

The impact of efficiency and market structure on the financial performance: empirical evidence from China's banking sector

Honghai Xu (*Corresponding Author*)

E-mail: xuhonghai@scrss.net

ORCID <https://orcid.org/0000-0001-9199-8432>

Affiliation: School of Economics, Xihua University, China

ROR: <https://ror.org/04gwtvf26>

Qi Liu

E-mail: liuqiluqi@outlook.com

ORCID: <https://orcid.org/0000-0000-0000-0000>

Affiliation: Chengdu Industry Investment Group CO.LTD, China

ROR:

Annotation. Against the backdrop of structure-conduct-performance (SCP) and efficient-structure (ESH) hypotheses, this research investigates the impact of the market structure on the performance of banks in China from 2015 to 2024. The DEA method is adopted to gauge the efficiency of banks, whereas the concentration ratio is utilised to evaluate the market structure of Chinese banks. Using random regression analysis, both variables (market structure and efficiency of banks) among other independent variables (market share, loan ratio, bank size, and operating expenses) are regressed upon the explained variable, namely the financial performance of Chinese banks represented by ROA. In this study, a trend analysis is also carried out to analyse the performance of the Chinese banking sector. The regression results show that both the market structure and the efficiency of banks exert a noticeable positive influence on the banks' performance in China, supporting the ESH and rejecting the SCP hypothesis. This implies that banking efficiency and market structure (concentration) significantly affect the profitability performance of Chinese commercial banks. From the structural perspective, the concentration of Chinese banks is on a declining trend, and the Chinese banks are more competitive due to less concentration of the market. In the context of efficiency, DEA analysis shows that banks in China are operating below their efficient capacity. Thus, Chinese banks could lessen the utilisation of their inputs to operate in an efficient manner.

Keywords: efficiency, market structure, HHI, market size, DEA.

JEL classification: C6, D4, D61, L11.

Introduction

The banking industry is a major sector contributing to China's economic growth (Lee, 2017). This sector assumes a highly critical role and is easily comprehensive, for it also affects other financial sectors, including the SSE, SZSE, and NBFCs such as insurance firms, mutual funds, and investment corporations. All these financial institutions strongly influence the economic growth of China (Chow, 2015). The efficient performance of the Chinese banking sector can be attributed to a wide range of banking reforms (Tan, 2017). Specifically, competition has compounded since 2001 when China joined the WTO (Sachs and Woo, 2003). As a result, the Chinese commercial banks were compelled to compete more intensely with other banks. For the first time, domestic Chinese banks were also exposed to foreign competition

(Peng, 2006). In China, the financial sector also exhibits a stronger economic position than in other emerging countries, with the banking sector as one of the imperative financial sectors contributing to Chinese economic development (Zhang et al., 2012). In China, banks have generally performed well as an industry, but this sector does not ensure greater credit access and availability (He, Wei, 2023; Hua, Huang, 2021). While in the era of modern trade and commerce, the banking sector acts as the blood, as it is the key source of financing (Dwivedi et al., 2021). Commercial banks such as joint-stock, SOEs, and private commercial banks operate in China (Ye et al., 2012).

The financial crisis in Asia has uncovered the vulnerabilities of the domestic banking industry even in large economies such as China (Essers, 2013). Consequently, numerous fragile financial firms and commercial banks were uncovered; financial distress and insolvency were chaotic. Nonetheless, Leightner (2000) attributed the proposed financial crisis to over-saving and under-consumption in the Asian nations, although Chirpcop (2000) illuminates that crony capitalism in some Asian countries had potentially led to the financial crisis due to the misallocation of resources. In addition, Laeven (1999) points out that most financial institutes in Asian countries exhibited a high extent of non-performing loans amidst the crisis due to excessive lending and inappropriate risk management.

In China, the banking system has observed a substantial transformation due to financial/technological innovation and liberation to global flows of capital (He, 2024). In addition, banking crises always involve bank closures and government intervention, resulting in the structural reform of the banking sector. The systemic crises in banking industry triggered several governments in emerging economies to warrant or coerce failing banks to merge (Shih, 2003). The financial crisis also influenced the banking sector in China, leading the Chinese authorities to accelerate the mergers and acquisitions (M&As) of several commercial banks to improve the bank management (Healey, Chenying, 2017).

