Market concentration, risk-taking, and bank performance: Evidence from emerging economies[①]

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Abstract

This paper investigates the relationship between market concentration, risk-taking, and bank performance using a unique dataset of the BRIC banks over the period 2003-2010. We find a negative association between market concentration and performance, in support of the "quiet life" hypothesis. We also find that banks taking a lower level of risks perform better, in favour of prudential practice. Moreover, the BRICs' banking sectors were all negatively affected by the 2007-2008 global financial crisis with China and Russia being the least and most affected, respectively. On average Chinese and Brazilian banks outperform Indian and Russian ones, indicating that China and Brazil have more favourable institutional infrastructure. These results are robust to alternative model specifications and estimation techniques. Our analysis may have important policy implications for bankers and regulators in the BRICs and other developing and transition countries.

JEL Classification： *G21, G28, O57*

Keywords: *Market concentration, Risk-taking, Bank performance; Stochastic frontier analysis; Brazil; Russia; India; China.*

[①]This paper represents the views of the authors and does not necessarily represent the views or policy of the People's Bank of China.

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Highlights

- The “quiet life” hypothesis holds in the BRICs’ banking markets.
- Banks taking a lower level of risk are more efficient.
- Chinese and Brazilian banks outperform Indian and Russian ones.
- The BRIC banks have recovered rapidly after the 2007-2008 financial crisis.

1. Introduction

Banks are the cornerstone of a country's financial system, especially in the developing countries where capital markets are underdeveloped. The global financial crisis in 2007-2008 has caused great turmoil in the banking sectors of the developed world. In sharp contrast to the clustered collapses of international financial giants in advanced economies, there were fewer bank failures in Brazil, Russia, India, and China (hereinafter the BRICs). In fact, the 2007-2008 financial crisis has catalyzed the catching up process for banks in the developing world. According to Bloomberg, as of 31 July 2011, 4 of the world top 10 banks by market capitalization were from the BRICs; and 44% of the world top 100 banks belonged to developing countries, increased by 14 percentage points from 30% in 2007. Meanwhile, the 2007-2008 financial crisis has fuelled active public policy debates on issues such as bank performance, market concentration (market power), competition, risk-taking, financial stability, regulation, and so forth. The rapid recovery of the BRIC economies[1] and their relatively stable banking sectors provide a natural experiment and rare opportunity to study these issues.

The relationship between market concentration and performance has long been subject to theoretical debates. The Structure-Conduct-Performance (SCP) hypothesis from traditional industrial organization literature suggests a positive relationship between market concentration and performance base on the conjecture that in a concentrated market large banks collude to earn higher profits (Bain, 1956). Affirming this positive relationship, the efficient structure hypothesis, however, asserts a reverse causality that efficient banks are more profitable and gain market shares, resulting in a concentrated market (Demsetz, 1973). In contrast, the "quiet life hypothesis" predicts a negative association between market concentration and performance arguing that firms with market power tend to operate inefficiently as managers may relax their efforts and enjoy the monopoly profit of a "quiet life" (Hicks, 1935). Empirical literature has achieved no unanimity. In the European banking sector, the "quiet life" hypothesis is rejected in Maudos and

[1] All the BRIC economies were hit by the 2007-08 financial crisis and Brazil and Russia even experienced a negative growth rate of -0.64% and -7.81% in 2009, respectively. However, the BRIC economies recovered rapidly to a growth rate of 7.49% in Brazil, 4.03% in Russia, 8.81% in Indian, and 10.4% in China in 2010.

Fernandez de Guevara (2007) but accepted in Delis and Tsionas (2009). In the US market, an early study of Berger and Hannan (1998) finds strong evidence for the "quiet life" hypothesis. A recent study by Koetter et al. (2012) presents a more complex picture with a negative association between market power and profit efficiency but a positive association between market power and cost efficiency.

On the other hand, bank intermediation involves a variety of risks. Excessive risk-taking could lead to bank failures, which in turn may cause bank runs and even costly financial crises. Motivated by more frequently occurring financial crises with disastrous damages to the economy, a growing body of research addresses the macro stability of the banking/financial systems with two contrasting views emerged. The competition-fragility view believes that competition may encourage banks to take more risks for higher return and thus undermine financial stability, while monopoly rents increase a bank's charter value and discourage risk-taking behaviour (Allen and Gale, 2004; Keeley, 1990). The competition-stability view argues that monopoly allows banks to charge higher interest rates, which exaggerate the adverse selection effect and jeopardize banking/financial stability (Boyd and De Nicolo, 2005; Allen et al., 2011; Schaeck et al, 2009).

Other researchers take a micro approach to gauging how risk-taking behaviour interacts with bank performance. The "bad luck" hypothesis argues that an increase in problem loans caused by precipitated external events induces credit risk and banks may become inefficient due to greater efforts and expenses on those problem loans (Berger and De Young, 1997). Empirical studies have examined the relationship between performance and a wide range of risks, including credit risk, capital risk, liquidity risk, market risk, operational risk, and overall risk (Altunbas et al., 2007; Berger and De Young, 1997; Brissimis et al., 2008; Fiordelisi et al., 2011). This strand of literature to date is primarily based on the US and European countries with, if any, fewer insights and discussions on the banking industry in emerging economies.

Over the past decade or so, the banking sectors in developing and transition economies have received great research attention. Existing literature has examined bank capital buffers (Fonseca and Gonzalez, 2010), bank distress and

financial crisis (Mannasoo and Mayes, 2009; Bongini et al., 2000), banking problems in Asian and South American in the 1980s and 1990s (Arena, 2005), and bank performance in individual countries (Berger et al., 2005; Jiang et al. 2009) or a group of countries (Fries and Taci, 2005; Williams and Ngyen, 2005). There is a big gap in the banking literature in that there is no empirical comparative study across the BRIC banks despite of their increasingly important role and rising status in the world financial marketplace.

In this context, this paper attempts to reveal how market concentration and risk-taking behaviour affect bank performance in the BRICs, enriching our understanding of how BRIC banks withstood the storm wave of the 2007-2008 global financial crisis. Our main goal is to fill in the gap and contribute to existing literature in the following dimensions. First, we evaluate bank performance and examine the impact of the 2007-2008 financial crisis across the BRIC banks while controlling for the effects of country-, industrial-, and bank-level differences to address the heterogeneity of the sample. Second, we test for the "quiet life" hypothesis and present new empirical evidence to theoretical debates in the existing literature from an emerging market perspective. Given the high policy relevance of the concentration-performance relation, this paper provides insights into banking industries in the BRICs with important implications for policy makers engaging in formulating banking policies not limited to the BRIC countries but also other developing countries. Finally, this paper follows the micro approach to examining the risk–performance relation in the BRICs' banking markets. The results will be of particular interests to bankers, practitioners, and regulators.

