatively, it may be too early to assess their influence because most FEI took place relatively recently. In 1999, foreign equity was invested in just two banks, doubling to 4 by 2003. This figure doubled again in both 2004 and 2005 but remained unchanged at 16 in 2006.

(Table 2 inserted here)

Though insignificant, the coefficient on OIA has the expected sign for three measures, suggesting that diversification into off-balance-sheet (OBS) activities boosts performance. Its insignificance may be because the move into OBS activities has been relatively slow to date, so it is not yet an important factor in explaining performance.[29] The significantly negative coefficient for NIM may suggest that margins fall as banks diversify into other activities, making this proxy for performance less reliable if and when Chinese banks engage in a wider range of OBS activity.

To avoid collinearity, one of the bank type dummies (DB3) was dropped from the estimating equation. The results from table 2 show that for EVA and NIM, the rural commercial banks (DB4)

[29] This is borne out by the relatively small percentage of non-interest income to total income for most banks. In 2005, the ratio of non-interest income to total income was between 3.3% and 12.4% among the big four. For the 12 joint-stocks, the figure ranged from 1% to 19%. Sources: Bankscope; *Almanac of China's Finance and Banking*, 2006.

performed significantly better than either the joint stocks or big four. Thus, the recent reform aimed at creating, in this case, rural commercials appears to have met with some success. Though not reported, DB3 was used instead of DB4 in an alternative estimation and found to be insignificant.

The coefficient on LOGTA was insignificant though it is not shown in table 2 - dropping it from the final system GMM estimation improved the diagnostics. The fixed effects model yields the same result, suggesting size is not important in explaining performance, nor can performance differences among the four types of banks be attributed to size effects. This finding contrasts sharply with most studies of Western banks, where size has a positive influence on performance, which is often attributed to benefits achieved through scale economies. But it is consistent with the results of Shih et al. (2007) and Lin and Zhang (2008). A possible explanation may be linked to the results of Berger et al. (2008) and Yao et al. (2007), who find state banks to be relatively inefficient. The state banks are considerably larger (measured by assets), and the relative inefficiency may adversely affect their performance. The inefficiency is likely due to pressure to lend to state-owned enterprises, without provisioning for and/or writing off bad debt. Though the government instructed these banks to focus on profits from 1996 onward, lenient treatment of the ever growing non-performing-loans contributed to poor efficiency and performance, as did the moral hazard that is inevitable if bank managers and borrowers are not held accountable for bad debt, which was around 20% for the big 4 as late as 2004. This could be offset by the better performance of other banks, especially rural commercials, making the coefficient insignificant.

The positive and significant coefficient on the loan loss reserve ratio (LLR) for all the dependent variables (except ROAE) suggests loan loss provisioning actually improved performance. One explanation could be that banks differ in their risk attitudes and those taking more risks could enjoy greater immediate profits but at some point, have to provision for larger losses. By contrast very cautious banks will see few loans turn sour but may well generate lower profits. An alternative explanation could be linked to the growing mountains of undeclared bad debt, which meant profits could continue to rise through inflated, seemingly healthy assets. When the authorities began to insist banks provision for or write off bad debt, it came with a sweetener - ranging from government financed generous capital injections in major banks to state funded debt write-offs for rural commercials.

Referring to chart 1, the average performance of the city commercials is higher than that of the big four but lower than the joint stocks (by three of the measures) indicating DB3 lies somewhere between the two, though they are significantly outperformed by their rural counterparts. The superior performance of the rural commercials may be because local government cleaned up their balance sheets by writing off their bad debt[30] and, more important, they face relatively little competition. The state banks have withdrawn from these areas. The rural credit unions supply a very basic banking service, and remain under pressure to provide "policy loans".[31] Thus the rural commercials operate what are effectively local monopolies. But the big four, joint stocks, and city commercial banks compete for deposits and loans. In the cities, there is nothing to stop customers from doing business with one of these three types of bank. On the cost side labour and space rents will be considerably dearer, too.

The macro variable that performs best is the real GDP growth rate ($RGDP_{t-1}$), followed by the unemployment rate (U_{t-1}), both lagged by a year.[32] As expected a rise in the real growth rate boosts bank performance for EVA and NIM. The coefficient on lagged unemployment is significantly negative for EVA, and correctly signed for ROAA and ROAE. Their effect on performance cannot be attributed to a time trend, since its coefficient was insignificant. These results show the importance of including macroeconomic variables when testing bank performance - to date they have been largely neglected in this literature.