The most appropriate tools to reduce social costs related to bank defaults and optimise the efficiency and structure of the banking sector during a crisis are mergers and acquisitions of banks (Al-Binali et al., 2023). In line with this, the Chinese government has also merged several domestic banks to form single-merged entities. The proposed reform has profoundly changed the banking landscape of China. Management theories advocate that business mergers have the potential to optimise corporate efficiency (Rhaodes, 1998; Shaffer, 1993), which eventually also encourages commercial banks to institute new organisational structures, assume operational improvements, and substitute inefficient management. In contrast, Berger (2003) believes that M&As can lessen bank efficiency due to managerial turf battles, downsizing disruptions, conflict of organisational cultures, and a rise in various costs such as legal expenses, severance pay, and consultant fees.

Market concentration occurs when fewer enterprises have a higher percentage of the total market (Rinz, 2022). Therefore, a concentrated market generally results in greater chances to realise higher profits (Liu et al., 2023). However, in order to determine how market structure impacts the financial performance of China's banks, the influence of market structure on its performance must be investigated. Thus, this study aims to investigate the impact of banking efficiency and market structure on the performance of banks in China. Since the state-owned commercial banks adopt technologies in China more rapidly due to extensive state support, the SOE banks' market share is significantly greater than that of private sector banks (Wu et al., 2023; Yeung, 2021). Specifically, these advancements include online banking, ATM services, internet transactions, etc., which reduce the overhead expenses (IT, staff, and marketing). The proposed changes hold useful implications for the Chinese banking and financial sectors. Nevertheless, the increased concentration can reinforce the market power of the large banks by developing fraudulent behaviour. In order to derive valuable implications of these structural changes and developments (Xu et

al., 2024), it is of vital significance to analyse the current market structure of the Chinese banking sector to recognise the impact of changes that are likely to occur in the market structure and behaviour of banks.

Previous studies on China's banks focus on scaling their performance, bank-specific, and macroeconomic determinants (Ahmed et al., 2021; Chen, Lu, 2021). However, almost no studies exist on measuring the efficiency and market structure of banks and their association with banks' performance. As a result, this paper endeavours to fill this research gap by linking the market structure and efficiency of banks with their financial performance. In this study, the key motivation is derived from the rapidly growing literature on market structure problems in developed countries, with little attention being paid to this issue in developing economies such as China. By comprehending the association between the market structure (market concentration) and the efficiency performance of commercial banks, this study helps both financial corporations and regulatory authorities to recognise the core determinant of the Chinese banks' performance.

This research aims to scrutinise the effect of efficiency and market structure on the performance of China's commercial banks. Different study objectives can be summed up as follows: to analyse the market structure's impact on the performance of the Chinese banks; to investigate the impact of banking efficiency on the banks' financial performance in China; to determine the influence of market share on the Chinese banks' performance; and to ascertain the trend of bank performance in China.

1. Literature Review

Market structure has been one of core determinants in scaling the banking performance (O'Connell, 2022; Feghali *et al.*, 2021). Furthermore, the market concentration and profitability of the banks were found to be positively related to each other (Kumar *et al.*, 2022; Horobet *et al.*, 2021). This means that profitability shall be increased by low competition and higher market concentration. Therefore, concentration can exert adverse effects on industry competition. Several studies also highlight that those banks that have a large market share can yield high-profit margins (Kashyap, Stein, 2023; Whited *et al.*, 2021; Petria *et al.*, 2015). Conversely, different empirical research also indicates that there exists an inverse correlation between market concentration and bank performance (Bello, Isola, 2014; Shin, Kim, 2013; Chen, Liao, 2011). These findings reveal that efficiency constitutes the main factor in optimising the banks' performance.