Using a unique sample of major domestic commercial banks in the BRICs over 2003-2010, we find a negative association between market concentration and performance, in support of the "quiet life" hypothesis. We also find that banks with a lower level of risks perform better, in favour of prudential practice. Moreover, the banking sectors in the BRICs were negatively affected by the 2007-2008 global financial crisis with China and Russia being the least and most affected, respectively. On average Chinese and Brazilian banks outperform Indian and Russian ones,

indicating that China and Brazil have more favourable institutional infrastructure.

The remainder of the paper proceeds as follows. Section 2 introduces the evolutionary background of the BRICs' banking systems. Section 3 reviews literature. Section 4 describes research methodology and data. Section 5 discusses empirical results, and section 6 concludes.

2. The evolutionary background of the banking systems in the BRICs

The banking systems in the BRIC countries have experienced rather different evolutionary processes. The Brazilian banking system did not start from a Central Bank and the first commercial bank dated back to the early 19th century. The Central Bank of Brazil was established in 1964 as part of the financial reform to support the industrialization plan and fight against inflation. The reform specialized financial institutions and laid the foundation for the Brazilian Financial System referencing to the American financial model. The Brazilian banking system has two distinct features. First, Brazil experienced historical hyperinflation – three digits in the 1980s and well over 1000% in the 1990s. Brazilian banks survived and benefited from inflation by raising low-cost liabilities that were invested in short term securities at much higher interest rates. The high returns from this kind of transactions (known as the "float") covered up the deficiencies of the banking system and disincentivized the development of normal banking practice. Second, Brazilian banking market has the highest cost of financial intermediation in the world in terms of both absolute interest rates and spreads (Miccolis-Anwar, 2007). For instance, over 2003-2010, the average net interest spread is 38% in Brazil, which is more than six times of Russia (6%), seven times of India (5%), and twelve times of China (3%).

State banks in Brazil played a critical role in financing state-level developments and deficits. In the 1980s, most state banks became rather weak, which was hampered by the worsening economic condition and public sector deficits. In 1994, the Brazilian government implemented the Real Plan to stabilize the economy and control inflation.

Without inflationary gains some banks went bankrupt. To avoid a systemic banking crisis, the federal government launched the "Program of Incentives for the Restructuring and Strengthening of the National Financial System – PROER" and the Credit Guarantee Fund to assure public confidence. Subsequently state banks underwent significant reforms of restructuring, privatization, or liquidation (Beck et al., 2005).

The Russian banking system emerged only in the early 1990s after the collapse of the Union of Soviet Socialist Republics (USSR) in the late 1980s. The Bank of Russia (the Central Bank of the Russian Federation) assumed central banking functions and five state banks were commercialized to serve enterprises in their assigned sectors in the economy.[2] Without much surprise, the sudden death of the centrally-controlled economic system invited a disaster: the economy collapsed, GDP fell dramatically, and inflation rocketed to 2510% in 1992 (Heffernan, 2005). The repercussions for the banking system were significant, leading to a series of systemic mini-crises in 1994, 1995, 1998, and 2004. The causes of these crises are a combination of numerous factors, including the absence of a regulatory and supervisory system until 1995, a massive and uncontrolled privatization schemes from 1992, the "pocket banks" serving business groupings or state institutions, under-capitalization, the lack of modern banking skills, and resultant poor asset quality (Tompson, 2004).[3] After the crisis in 1998, the Bank of Russia took decisive steps to reform the banking system and made impressive progresses. After the implementation of the Banking Sector Development Strategy over 2005-2008, the Russian government ambitiously aims at positioning the banking system on international financial markets during the period 2009-2015. Currently, the Russian banking system is dominated by state banks,

[2] Five state banks were created in 1987 by taking over commercial operations from the State Bank, namely USSR Promstroybank (industry), USSR Agroprombank (agriculture/industrial), USSR Zhilsotzbank (housing and social security), USSR Vnesheconombank (foreign trade) and USSR Sberbank (the savings bank).

[3] The "pocket banks" were controlled by a single shareholder or a small group of related shareholders and they were used as a tool of business groupings or state institutions (Tompson, 2004).

comparatively small, highly fragmented, underdeveloped, largely free of financial repression, and with a deposit insurance scheme in place (www.cbr.ru/eng).

Since the independence in 1947, India has been a democratic nation without experiencing a centrally-controlled economic system as in former USSR and China. The financial system was quite unrestricted until the 1960s when the state took control to facilitate the 5-year national economic plans. The government nationalized the 14 largest commercial banks in 1969 and further 6 in 1980 to support the implementation of the national economic plans by channelling funds to priority sectors and minimizing the cost of state borrowing. However, in 1991 India was faced with severe balance of payment crisis due to a rapidly growing fiscal deficit and rising oil prices.[4] In response, the Indian government initiated a systemic economic reform programme toward a market-oriented economy, along with financial deregulation and liberalization. From 1996, the government partially privatized state banks to avoid costly capital injections while maintaining 60-80% shareholding (Heffernan, 2005), but the pace of banking reform was slow. The current banking sector is dominated by state ownership with poor asset quality, excessive supervision, and weak financial institutions. It also faces moral hazard and incentive problems stemming from the public belief that state banks will never be allowed to fail. A striking feature of the Indian banking system is the preferential lending requirements set by the Indian authority. Domestic banks and foreign banks are required to lend 40% and 32%, respectively, of their adjusted net bank credit (or credit equivalent of off-balance sheet exposures whichever is higher) to the priority sectors.

Since the establishment of the People's Republic of China in 1949, the banking system was entirely dominated by the only bank – the People's Bank of China (PBC) – to serve its centrally-planned economy. Unlike Russian banking system being created through a "shock therapy" approach to dismantling the old system, Chinese banking system underwent a rehabilitation process from the late 1970s. To transform a

[4] Rising oil prices were caused by the first Gulf War in 1990-91.

centrally-planned banking system to a competitive market-oriented one, the Chinese government implemented a series of banking reforms – institutional restructuring, deregulation, and banking commercialization, which, however, failed by the end of the 1990s. The banking sector was dominated by the four largest state-owned commercial banks (SOCBs) and they were technically insolvent due to the huge amount of non-performing loans (NPLs). These NPLs were the inevitable consequences of the persistent government intervention in banks' operations to support the real economic reform whilst maintaining social stability. In 1998-99, the central government had to bailout state banks by injecting capital and removing NPLs from SOCBs' books. As China became a member of World Trade Organization in 2001, the government accelerated banking reform and partially privatized state banks after the second round of bailout. These more radical reforms have made great strides in modernizing the banking system and now China is a home to 4 of the world top 10 largest banks by market capitalization (Berger et al., 2009; Jiang et al., 2013).

3. Literature review

In the past three decades, the banking sectors in the developing countries and transition economies have experienced drastic changes for different reasons. For instance, banking reforms were caused by the significant political and economic changes of 1989 in Russia and the Eastern and Central European countries, triggered by financial crises in South-East Asian and Latin American countries, and initiated by the governments in China and India to improve bank performance to better serve the real sector development. The changing banking landscape has attracted great research interest to examine the performance effect of banking reform in terms of deregulation, ownership, corporate governance, privatization, foreign bank entry, and so forth.