The results from the GMM estimation suggest the fixed effects model is misspecified; hence its estimates are biased. Nonetheless, it is useful because it provides a goodness of fit measure, which shows that estimations using EVA or NIM outperform the more standard return on equity/assets. The GMM model tends to confirm this: more coefficients are significant and

[30] The reform of the rural credit cooperatives (RCCs) began in 2001 when three rural commercial banks were created. They were classified into three types, namely rural commercial banks, rural cooperative banks and credit unions. As with other banks, to help relieve their accumulation of non-performing loans (NPLs), the government (via its central bank, the PBC) adopted a series of policies including government subsidies, preferential taxation and financial aids. By April 2005, the PBC had swapped CNY36.9 billion worth of central bank bills for CNY31.9 billion of NPLs. It also wrote off CNY4.99 billion of losses incurred by 648 RCCs in the 8 provinces selected for the pilot reform. In addition, the PBC extended financial aid to the RCCs in another 21 provinces selected for the second batch of the pilot reform. Source: www.cbrc.gov.cn

[31] Policy loans finance key projects designated by the government to be of national importance. In 1994 three policy banks were created for this purpose, so other banks could operate on a national footing. However banks that are largely state owned (from the big four to rural coops) continue to be pressured into making these loans.

[32] The lagged inflation rate was dropped because it was insignificant in all seven models tested, and was highly correlated with the other macro variables.

confidence levels are higher for EVA and NIM compared to ROAA and ROAE. The AR(1) test is most significant for ROAA, followed by EVA, and NIM, but based on the number of significant explanatory variables, ROAA is inferior. ROAE is the worst performing measure given its low adjusted R^2, the lack of significant coefficients, and the GMM diagnostics. Using the same criteria, EVA and NIM do best overall. However, if and when Chinese banks expand their off-balance-sheet activities, the net interest margin is likely to become a less reliable measure of performance.

5. Conclusions

The main objective of this paper is to identify the determinants of Chinese bank performance, and to assess whether recent reforms (i.e. foreign bank participation, bank listing, and the creation of new rural financial institutions) had any effect. The sample covers 76 banks (95% of total banking assets) between 1999 and 2006. The results show that the system GMM model is the preferred method of estimation. The study also looks at the question of which of four performance measures work best. Based on diagnostics and the significance of coefficients, the results suggest the best dependent variables are economic value added and the net interest margin, as against ROAA or ROAE. Two main indicators of reform (bank listing and foreign equity investment) have no significant influence on performance, which is consistent with a number of studies based on China and other developing countries. The possible explanations for these findings include state subsidies tailing off after shares are listed and/or foreign bank investment which excludes any real input into corporate governance. Or it may be too early to judge, since these changes are relatively recent. By contrast the rural commercials are the only banks with a positive average EVA over the period, and they significantly outperform the big four, the joint stocks, and city commercial banks, perhaps because they effectively operate as local monopolies while other three types of banks compete for customer business to some degree. This finding may be indicative of some success of the recent reform aimed at improving rural financial services by creating new types of financial institutions in the country side. Efficiency significantly improves performance but off-balance-sheet activities are insignificant, perhaps because Chinese banks remain focused on traditional bank services. Real GDP growth rates and unemployment also register significant effects.

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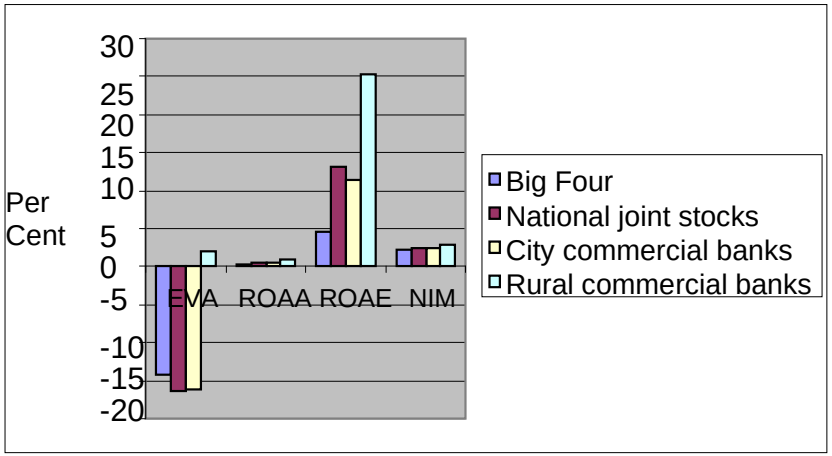
Chart 1: Mean EVA, ROAA, ROAE, NIM by Type of Bank, 1999-2006



Note: EVA is expressed as a percentage to facilitate comparison with the other performance measures.