Studies on the connection between market structure and bank performance are based on two competing hypotheses, namely: the structure conduct performance (SCP) and the efficient structure hypothesis (ESH). SCP is used to link market structure and market performance. In the 1940s and 1950s, the SCP model was derived from the economic notions of the market structure. Bain (1950) was the first to introduce this model to find out the connection between concentration and profitability of the US manufacturing industries. On the contrary, Demsetz (1973) and Peltzman (1977) were the first to introduce the ESH. This hypothesis suggests that the aggressive behaviours of efficient enterprises in the market result in an uplift not only in their size but also in market share. Besides, ESH emphasises that the linkage between market structure and performance is reversed, and several other factors, such as the latest technology and management competency, uplift the banks' profitability.

The overview of Chinese studies on market structure and financial performance of the banks indicates that several studies have been undertaken in this field (Tan *et al.*, 2017). For instance, Sufian, Habibullah (2009) analysed the influence of credit risk on the Chinese banks' profits and established that it exerts a substantial positive effect on the financial outcome of joint-stock banks and state-owned banks. Parallel to this, Sufian (2009) also ascertained the bank profits' determinants and established that China's banks

with higher degrees of liquidity and credit risks demonstrate optimal profitability. Subsequently, Tan, Floros (2012a) explored the influence of credit risk and competition on the profitability of commercial banks in China. However, their study results did not report any significant influence. Nevertheless, Tan, Floros (2012b) confirmed that credit risk substantially influences the Chinese banks' financial performance. Similarly, Tan, Floros (2012c) indicated that joint-stock banks in China with greater degrees of credit risk yield greater financial profits. Afterward, Tan, Floros (2014) scrutinised the inter-association between risk, financial profit, and competition among China's banks. Their study findings posited that there exists an inverse effect of competition on Chinese commercial banks; nonetheless, various types of risks do not demonstrate a noticeable influence on the banks' financial performance. Moreover, Garcia-Herrero *et al.* (2009) investigated the influence of competition and efficiency on the financial performance of China's banks and reflected that commercial banks with greater efficiency exhibit higher extents of financial performance; however, competition does not reflect a profound impact on bank profitability. Thereafter, Tan (2016) studied the influence of competition and risk on the Chinese commercial banks' performance and proposed that both aforementioned variables do not demonstrate a substantial impact on China's banking profitability.

Apart from this, the review of extant studies from foreign and other emerging economies highlights that the linkage between the market structure and performance of banking sectors is mixed. To illustrate, Ab-Rahim and Chiang (2015) studied the relationship between market structure and performance of Malaysian commercial banks, and established that Malaysian commercial banks are less efficient in term of managerial performance since Malaysian banking sector has a less concentrated market, therefore competition is high in the market. Chirwa (2003) concluded that there exists a positive relationship between profitability and market structure, as well as a long-run association between profitability and market concentration in the Malawi banks. Pervan *et al.* (2012) supported the SCP hypothesis by finding that the concentration level positively influences the profitability of Croatian national banks. Subsequent to that, Simatele (2015) concluded that the South Africa's banks operate in a monopolistically competitive market structure, and the increased concentration does not reduce the level of competition.

In terms of the SCP and ESH, Bhatti and Hussain (2010) confirmed that the concentration and profitability of Pakistani commercial banks are positively related to each other. Subsequently, Nurwati *et al.* (2014) reflected that market concentration positively influences the performance of Indonesian Islamic banks. Likewise, Ahamed (2012) applied two competing hypotheses, i.e., SCP and ESH, to ascertain the linkage between concentration and competition in Bangladeshi banks. His study results posited that profitability is negatively related to market share and positively related to concentration ratio. In the context of Tunisian commercial banks, Ayadi and Ellouze (2013) advocated that efficiency demonstrates a positive effect on the performance of Tunisian banks. Based on different European countries, Molyneux and Forbes (1995) illuminated that the collusion cost between corporations is low due to increased concentration. In light of four competing hypotheses, including the SCP, relative market power (RMP), X-efficiency (XEFF), and scale-efficiency firm (SEFF), Seelanatha (2010) suggested that the Sri Lankan banks' performance is independent of the market concentration, but it is subject to the efficiency level.