Both theoretical and empirical literature shows that ownership has a significant influence on performance. Literature in developing countries and transitional economies generally suggests a negative impact of state ownership on performance

(Bonin et al., 2005; Fries and Taci 2005; Yao et al., 2007; Jiang et al, 2009), which is more significant on profit efficient than on cost efficient (Berger et al., 2009; Jiang et al., 2013). Being aware of the poor performance of state banks, many governments privatized state banks, which has improved bank performance (Berger et al., 2005; Jiang et al., 2013), especially with the involvement of foreign strategic investors (Fries and Taci, 2005; Hasan and Marton, 2003). As a result of deregulation, globalization, and technological advancement, foreign banks have penetrated into developing countries. On average the efficiency advantages of foreign-owned banks relative to domestically owned banks tend to outweigh the disadvantages in many developing and transitional countries (Berger, 2007).

Research on bank performance in the BRICs is mainly single country studies. Brazilian and Russian banking sectors are largely un-researched relative to Indian and Chinese ones. Findings in general are consistent with literature in developing countries and transition economies, except for evidence showing that state banks perform better over their private counterparties. In Brazil, research suggests that state banks outperform both foreign banks and private banks (Tecles and Tabak, 2010; Staub et al., 2010); well-capitalized banks are more efficient (Tecles and Tabak, 2010); and bank performance has improved for privatized banks but not for restructured banks (Beck et al., 2005). One might not be surprised by the scarcity of banking literature in Russia given the short history of the banking system. Among two studies we have been aware of, Styrin (2005) reports that foreign banks are more efficient than domestic banks; and Karas et al. (2010) suggests that public banks are more cost efficient than private banks while the introduction of deposit insurance has no significant impact on narrowing down the efficiency gap between these two types banks.

In India, an earlier study (Bhattacharyya et al., 1997) suggests that public banks are the best performers benefiting from deregulation, while subsequent work of Kumbhakar and Sarkar (2003) finds that the performance effect of deregulation is

insignificant. In the post-liberalization period, empirical research suggests that banking deregulation has led to performance improvement for state banks (Zhao et al., 2010) and state banks outperform private banks regardless of efficiency measures employed (Sensarma, 2005; Das and Ghosh, 2009; Sathye, 2003). A more recent study (Sanyal and Shankar, 2011) shows that private banks outperform both public banks and foreign banks. In China, existing research generally concludes that bank performance has improved and joint-stock banks are more efficient than state banks (Yao et al., 2007; Ariff and Can, 2008; Berger et al., 2009; Jiang et al., 2013). Although it may take a longer time to realize the benefits (Jiang et al., 2009), foreign minority ownership has a significant positive effect on performance (Berger et al., 2009; Jiang et al., 2013). Moreover, Zhang et al. (2012) find that a sound legal environment and stronger protection of intellectual property rights help regional city commercial banks improve performance.

Literature on the relationship between bank performance and risk-taking is still in its infancy. In the US banking market, researchers observe a negative association between bank performance and risk taking (Berger and De Young, 1997; Kwan and Eisenbeis, 1997). In the EU banking markets, empirical evidence is mixed. While Altunbas et al. (2007) find no such a negative association as in the US market, Fiordelisi et al. (2011) provide evidence that banks with a lower level of capital risk are more efficient. Brissimis et al. (2008) suggest that bank performance is negatively affected by capital risk and credit risk but positively influenced by liquidity risk.

The noticeable absence in literature is a comparative study across the BRIC banks. Although the BRIC banks may exhibit a similar dynamic trend in performance when facing a big world-wide shock (i.e., the global financial crisis), the quantitative effect may vary across the BRICs due to differences in macroeconomic and institutional environment, industrial market conditions, and bank specific characteristics. For instance, at the country level, stronger institutional and regulatory infrastructure may promote more prudential practice which eases the impacts of unexpected shocks

on banks. Moreover, existing literature on the relationship between market concentration, risk taking and performance have mainly focused on US and European banking markets, leaving the issue unexamined in emerging economies. This study attempts to fill in the gap in literature by investigating the issue in the context of emerging economies.

4. Research methodology

The preferred estimation technique is the stochastic frontier analysis (SFA) which pre-specifies a functional form and decomposes error terms into a random error (v_i) and inefficiency (u_i) (Aigner et al, 1977). SFA is more appropriate for emerging markets where measurement errors and uncertainties of the economic environment are more likely to prevail. This study estimates a common frontier composed from all banks in the sample and employs an output distance function approach in a one-step estimation setting (Battese and Coelli, 1995).[5] A major advantage of the distance function approach is the ability to accommodate a production process with multiple inputs producing multiple outputs without requiring price information as the cost/profit function does.

Following Lovell et al. (1994), the output distance function is defined as $D_0(x,y) = \min\{\theta : (y/\theta) \in P(x)\}$. $D_0(x,y)$ is non-decreasing, positively homogeneous and convex in the output vector y and non-increasing in the input vector x. For a firm producing *m* outputs using *n* inputs, an output distance function in a translog form is:

[5] For a cross-countries study, bank efficiencies can be measured against a common frontier or nation-specific frontiers. When using a common frontier, the analysis is informative for policy makers as measured efficiencies are comparable and studies have made good progress in controlling country differences through econometric methods. When using nation-specific frontiers, measured efficiencies are not comparable and therefore such comparisons are less informative regarding the policy and research questions in relation to the international financial institutions (Berger, 2007).

$$\ln D_o(x^t, y^t, t) = \alpha_0 + \sum_{k=1}^{n} \alpha_k \ln x_k^t + \sum_{j=1}^{m} \beta_j \ln y_j^t + \frac{1}{2}\sum_{k=1}^{n}\sum_{h=1}^{n} \alpha_{kh} \ln x_k^t \ln x_h^t + \frac{1}{2}\sum_{j=1}^{m}\sum_{l=1}^{m} \beta_{jl} \ln y_j^t \ln y_l^t$$

$$+\sum_{k=1}^{n}\sum_{j=1}^{m} \gamma_{kj} \ln x_k^t \ln y_j^t + \varphi_t t + \frac{1}{2}\varphi_{tt} t^2 + \sum_{k=1}^{n} \xi_{kt} \ln x_k^t t + \sum_{j=1}^{m} \tau_{jt} \ln y_j^t t \,, \qquad (1)$$

where x is input, y is output, and t is a time trend.