Table 1 Descriptive Statistics

Variable	Description	Mean	S.D.	Min	Max	Obs.
A. Dependent variable						
EVA	Economic value added	-0.149	0.233	-2.634	1.034	342
ROAA	Return on average assets (%)	0.489	0.358	-1.250	1.910	342
ROAE	Return on average equity (%)	11.972	9.511	-23.730	82.350	342
NIM	Net interest margin (%)	2.393	0.818	0.420	6.680	342
B. Independent variables and Instruments (see note in table 3)						
CI	Cost to income ratio (%)	52.175	16.081	22.320	165.050	342
EA	Equity/total assets (%)	4.450	2.350	-10.770	31.340	342
LIQ	Liquid assets/deposits & short-term funding (%)	20.190	9.740	5.280	74.300	342
LLR	Loan loss reserves/gross loans (%)	2.041	1.898	0.000	16.430	342
NLA	Net loans/total assets (%)	53.289	8.907	29.100	76.270	342
OIA	Other operating income/average assets (%)	0.378	0.365	-0.080	2.003	342
LOGTA	Log of total assets	4.728	0.819	3.141	6.833	342
DL	A dummy for whether some of a bank's shares are listed, 1 = listed bank, 0 otherwise	0.102	0.304	0.000	1.000	342
FEI	The percentage of foreign ownership of a bank (%)	2.283	6.160	0.000	24.980	342
DB1	Bank type dummy 1, 1 for big four, 0 otherwise	0.091	0.288	0	1	342
DB2	Bank type dummy 1, 1 for national joint stocks, 0 otherwise	0.234	0.424	0	1	342
DB3	Bank type dummy 1, 1 for city commercial banks, 0 otherwise	0.614	0.488	0	1	342
DB4	Bank type dummy 1, 1 for rural commercial banks, 0 otherwise	0.061	0.240	0	1	342
U_{t-1}	1-year Lag of annual unemployment rate (%)	3.855	0.470	3.100	4.300	342
$RGDP_{t-1}$	1-year Lag of annual real GDP growth rate (%)	9.264	0.979	7.600	10.400	342
INF_{t-1}	Annual inflation rate (%), lagged by one year	1.053	1.703	-1.400	3.900	342
TT	Time trend	5.173	2.119	1	8	342
C. Variables used to compute EVA						
OP	Operating profits after-tax (mil CNY)	1599.778	5863.53	-356.419	46678.66	342
K	Total equity capital (mil CNY)	17247.18	61125.37	-510021.6	430124.7	342
BY	The 10-year government bond yield (%)	4.669	1.082	3.495	6.344	342
W	Wang-risk premium (%)	4.662	1.172	0.000	6.830	342
CAPCOST	Cost of capital	0.198	0.014	0.140	0.237	342
T-COST	Total costs (mil CNY)	11430.740	29094.910	41.620	157101.300	342

Sources: Bankscope, Datastream, IMF, Almanac of China's Finance and Banking, China Statistical Yearbook, individual bank's annual reports, Wang (2006).