Both domestic and foreign studies encompass a wide range of inferences related to market structure and bank performance. Reportedly, although different aspects of market structure and bank performance are investigated in the literature, there is still a substantial need to analyse the connection between market structure and bank performance in the Chinese context, based on the research aspects to be scrutinised

in the present study. As a result, in light of the aforementioned literature, this paper attempts to determine the influence of banking efficiency and market structure on banks' performance. The following research hypotheses are proposed:

H1: Market share exerts a positive influence on the performance of banks in China;

H2: Market concentration negatively impacts the performance of Chinese banks;

H3: Technical efficiency exhibits a positive impact on the performance of banks in China;

H4: Scale efficiency has a positive influence on the performance of Chinese banks.

2. Data and Methods

The study population includes the commercial banks listed on the SSE and SZSE of China. Small banks with a low market capitalisation are also excluded from the study sample. Furthermore, some banks have not been selected in the study sample for their incomplete data. As a result, a total of 60 commercial banks were chosen as a study sample. Using the time period from 2015 to 2024, data related to input and output variables of the chosen banks is retrieved from their annual reports. Moreover, the DEA method is used to measure the efficiency scores of banks based on the list of input variables: personnel expenses and deposits, and output variables: total loans and other earning assets. The intermediation approach is used in this research for variable selection. Additionally, concentration ratios and Herfindahl-Hirschman index (HHI) approaches are adopted to measure the market concentration. Meanwhile, the ROA ratio is utilised to gauge the performance of banks. Market share is scaled by concentration ratios and the HHI. Lastly, CR_k is estimated as the sum of the K largest banks' market share in the market.

$$CR_k = \sum_{i=1}^k s_i$$

$$CR_k = S_1 + S_2 + \dots + S_m$$

s_i represents the market share of the firm i .

HHI refers to the sum of the squares of the market share of all commercial banks in the market, while market share is gauged as a weightage. Accordingly, the HHI expression is as follows:

$$HHI = \sum_{i=1}^n s_i^2$$

s_i denotes the market share of firm i in the market, and N is the number of firms

2.1 Econometric Model

Drawing on Ab-Rahim and Chiang (2016), Goldberg and Rai (1996), Berger (1995), and Smirlock (1985), this study estimates the following two econometric models:

$$ROA_{it} = \beta_0 + \beta_1 CR_{it} + \beta_2 MS_{it} + \beta_3 TE_{it} + \beta_4 SE_{it} + \beta_j Z_{it} + \epsilon_{it}$$

$$ROA_{it} = \beta_0 + \beta_1 HHI_{it} + \beta_2 MS_{it} + \beta_3 TE_{it} + \beta_4 SE_{it} + \beta_j Z_{it} + \epsilon_{it}$$

Where ROA_{it} signifies the performance of bank i in period t . Both CR_{it} and HHI_{it} refer to market concentration in period t . MS_{it} denotes the market share of bank i in period t . TE_{it} and SE_{it} refer to the technical efficiency and scale efficiency of bank i in period t , respectively. Z_{it} connotes the vector of control variables for bank i in period t . ϵ_{it} shows an error term for bank i in period t .

2.3 Description of the Variables

The share of individual bank's ROA is incorporated as an explained variable, while using the DEA, the technical and scale efficiency scores of banks are computed to reflect bank efficiency (independent variable). The bank's assets are used to measure its market size (MS). Different control variables added to the econometric model include operating expenses (OE; operating expenses/total assets), loan ratio (LR; loans/total assets), and bank size (BS; log of total assets).

3. Results and Discussion

3.1 Descriptive Statistics

Different variables including profitability, market concentration, efficiency, and controlled variables are presented in *Table 1*. The descriptive statistical analysis is focused on the number of observations, standard deviations, and minimum and maximum values of the variables. The average ROA is 0.6% of total assets, with the lowest value of -6.3% and the highest of 4.6% ROA. On average, the 5 banks concentration (CR5) is 58.4% of the total market, while the lowest value is 54.0% and the highest value is 61.3%. The mean of the 3 banks concentration (CR3) is 42.6%, with the lowest value of 37.9% and the highest value of 44.0%. The mean of the 3 banks concentration (CR3) is 42.6%, with the lowest value of 37.9% and the highest value of 44.0%.