$D_o(x^t, y^t, t)$ is homogeneous of degree 1 in y, which give following constraints:

$$\sum_{j=1}^{m} \beta_j = 1 \quad , \quad \sum_{l=1}^{m} \beta_{jl} = 0 (j = 1, 2, ...M) \quad , \quad \sum_{j=1}^{m} \gamma_{kj} = 0 (k = 1, 2, ...N) \quad ,$$

$$\sum_{j=1}^{m} \tau_{jt} = 0 (j = 1, 2, ...M) \,, \ \beta_{jl} = \beta_{lj} \ \text{and} \ \alpha_{kh} = \alpha_{hk} \,.$$

Rearranging the Eq.(1), we have the following for individual firm i

$$\ln D_{oi}^t - \ln y_{mi}^t = \alpha_0 + \sum_{k=1}^{n} \alpha_k \ln x_{ki}^t + \sum_{j=1}^{m-1} \beta_j \ln (y_{ji}^t)^* + \frac{1}{2}\sum_{k=1}^{n}\sum_{h=1}^{n} \alpha_{kh} \ln x_{ki}^t \ln x_{hi}^t$$

$$+\frac{1}{2}\sum_{j=1}^{m-1}\sum_{l=1}^{m-1} \beta_{jl} \ln (y_{ji}^t)^* \ln (y_{li}^t)^* + \sum_{k=1}^{n}\sum_{j=1}^{m-1} \gamma_{kj} \ln x_{ki}^t \ln (y_{ji}^t)^* + \varphi_t t + \frac{1}{2}\varphi_{tt} t^2$$

$$+\sum_{k=1}^{n} \xi_{kt} \ln x_{ki}^t t + \sum_{j=1}^{m-1} \tau_{jt} \ln (y_{ji}^t)^* t + v_i^t \,, \qquad (2)$$

where $(y_{ji}^t)^* = y_{ji}^t / y_{mi}^t (j = 1, 2, ...m-1)$.

By definition $\ln D_{oi}^t \le 0$. When defining $u_i^t = -\ln D_{oi}^t$ (i.e., u_i^t follows a non-negative truncated normal distribution); $v_i^t \sim N(0, \sigma_v^2)$ (i.e., v_i^t follows a standard normal distribution); and u_i^t and v_i^t are independent, Eq.(2) becomes the standard setting of a stochastic frontier model.[6]

[6] Simultaneous equation bias may exist when both inputs and outputs are included in the distance function as regressors. But after the normalization procedure, output ratios may be treated as exogenous (Coelli and Perelman, 1996).

This paper follows Jiang et al. (2009) and specifies two empirical models – the income-based model and the earning asset-based model. When defining inputs and outputs, the intermediation approach (Sealey and Lindley, 1977) is modified by treating total deposits as an output. The income-based model focuses on the efficiency of generating income and defines two inputs (total interest expense and non-interest expense) and two outputs (net interest income and non-interest income). The earning assets-based model explores the efficiency of growing earning assets and defines three inputs (total interest expense, labor, and physical capital) and four outputs (net loans, total securities, total deposit, and non-interest operating income). Following literature, non-interest expenses is used as the proxy for labor (Hasan and Marton, 2003) and non-interest income is included to capture the effect of the diversification in bank activities, such as off-balance sheet activities.

The technical inefficiency effect model is shown in Eq.(3).

$$u_{it} = \delta_0 + \delta_1 CR_{jt} + \sum_{a=2}^{6} \delta_a Risk_{it} + \sum_{b=7}^{18} \delta_b Control + \delta_{19} t + \varepsilon_{it} \qquad (3)$$

where CR_{jt} is the concentration ratio for the country *j* in year *t*; $Risk_{it}$ is a vector of risk-taking variables for bank *i* in year *t*; *Control* is a vector of control variables; *t* is a time trend to capture the catching up effect against the shifting frontier.

Market concentration is defined as the sum of the market share (in terms of total assets) of the five largest banks. *Capital risk* is proxied by the ratio of equity to total assets (E/A) and a bank with a lower E/A ratio faces higher risk of failure. *Credit risk* is measured by the ratio of NPLs to total loans and a higher ratio indicates that the bank is more likely to suffer losses from loan defaults. *Market risk* is captured by the ratio of interbank borrowing to total borrowing and a higher ratio suggests that the bank relies more on interbank borrowing and therefore more vulnerable to the movements of market rates.[7] *Liquidity risk* is measured by the ratio of liquid assets to

[7] One may argue that market risks also include risk arising from the movement of foreign exchange

total assets and the higher the ratio, the lower the risk that a bank may fail to meet its liabilities when they fall due. *Overall risk* is proxied by the ratio of loan loss reserve to NPLs that indicates the bank's ability to absorb losses from NPLs before eroding the bank's capital. A bank with a higher ratio faces lower risk of going bankrupt.

The first control variable is *the 2007-2008 financial crisis* and the dummy equals zero before 2008 and one after. The country level control variables include *GDP growth* to reflect the macroeconomic environment, and *Country dummies* to take into account the differences in institutional framework and legal systems across the BRICs. At the industrial level, the *share of state-owned banks* and the *share of foreign banks* (in terms of total assets) are employed to gauge the performance effect of ownership. *The importance of the stock market* reveals the impact of capital markets on bank performance.[8] The effect of *net interest spread* is also controlled given the significant differences across the BRIC banks. At the bank level, this study considers the impact of *Bank size* (dummy equals 1 if a bank's total assets greater than the average total assets of the sample and 0 otherwise), *Listing status* (dummy equals 1 for publicly listed banks and 0 otherwise), *Revenue diversification* (the share of non-interest income in total income), and *Assets diversification* (the share of security in total earning assets).

Our unbalanced sample includes major domestic commercial banks in the BRICs over 2003-2010 with 1001 bank-year observations. Banks are selected if they are on the list of the world 1000 biggest banks by *The Banker* and data are available from the

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rates and the ratio of interbank borrowing may not be an adequate measure. We consider that our sample only includes domestic commercial banks and these banks' exposure to foreign exchange risk is small given their involvement in international financial markets.

[8] Following the "Financial Structure Dataset" from the World Bank, *the importance of the stock market* is defined as the average of the structure activity and the structure size. The higher the value, the more market-based is a country's financial system. The structure activity is defined as the ratio of two ratios: (1) the ratio of stock market total value traded to GDP, and (2) the ratio of private credit by deposit money banks to GDP; the structure size is also defiend as the ratio of two ratios: (1) the ratio of stock market capitalization to GDP, (2) the ratio of private credit by deposit money banks to GDP. The higher the value, the more market-based is a country's financial system.

Bankscope. Data on Chinese banks are obtained from PBC – the central bank of China. Data are collected from multiple sources, such as *BankScope*, the Central Banks' website, World Bank, and IMF.

Table 1 presents descriptive statistics of the sample, providing a snapshot of the banking sectors in the BRICs. The BRICs' banking markets are relatively concentrated with an average five-bank concentration ratio of 61%, ranging from 72% in China, followed by 64% in Brazil, to just below 50% in both India and Russia. The Chinese banking market is the largest, 5 times greater than the smallest one in Russia. State banks dominate in the banking sectors in India and China, while foreign banks play a relatively more important role in Brazil and Russia. The capital markets are more important in India and Russia relative to Brazil and China. Data also reveal that Russian and Brazilian banks are in favour of a diversification strategy, while Chinese banks seem to embrace a focus strategy.