Table 2 Empirical Results

System GMM Model								
	EVA		**ROAA**		**ROAE**		**NIM**	
Independent Variables	coefficient	t statistic	coefficient	t statistic	coefficient	t statistic	coefficient	t statistic
L_{t-1}	**0.072****	2.160	**0.816*****	4.840	**0.591*****	3.520	**0.619*****	3.860
CI	**-0.003*****	-4.060	-0.002	-0.770	**-0.092***	-1.630	**-0.006****	-2.090
EA	**-0.053*****	-7.970	0.010	0.900	-0.590	-0.850	**0.060*****	3.360
LIQ	-0.0004	-0.370	0.003	1.290	**0.114***	1.720	0.004	1.240
LLR	**0.014****	2.340	**0.021***	1.810	-0.073	-0.150	**0.048*****	2.930
NLA	-0.001	-0.430	0.0002	0.060	-0.017	-0.220	**0.016*****	3.830
OIA	0.005	0.210	0.042	0.920	0.169	0.140	**-0.441***	-1.990
DL	0.021	1.100	-0.018	-0.260	1.205	0.720	-0.032	-0.440
FEI	-0.001	-0.940	-0.002	-0.770	0.020	0.240	**-0.010*****	-3.330
U_{t-1}	**-0.084****	-2.510	-0.054	-0.490	-2.069	-0.710	0.022	0.120
$RGDP_{t-1}$	**0.044****	2.240	0.038	0.610	-0.130	-0.060	**0.267*****	3.830
DB1	0.006	0.200	0.043	0.710	-1.445	-0.710	**-0.287*****	-3.240
DB2	-0.022	-0.910	-0.016	-0.200	-0.379	-0.180	**-0.245*****	-2.750
DB4	**0.118*****	3.050	-0.033	-0.240	4.524	0.750	**0.268*****	3.210
TT	0.004	0.320	0.020	0.640	0.523	0.370	-0.101	-1.560
CONSTANT	0.128	0.660	-0.198	-0.400	17.502	1.170	-1.763	-1.500
F test (1)	**15.91*****		**61.24*****		**44.74*****		**55.49*****	
Hansen test	28.13		28.8		32.52		29.24	
AR(1) test	**-2.86*****		**-4.14*****		**-1.8***		**-2.59*****	
AR(2) test	-0.68		-0.86		-0.47		-0.22	
Observations	265		265		265		265	

Notes: 1. The results reported above are based on the estimation of equation (4) using the system GMM model. The panel contains 70 banks over 8 years, which is consistent with the "small T and large N" criteria to employ the system GMM model. EVA: economic value added; ROAA: return on average assets; ROAE: return on average equity; NIM: net interest margin; L_{t-1}: one year lag of the dependent variable; CI: cost to income ratio; EA: equity/total assets; LIQ: liquid assets/deposits and short-term funding; LLR: loan loss reserves/gross loans; NLA: net loans/total assets; OIA: other operating income/average assets; DL: dummy for bank listing, 1=listed bank, and 0 otherwise; FEI: the percentage of foreign ownership of a bank; U_{t-1}: one year lag of annual unemployment rate; $RGDP_{t-1}$: one year lag of annual real GDP growth rate; DB1: bank type dummy 1, 1 for big four, 0 otherwise; DB2: bank type dummy 2, 1 for national joint stocks, 0 otherwise; DB4: bank type dummy 4, 1 for rural commercial banks, 0 otherwise; TT: time trend. 2. The robust standard errors corrected for heteroscedasticity are applied. 3. ***, **, * are significant at 1, 5, and 10 per cent significance levels, respectively. 4. Significant F statistic (1) confirms the joint significance of all independent variables. 5. The Hansen statistics are insignificant, suggesting joint validity of the instruments in all three system GMM models. 6. Arellano-Bond test for AR(1) in first differences rejects the null of no first-order serial correlation, but the test for AR(2) does not reject the null that there is no second-order serial correlation. This is consistent with what one expects in a first-differenced equation with the original untransformed disturbances assumed to be not serially correlated. 7. All variables are instrumented through the system GMM procedure. 8. Small sample adjustments to the covariance matrix estimate are applied. 9. To maximize the sample size, the forward orthogonal deviations transform suggested by Roodman (2006) is also used instead of first differencing because there are gaps in the sample panel. 10. In the models without the time trend variable, time dummies are employed as suggested by Roodman (2006) to substitute the macro variables (U_{t-1} and $RGDP_{t-1}$). The results are qualitatively similar, and are available on request. 11. The lagged inflation rate and the reform dummy variable were dropped from the final estimating equation because both were highly correlated with each other (see table A1) and when run in separate estimations, provided insignificant.

Table 2 Empirical Results (Cont'd)