Table 1. Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Profitability					
ROA	200	0.006	0.017	-0.063	0.046
Market Concentration					
CRLOANS5	200	0.584	0.029	0.540	0.613
CRLOANS3	200	0.426	0.026	0.379	0.440
CRLOANS2	200	0.310	0.022	0.271	0.335
HHILOANS	200	0.081	0.005	0.080	0.098
MSASSETS	200	0.060	0.045	0.003	0.177
Efficiency					
TE	200	0.680	0.055	0.512	1.000
SE	200	0.952	0.098	0.324	1.000
Control Variables					
Operating Expenses (OE)	200	0.011	0.003	0.001	0.042
Loan ratio (LR)	200	0.449	0.107	0.201	0.802
Size (BS)	200	12.153	1.386	1.421	13.736

Source: authors' own calculations.

Furthermore, the mean of the 2 banks concentration (CR2) is 31.9%, with lowest and highest values of 27.1% and 33.5%, respectively. The average of HHI is 8.1%, and the mean competition in the Chinese banking market is mixed, i.e., perfect competition and monopolistic competition have the lowest value of 8.0% and the highest value of 9.8%. The descriptive statistics indicate that five large banks are highly dominant in the banking sector of China. Meanwhile, the mean of market share (MS) is 6%, while the lowest value is 0.3% and the highest value is 17.7%. Similarly, the mean score of technical efficiency (TE) is 68%, which shows that the banks' ability to convert diverse resources into different services is comparatively low, and the key area of TE score comes from SE, which is 95%. The mean value of operating expenses (OE) is 1.1%, with the lowest value of 0.12% and the highest value of 4.2%. Another control variable the mean of loans ratio (LR) stands at 44.92%, with the lowest value of 20.1% and the highest value of 80.2%. Lastly, the mean value of bank size (BS) is 12.1%, whereas the lowest value of BS

is 1.4% and the highest value is 13.7%. In terms of size, the larger commercial banks hold a variety of products and loan diversification.

3.2 Financial Analysis of Bank Performance

3.2.1 Market Efficiency

In this study, both TE and SE are employed to capture the market efficiency of Chinese banks. The relevant details are shown in *Table 2*. *Table 2* presents the commercial banks' efficiency in China. This research utilises the DEA method to scale the efficiency scores of banks based on the list of input variables, including personnel expenses and deposits, and output variables, including total loans and other earning assets. The intermediation approach is adopted to choose the variables. The mean of TE is 67%, which shows that the Chinese banks' capability to convert diverse resources into diverse services is comparatively low. Conversely, the scale efficiency's mean is documented to be 94%. This implies that commercial banks in China produce the maximum output for the given inputs without becoming less efficient by either shrinking or expanding their operations. Essentially, Chinese commercial banks operate at the most productive scale where any changes in size lead to reduced efficiency.

Table 2. Efficiency Score of Chinese Banks

Year	Technical Efficiency	Scale Efficiency
2015	0.6122	0.8433
2016	0.6318	0.9563
2017	0.6428	0.9407
2018	0.6604	0.9219
2019	0.6649	0.9466
2020	0.6722	0.9692
2021	0.6793	0.9391
2022	0.6877	0.9687
2023	0.7223	0.9684
2024	0.7260	0.9741
Mean	0.6702	0.9429

Source: authors' own calculations.

In general, both technical and scale efficiencies show an upward trend from 2015 to 2024, with only minor deviations from the proposed trend in some years.

3.2.2 Financial Ratios

The financial performance of Chinese banks is scaled by ROA. This variable measures how efficiently the banking sector of China uses its assets to derive financial profitability. *Table 3* illustrates the ROAs of sampled banks.