[Table 1 around here]

Turning to risk taking variables, the BRIC banking sectors are generally under-capitalized with an average E/A ratio of 8%, ranging from the highest of Russian banks at 16% to the lowest of Chinese banks at 5%. The average NPL ratio is 5%, higher than an international level of 1-3% for a healthy bank. Indian banks and Brazilian banks have the lowest and the highest NPL ratio at 3% and 9%, respectively. The BRIC banks on average source 22% of their total borrowings from the interbank markets with large variations from 50% for Brazilian and Russian banks to only 10-13% for Indian banks and Chinese banks. The BRIC banks as a whole hold one-third of total assets as liquid assets with substantial variance from only 9% in India to 48% in China. Brazilian banks and Indian banks tend to take more overall risk with a relatively low LLR/NPL ratio of 75% and 66%, respectively, in contrast to Russian banks of 287% and Chinese Banks of 139%. In summary, Indian banks take on the highest liquidity risk and overall risk but assuming the lowest market risk and

credit risk; Brazilian banks confront the highest credit risk and market risk; Russian banks are relatively safe in terms of capital risk and overall risk; and Chinese banks are faced with greatest capital risk but the lowest liquidity risk.

5. Empirical analysis

5.1. Results from frontier estimations

Table 2 reports the one-step maximum-likelihood estimation results from model specifications. Gamma ($\gamma \equiv \sigma_u^2 / \sigma_v^2 + \sigma_u^2$) is 0.93 in the income-based model and 0.69 in the earning assets-based model, indicating a high proportion of the error terms attributable to inefficiencies. Log Likelihood statistics and LR test also confirm the good fit of the models. Moreover, all elasticities are significant and possess the expected signs at the geometric mean, fulfilling the property of monotonicity of the output-oriented distance function.[9] The scale elasticity, defined as the negative of the sum of input elasticities (Färe and Primont, 1996), is 0.97 in the income-based model and 0.98 in the earning assets-based model, consistently suggesting decreasing economies of scale for the BRIC banks.

[Table 2 around here]

The estimated average efficiency of the BRIC banks over 2003-2010 is 81% from the income-based model and 84% from the earning assets-based model. As shown in Figures 1 and 2, unsurprisingly the banking sectors in the BRICs were all negatively affected by the 2007-2008 global financial crisis with precipitous drop in performance. In the income-based model (shown in Figure 1), from 2007 to 2008, China was the least affected country with a reduction in efficiency level by 3 percentage points from 84% to 81%, while Russia recorded the biggest drop by 18 percentage points from 86% to 68%. Prior to the 2007-2008 crisis, the performance of the BRIC banks was stable at a relatively high level of 80-90%, except for Chinese banks that steadily

[9] Table 2 only reports scale elasticities and full results are available from the authors upon request.

caught up from 71% in 2003 to 84% in 2007. After 2008, the efficiency level of the BRIC banks dispersed: Chinese and Brazilian banks' performance recovered rapidly to 90%; Indian banks stabilized their performance at a level around 75%; and Russian banks suffered further losses by 8 percentage points down to 60% in 2010.

[Figure 1 around here]

The earning assets-based model (shown in Figure 2) shows a slightly different picture. The 2007-2008 crisis wiped out bank efficiency by 8 percentage points in Brazil and India, 13 percentage points in China, and 22 percentage points in Russia. Prior to the 2007-2008 crisis, Brazilian and Indian banks steadily improved their efficiency to 90% which had been enjoyed by Chinese and Russian banks. After the crisis, all BRIC banks recovered quickly and reached their highest efficiency levels in 2010, except for Russian banks with further efficiency losses by 14 percentage points in 2009. Russian banks were the most efficient banks prior to the 2007-2008 crisis but became the most inefficient ones after the crisis.

[Figure 2 around here]

5.2. Results from the inefficiency effect model

The results from the technical inefficiency effect model are reported in Table 2.[10] The estimated coefficients on *2007-2008 Global Financial Crisis* are positive at the 1% significance level in both models, statistically confirming a negative impact of the crisis on bank performance. The impact is more significant in the earning asset-based model than in the income-based model. The possible reason is that during the crisis period banks become more cautious in lending and their lending ability is also restricted by the availability of funding, while income can be sustained by increased

[10] We have tested for the possible multi-collinearity. The mean variance inflation factor (VIF) is 3.9 (well below 5) for all variables in the inefficiency effect model excluding countries dummies, suggesting multi-collinearity problem is not a major issue.

spreads between lending rates and borrowing rates with the latter being held down by central banks.[11]

We find a negative impact of *market concentration* (market power) on efficiency, which is stronger on income generation than on earning assets growth. The results provide strong evidence for the "quiet life hypothesis". The BRIC banks with market power tend to relax their efforts and reap the "monopoly profit" of a "quiet life". These banks may also become inefficient due to the pursuance of objectives other than profit maximization, the costs of gaining and maintaining market power, and the costs of keeping incompetent managers (Berger and Hannan, 1998).

As expected, various risks have significant and differential impacts on bank performance. *Capital risk* affects bank performance differently in two models. In the income-based model, the estimated coefficient is negative and marginally significant at the 10% significance level, indicating that banks with low capital risk are more efficient in drawing income, consistent with literature (Mester, 1996; Brissimis et al., 2008; Altunbas et al., 2000). In the earning assets-based model, the effect of capital risk is positive at the 1% significance level, consistent with the recent work of Altunbas et al. (2007). The implication is that over-capitalization may induce inefficiency by restricting earning assets growth. *Credit Risk* has a negative and statistically significant impact on bank performance, in line with findings of Berger and De Young (1997), Altunbas et al. (2000), and Brissimis et al. (2008). Banks taking excessive credit risk are associated with poor performance, which lend support to the "bad luck" hypothesis. This impact is more prominent in the income-based model than in the earning assets-based model. *Market Risk* also exhibits a negative influence on bank performance. Indeed, greater exposure to interbank markets induces not only market risk but also liquidity risk. Interbank markets are vital for banks' liquidity management when the markets function smoothly in normal times, while overreliance

[11] For instance, the spreads increased by 2.45 percentage points in Brazil and 1.58 percentage points in Russia.

on interbank borrowing may cause severe liquidity problems in crisis periods. Our results show that *liquidity risk* positively affects bank performance in both models. Banks taking less liquidity risk are inefficient, consistent with the trade off between liquidity and profitability and existing studies (Altunbas et al., 2007; Altunbas et al., 2000; Brissimis et al., 2008). The effect of *overall risk* on bank performance is negative and statistically significant but the magnitude is rather small. Our finding is in contrast to Altunbas et al. (2007) that find efficient banks take on more risk using the ratio of loan loss reserve to total assets as a measure of overall risk.[12]

Turning to control variables, at the country level, estimation results suggest that *GDP growth* has no impact on bank performance in the income-based model but a statistically significant negative impact in the earning assets-based model. The BRIC banks seem not benefit in terms of efficiency from the faster than world average GDP growth rates of the BRIC economies, partially reflecting their role in supporting economic growth rather than improving performance. Coefficients on *country dummies* suggest that Brazil and China have the more favourable institutional environment for banks to draw income and to expand earning assets, respectively.