Fixed Effects Model								
	EVA		**ROAA**		**ROAE**		**NIM**	
Independent Variables	coefficient	t statistic	Coefficient	t statistic	coefficient	t statistic	coefficient	t statistic
CI	**-0.004*** **	-4.830	**-0.010*** **	-6.030	**-0.152*** **	-2.960	**-0.018 *** **	-6.310
EA	**-0.077*** **	-14.050	0.007	0.660	-0.455	-1.440	**0.067*** **	3.880
LIQ	-0.002	-1.410	**-0.004* **	-1.620	**-0.128* **	-1.650	0.000	-0.030
LLR	0.007	1.260	**0.022** **	2.180	0.144	0.480	**0.061*** **	3.660
NLA	0.000	0.010	**-0.006** **	-2.160	-0.049	-0.560	0.003	0.670
OIA	-0.006	-0.210	-0.040	-0.680	**-3.328* **	-1.890	**-0.934*** **	-9.630
DL	**0.109** **	2.140	**0.253*** **	2.620	-0.579	-0.200	0.026	0.160
FEI	-0.001	-0.470	-0.003	-0.770	-0.029	-0.290	-0.005	-0.880
U_{t-1}	**-0.182*** **	-4.310	**-0.337*** **	-4.180	**-4.794** **	-1.970	**-0.409*** **	-3.050
$RGDP_{t-1}$	**0.068*** **	2.950	**0.118*** **	2.700	1.232	0.930	**0.350*** **	4.800
LOGTA	-0.063	-0.820	-0.057	-0.390	3.866	0.870	**-0.984*** **	-4.020
CONSTANT	**0.812** **	2.390	**1.832*** **	2.840	17.004	0.870	**6.082*** **	5.670
F test (1)	**28.960*** **		**7.310*** **		**2.980*** **		**25.1*** **	
F test (2)	**2.810*** **		**3.780*** **		**3.320*** **		**5.380*** **	
R square	0.555		0.240		0.114		0.519	
Observations	342		342		342		342	

Notes: 1. The results reported above are based on the estimation of equation (4), for the fixed effects models.
2. The robust standard errors corrected for heteroscedasticity are applied.
3. ***, **, * are significant at 1, 5, and 10 per cent significance levels, respectively.
4. Significant F statistic (1) confirms the joint significance of all independent variables.
5. Significant F statistic (2) indicates that there are significant individual (group level) effects, implying that fixed effects model is appropriate.
6. The lagged inflation rate and the reform dummy variable were dropped from the final estimating equation because both were highly correlated with each other (see table A1) and when run in separate estimations, provided insignificant.
7. LOGTA was estimated in the fixed effects model but dropped from the final version of the systems GMM because it was insignificant and those versions of GMM which included it did less well (in terms of diagnostics and the number of significant variables) than the results reported in table 2.

Table A1 Correlation Matrix

	EVA	ROAA	ROAE	NIM	CI	EA	LIQ	LLR	NLA	OIA	DL	FEI	LOGTA	DR	U_{t-1}	$RGDP_{t-1}$	$INFL_{t-1}$
ROAA	0.5895**																
ROAE	0.4929**	0.7152**															
NIM	0.1431**	0.3390**	0.2126**														
CI	-0.4413**	-0.468**	-0.332**	-0.352**													
EA	-0.735**		-0.186**	0.1145**	0.2612**												
LIQ		0.1254**	0.1652**	0.1934**		0.1302**											
LLR	0.2490**	0.1468**	0.1335**	0.1270**	-0.1829**	-0.212**											
NLA		-0.170**	-0.109**	0.3269**	-0.1764**		-0.166**										
OIA				-0.553**	0.1239**				-0.289**								
DL			0.0943*		-0.1096**	-0.093*		0.1969**	0.2216**	-0.156**							
FEI					-0.1379**	0.1043*		0.1921**		-0.162**	0.1476**						
LOGTA	0.1155**	-0.0931*	-0.094*	-0.125**	-0.1396**	-0.175**	-0.215**	0.2691**	0.1454**	-0.236**	0.3301**	0.2033**					
DR	0.093	0.2027**	0.1655**	0.3685**	-0.3879**			0.1081**	0.1962**	-0.136**		0.1835**	-0.1226**				
U_{t-1}	0.1099**	0.1077**	0.1466**	0.2495**	-0.3908**				0.1947**	-0.0941*		0.1374**	-0.1316**	0.8111**			
$RGDP_{t-1}$	0.1070**	0.1789**	0.1778**	0.3340**	-0.4180**			0.0921*	0.2233**	-0.117**		0.1812**	-0.1286**	0.9140**	0.9296**		
$INFL_{t-1}$	0.1128**	0.1965**	0.1442**	0.3256**	-0.3620**				0.1556**			0.1651**	-0.1149**	0.8010**	0.6225**	0.7457**	
TT	0.1016*	0.1761**	0.1777**	0.3312**	-0.4269**			0.0923*	0.2117**	-0.101*		0.1871**	-0.126**	0.8467**	0.9152**	0.9653**	0.7472**

Note: ** and * denotes significant at 5% and 10% significance levels, respectively. If blank, no significant correlation was found. Though TT is significantly highly correlated with the macro variables, the significance of RGP and U is not masking a time trend, because these variables are significant whether or not a time trend is included in the model.