At the industrial level, *the share of state ownership* is found to be negatively associated with bank performance. This finding is consistent with literature in most developing and transition economies, but in contrast to most single country studies in Brazil, Russia, and India that find state banks are more efficient. *The share of foreign banks* affects domestic banks' performance negatively, consistent with Claessens et al. (2001). *The importance of the stock market* has a significant impact on bank performance and banks in a more capital market-based financial system are more efficient in expanding earning assets while become inefficient in raising income. This is because high quality borrowers may raise funds from capital markets, while they would go to banks for funding in a more bank-based financial system. A larger

[12] More than 75% of BRIC banks' total earning assets are loans and this study employs the NPL coverage ratio as the proxy for overall risk.

net interest spread has no impact on raising income but helping expanding earning assets. In fact, a larger spread pushes up interest rates, which exaggerates the adverse selection effect and undermines bank performance in generating income. On the other hand, excessive risks taken by banks due to adverse selection induce moral hazard problems that banks may lend recklessly which boost earning assets.

At the bank-specific level, we also observe some interesting findings. Bank-specific characteristics have significant and distinct impacts on bank performance: *Large banks* outperform small banks in growing earning assets but not in raising income; *Listed banks* perform better than unlisted ones; and the *diversification* strategy has a negative impact on bank performance with an exception of efficiency gains from the diversification of revenue sources in the income-based model.

5.3. Robustness tests

To test the robustness of our model specifications, we exclude the bank level control variables in turn while keeping variables with proven influences on bank performance according to literature. Results are reported in Table 3 for the income-based model and Table 4 for the earning assets-based model. The columns (1) of these tables are the chosen specifications in this paper. Test results indicate that our chosen models are robust to the inclusion of a variety of bank-specific characteristics. All estimated coefficients on market concentration and risk variables possess the same signs without substantial changes in the significance level. One exception is the capital risk that is slightly sensitive to the exclusion of bank level control variables but the effects are not significant enough to change our conclusion regarding capital risk. As to the country level and the industrial level control variables, the results also suggest that our final specifications are robust.

[Table 3 around here]

[Table 4 around here]

Moreover, as SFA is criticized for the predetermination of a functional form and the distributional assumptions of the random errors and inefficiencies, we also employ data envelopment analysis (DEA) to check the robustness of our results. The average efficiency level from DEA models is 66% in the income-based model and 79% in the earning assets-based models, lower than those of 81% and 84% from the corresponding SFA models. These results are consistent with literature that the nonparametric techniques generally give lower efficiency estimates (Berger and Humphrey, 1997). As to the inefficiency effect analysis, results from DEA models are qualitatively consistent with those from SFA models relating to our main concern of market concentration and risk variables. The significance level of the estimated coefficients from DEA models has generally decreased and the income-based model appears to be more robust than the earning assets-based model.[13]

6. Conclusions

This study investigates the relationship between market concentration, risk-taking, and bank performance using a sample of commercial banks in the BRICs over 2003-2010. Our main results, which are robust to alternative model specifications and estimation techniques, are as follows. First, the estimated average efficiency of BRIC banks is 81% in the income-based model and 84% in the earning assets-based models – a moderate and healthy level. The 2007-2008 financial crisis has a significant adverse impact on bank performance and BIRC banks recovered immediately in 2009 except for Russian banks that suffered further efficiency losses. Interestingly, the BRIC banks do not benefit from their fast growing economies as our results show that GDP growth has no or adverse impact on bank performance. Secondly, we find a negative association between market concentration and performance, implying that the "quiet life" hypothesis holds in the BRICs' banking markets. Thirdly, we observe a negative association between performance and credit risk, market risk, and overall risk but a trade off between performance and liquidity

[13] These results are available from the authors upon request.

risk. The implication is that banks may improve performance by taking less credit risk, market risk, and overall risk, which enhance the stability of the banking sector. Finally, results from a wide range of control variables at the country-, industrial-, and bank-level are also independently valuable. Brazil and China have more favourable institutional infrastructure for banks to operate more efficiently. State ownership and foreign banks have negative impacts on bank performance. Listed banks subject to market disciplines and public scrutiny perform better. Our results may provide important policy implications for bankers and regulators in the BRICs as well as other developing and transition countries.

Despite the rising status of the BRICS (including South Africa) with 43% of the world's population and healthier economic growth than Europe and the US, their banking sectors are under-researched. At the BRICS summit in March 2013, leaders from the BRICS nations agreed to create a contingency fund of $100 billion and proposed the BRICS Development Bank that focuses on infrastructure development. Apparently, future research is urgently needed for better understanding of the banking markets in the BRICS. Future research may address following issues. First, banking reforms in these countries are still ongoing and it takes time for the full impact of the special measures taken in the crisis period to materialize. For instance, during the eruption of the global financial crisis in 2008, the Chinese government took aggressive measures to stimulate the economy via its banking system. These issues need to be followed up. Second, future work may take a macro approach to investigating the connections between performance, financial stability, and competition from an emerging market perspective thereby providing information for policy makers. Last but not least, issues relating to the proposed BRICS development bank (i.e., the viability and feasibility) require immediate research attention.

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Figure 1: The Technical Efficiency Level from the Income-based Model

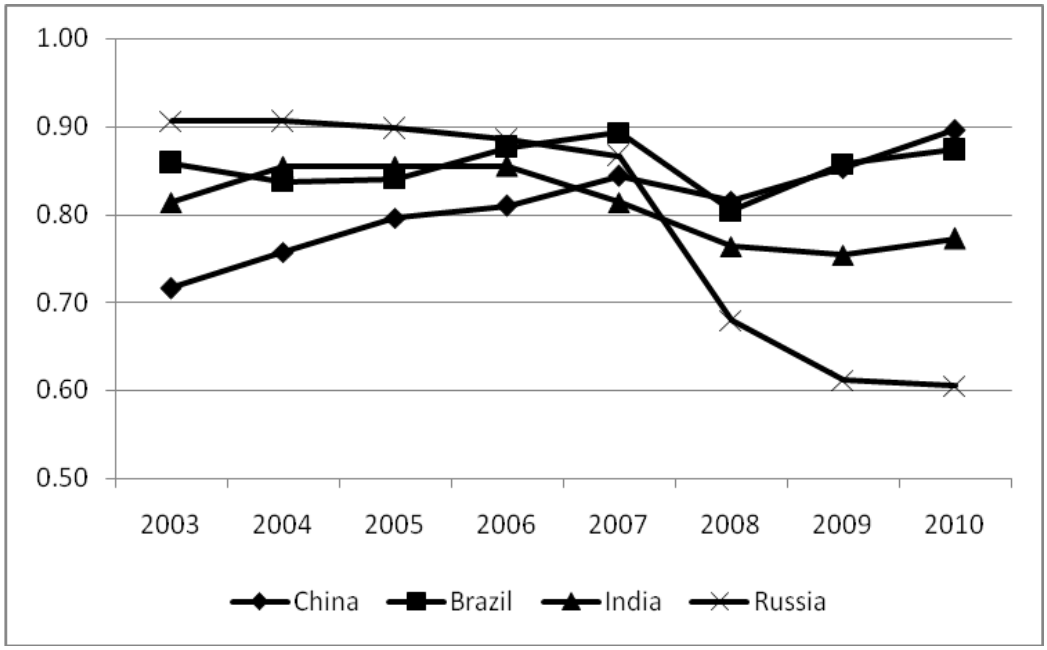

Figure 2: The Technical Efficiency Level from the Earning Assets-based Model

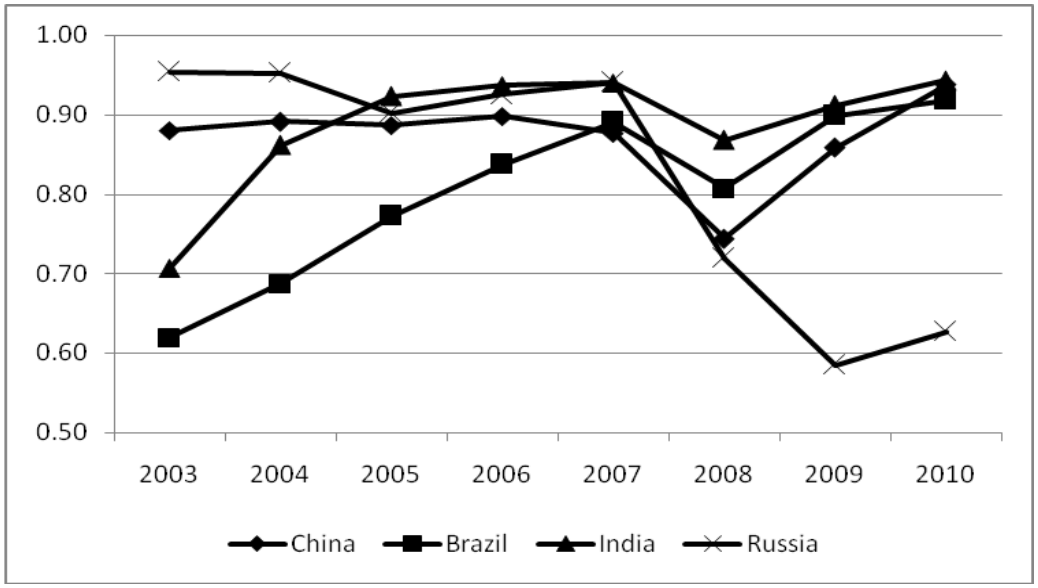

Table 1. Descriptive Statistics

	Full Sample No. Obs: 1001		Brazil No. Obs: 92		India No. Obs: 219		Russia No. Obs: 184		China No. Obs: 506	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Inputs and outputs variables										
Operating income*	1643	4164	3881	5147	1060	1889	974	2145	1731	5012
Net interest income*	1260	3342	2779	3540	628	997	600	1565	1498	4211
Total non-interest operating income*	382	1028	1102	1705	432	1001	374	762	233	898
Net Loans*	22890	66374	16946	25095	14020	22410	8689	19697	32974	89650
Total Securities *	11141	36456	17711	23406	7427	11658	1798	4433	14952	49061
Total Customer Deposits*	32858	109773	16874	24922	18924	28651	7985	20768	50840	150195
Total interest expense*	1021	2281	2672	3428	1155	1857	572	1170	826	2364
Total non-interest expenses*	1103	2657	2795	3741	746	1408	748	1671	1079	2994
Fixed assets*	492	1543	343	534	206	242	422	1029	668	2045
Inefficiency effects variables										
Market concentration	61	12	64	3	47	3	48	4	72	2
Risk-taking										
Capital Risk	8	7	10	4	6	2	16	12	5	3
Credit Risk	5	8	9	6	3	3	5	9	6	9
Market Risk	22	22	49	20	10	8	50	25	13	9
Liquidity Risk	34	21	29	21	9	3	26	11	48	15
Overall Risk	178	189	75	23	66	23	287	258	140	160
Control variables										
GDP	8.6	3.9	4.0	2.5	8.3	1.5	4.7	5.3	11	1.6
Share of state-owned banks	60	14	32	3	73	2	40	3	67	1
Share of foreign banks	7.1	6.6	20.9	1.5	7.5	0.6	13.9	4.7	1.9	0.3

Importance of stock market	1.2	0.89	1.3	0.37	2.0	0.75	2.1	0.49	0.5	0.26
Net interest spread	7.9	10.41	37.7	3.37	4.9	0.59	6.5	0.97	3.3	0.18
Bank size *	50455	153975	45953	63842	24751	38970	13471	28521	75848	209350
Revenue Diversification	19.3	20.5	20.6	18.3	32.6	11.1	39.5	28.1	6.0	5.5
Assets Diversification	24.7	14.0	46.9	18.0	34.6	6.8	14.3	9.0	20.1	9.4

Note: (1) * Values are in million US dollars (2005 price level); (2) NPL – non-performing loans; LLR – loan loss reserve (3) Operating Income = Net Interest Income＋Total Non-Interest Operating Income, Pre-Impairment Operating Profit = Operating Income - Total Non-Interest Expenses (overheads), Operating Profit = Pre-Impairment Operating Profit - Loan Impairment Charge - (Securities and Other Credit Impairment Charges).

Table 2. Estimation Results

	Income-based model		Earning assets-based model	
	Coefficient	t-value	Coefficient	t-value
Frontier Regression				
Scale elasticity	0.97		0.98	
Sigma-squared ($\sigma^2 \equiv \sigma_v^2 + \sigma_u^2$)	0.60	11.86	0.10	12.01
Gamma($\gamma \equiv \sigma_u^2 / \sigma_v^2 + \sigma_u^2$)	0.93	99.58	0.69	17.68
Log likelihood		-110.56		149.22
LR test		615.19		341.85
Inefficiency Effects Analysis				
2007-2008 Global Financial Crisis	0.62	4.39	0.98	9.32
Market concentration	15.63	10.36	2.01	3.45
Risk-taking variables				
Capital Risk	-1.31	-1.31	0.89	3.62
Credit Risk	3.35	6.55	0.81	4.67
Market Risk	3.37	9.96	0.74	6.16
Liquidity Risk	2.62	5.65	1.35	11.63
Overall Risk	-0.004	-3.27	-0.002	-9.55
Control variables:				
Country level				
GDP Growth	0.97	0.78	4.09	6.22
Brazil	-2.13	-3.41	6.26	8.15
India	2.94	4.85	0.43	1.89
Russian	2.87	4.15	5.67	9.13
Industrial level				
Share of State-owned Banks	7.23	5.03	17.77	12.18
Share of Foreign Banks	12.72	9.09	5.22	4.76
Importance of Stock Market	0.93	3.71	-0.72	-8.94
Net Interest Spread	3.53	2.41	-3.40	-2.81
Bank level				
Bank Size	0.25	1.85	-0.25	-3.83
Listing Status	-0.81	-6.52	-0.19	-5.90
Revenue Diversification	-0.60	-1.94	0.84	7.12
Assets Diversification	3.24	7.57	1.57	8.74
Time	-0.16	-2.86	0.05	4.16
Constant	-21.19	-9.93	-15.34	-12.19

Note: (1) As the dependent variable in the inefficiency effect model is the estimated inefficiencies, a negative sign of the estimated coefficient indicates that the particular variable has a positive effect on efficiency and *vice versa*; (2) The country dummy of China is excluded from the estimation for comparison purposes.

Table 3. Robustness test: the income-based model

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value
2007-2008 Financial crisis dummy	0.62	4.39	0.84	4.35	0.77	4.57	0.77	5.23	0.71	4.00	0.77	4.68	0.88	4.50
Market concentration	15.63	10.36	18.43	9.75	16.57	11.59	16.20	13.30	14.58	11.62	15.18	12.21	14.29	8.81
Risk-taking variables														
Capital risk (Equity/assets)	-1.31	-1.31	-1.05	-1.23	-0.98	-1.36	-1.55	-2.84	-0.31	-0.34	0.05	0.06	-0.06	-0.07
Credit risk (NPL ratio)	3.35	6.55	3.42	6.51	3.38	6.31	3.34	6.19	3.56	6.41	3.60	6.52	3.60	6.04
Market risk	3.37	9.96	3.72	9.32	3.65	10.02	3.16	10.23	3.54	8.68	3.30	9.54	3.44	8.65
Liquidity risk	2.62	5.65	2.65	6.23	2.59	5.74	2.54	5.50	2.71	4.61	2.12	4.72	2.13	4.04
Overall Risk	-0.004	-3.27	-0.005	-7.46	-0.005	-7.96	-0.004	-8.01	-0.006	-9.12	-0.006	-9.43	-0.006	-8.14
Control variables														
GDP growth rate	0.97	0.78	1.73	1.17	1.27	0.89	1.64	1.43	1.06	0.87	1.19	1.01	1.91	1.24
Brazil	-2.13	-3.41	2.43	1.16	0.72	0.27	-2.44	-3.15	-0.54	-0.60	-0.25	-0.24	1.45	0.82
India	2.94	4.85	3.83	5.77	3.24	4.37	2.69	4.37	3.59	6.53	3.53	5.62	3.08	4.49
Russian	2.87	4.15	6.36	3.75	5.01	2.48	2.57	3.76	3.59	2.80	3.32	2.60	4.45	3.03
Share of state-owned banks	7.23	5.03	13.07	3.72	11.02	2.80	7.27	4.69	10.32	3.12	9.16	2.90	12.73	2.95
Share of foreign banks	12.72	9.09	4.00	0.84	5.54	0.99	16.25	13.87	13.45	9.39	14.33	12.39	12.58	4.70
Importance of stock market	0.93	3.71	0.99	3.88	1.00	4.40	0.95	3.75	0.59	2.85	0.56	2.27	0.63	2.39
Listing status	-0.81	-6.52	-0.83	-6.17	-0.78	-7.99	-0.81	-6.96	-0.99	-6.91	-1.03	-6.52	-1.04	-6.20
Net interest spread	3.53	2.41			2.62	1.08	2.84	2.24	5.57	2.06				
Bank size	0.25	1.85	0.30	2.47			0.18	1.34	0.42	3.51	0.47	3.22		
Revenue Diversification	-0.60	-1.94	-0.73	-3.28	-0.72	-2.33			-0.44	-1.34				
Assets Diversification	3.24	7.57	3.21	7.77	3.22	6.94	3.22	8.18						
Time	-0.16	-2.86	-0.19	-3.47	-0.18	-4.30	-0.21	-3.86	-0.19	-3.47	-0.21	-3.37	-0.26	-3.75

Table 4. Robustness test: the earning assets-based model

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value	δ_s	t-value
2007-2008 Financial Crisis	0.98	9.32	0.57	1.17	0.27	5.90	0.08	2.20	0.37	7.88	0.11	3.21	0.12	3.91
Market concentration	2.01	3.45	1.53	1.46	0.18	0.36	0.68	1.61	1.10	2.08	0.69	1.75	0.72	3.05
Risk-taking variables														
Capital Risk	0.89	3.62	0.64	4.22	0.20	1.06	0.09	0.39	0.39	1.43	0.05	0.27	-0.01	-0.08
Credit Risk	0.81	4.67	0.75	1.35	0.44	4.67	0.31	2.00	0.43	2.68	0.29	2.03	0.22	1.65
Market Risk	0.74	6.16	0.72	7.59	0.35	5.21	0.51	5.69	0.48	4.23	0.49	6.10	0.40	6.30
Liquidity Risk	1.35	11.63	1.29	1.63	0.61	23.46	0.27	3.19	0.74	5.94	0.25	3.00	0.20	3.20
Overall Risk	-0.002	-9.55	-0.001	-2.22	-0.001	-2.16	-0.002	-5.36	-0.001	-3.13	-0.003	-14.78	-0.002	-10.59
Control variables:														
GDP growth rate	4.09	6.22	2.06	0.89	1.59	3.42	0.50	0.94	1.42	2.63	0.82	1.59	0.82	1.94
Brazil	6.26	8.15	3.70	3.93	1.92	6.69	2.00	5.14	2.69	6.03	2.67	8.29	2.32	8.08
India	0.43	1.89	0.33	0.52	0.03	0.15	-0.15	-1.00	0.33	1.62	-0.03	-0.20	-0.02	-0.21
Russian	5.67	9.13	3.62	6.16	1.89	18.07	1.93	6.80	2.34	6.45	2.14	7.85	1.95	9.11
Share of state-owned banks	17.78	12.18	12.46	12.67	6.78	17.94	7.67	10.20	8.34	8.94	8.18	11.95	7.41	11.96
Share of foreign banks	5.22	4.76	4.98	7.77	3.20	2.61	0.96	1.55	4.15	7.04	0.99	1.69	1.27	2.09
Importance of stock market	-0.72	-8.94	-0.43	-1.62	-0.30	-12.04	-0.09	-2.09	-0.36	-7.05	-0.11	-2.63	-0.10	-3.10
Listing status	-0.19	-5.90	-0.13	-6.75	-0.12	-9.29	-0.06	-2.25	-0.12	-3.52	-0.06	-2.41	-0.06	-2.48
Net interest spread	-3.40	-2.81			-0.36	-0.43	2.14	2.44	-0.96	-1.07				
Bank size	-0.25	-3.83	-0.18	-2.36			-0.13	-3.30	-0.16	-3.58	-0.14	-3.37		
Revenue Diversification	0.84	7.12	0.67	4.47	0.33	3.05			0.56	5.41				
Assets Diversification	1.57	8.74	0.98	6.44	0.74	6.64	0.57	3.21						
Time	0.05	4.16	0.037	1.75	0.02	2.16	0.32	8.87	0.03	2.85	0.27	7.13	0.13	9.15