The Chinese commercial banks' profitability is scaled by ROAs (see *Table 3*). In 2015, the mean ROA was 0.5%; in 2016, the average ROA was 0.1%; in 2017, the mean ROA was -0.1%; in 2018, the average ROA was 0.1%; in 2019, the average value of ROA was 1.1%; in 2020, the average ROA was 0.90%; in 2021, the mean ROA was 0.4%; in 2022, the average ROA was 0.7%; in 2023, the average ROA was 0.9%; and in 2024, the mean ROA was 1.2%. Collectively, the mean ROA for Chinese commercial banks is 0.6%. The highest ROA (1.2%) was recorded in 2024, showing that Chinese commercial banks are able to optimally utilise their assets and yield higher returns in 2023, as compared to the remaining years included in the

study period (2015–2024). Contrarily, the year 2017 demonstrates that the lowest returns (-0.1%) were derived from their assets by the banking sector than in other years. Further trend analysis also highlights that during the study period from 2015 to 2024, there is a general uptrend in terms of the return on assets. However, there are observed certain minor fluctuations in the aforementioned trend in some years.

Table 3. Performance of Chinese Banks

Year	Return on Assets
2015	0.005
2016	0.001
2017	-0.001
2018	0.001
2019	0.011
2020	0.009
2021	0.004
2022	0.007
2023	0.009
2024	0.012
Mean	0.006

Source: authors' own calculations.

3.2.3 Trend Analysis

The trend analysis of the sampled Chinese banks is carried out by analysing the loan concentration ratio, TE, SE, and ROA from 2015 to 2024. *Table 4* presents the relevant details.

Table 4. The trend of Major Variables

Year	CRLOANS5	TE	SE	ROA
2015	0.6073	0.6122	0.8433	0.005
2016	0.6231	0.6318	0.9563	0.001
2017	0.6205	0.6428	0.9407	-0.001
2018	0.5909	0.6604	0.9219	0.001
2019	0.5941	0.6649	0.9466	0.011
2020	0.5955	0.6722	0.9692	0.009
2021	0.5755	0.6793	0.9391	0.004
2022	0.5518	0.6877	0.9687	0.007
2023	0.5409	0.7223	0.9684	0.009
2024	0.5482	0.7260	0.9741	0.012
Mean	0.5846	0.6702	0.9429	0.006

Source: authors' own calculations.

Table 4 demonstrates the trend analysis of the present study's variables over the selected years from 2015 to 2024. Notably, the trend of the loan concentration ratio of five large banks is downward over the years (2015–2024), while the technical efficiency increases over the chosen years. On the same note, scale efficiency also increases over the study period, and return on assets depicts mixed results.

3.3 Correlation Analysis

In order to predict a potential relationship between the studied variables, a correlation analysis is undertaken in this study. Details of the correlation analysis are presented in the subsequent paragraph, supported by tabular correlation statistics.

Table 5. Correlation Analysis

	1	2	3	4	5	6	7	8	9
1. ROA	1.000								
2. CRLOANS5	0.177***	1.000							
3. HHILOANS	0.166**	0.962***	1.000						
4. MSASSETS	0.434***	0.000	0.000	1.000					
5. TE	0.185*	-0.581***	-0.546***	-0.012	1.000				
6. SE	0.223***	-0.170***	-0.142**	0.073	0.212***	1.000			
7. OE	-0.463***	0.211***	0.215***	-0.108	-0.209***	-0.132*	1.000		
8. LR	-0.158***	0.465***	0.426***	-0.063	-0.362***	-0.021	0.312***	1.000	
9. BS	0.448***	-0.263***	-0.233***	0.694***	0.223***	0.267***	-0.245***	-0.162***	1.000

Source: authors' own calculations.

Table 5 shows the correlation between study variables. Notably, CRLOANS5 and HHILOANS exhibit a profound and positive association with ROA. Hence, a higher market concentration of Chinese commercial banks shall positively influence their profitability. MSASSETS is also significantly and positively related to ROA. As a result, the financial profitability of Chinese banks is also expected to increase due to the increase in market size. In terms of banking efficiency, TE and SE display a significantly positive association with ROA, implying that the efficiency of the banking industry is positively related to their financial performance. However, OE and LR are negatively associated with ROAs. The financial profitability of China's banks is adversely influenced by greater loan ratios and operating expenses. Finally, BS shows a significant and positive association with ROA. Thus, larger Chinese banks are able to yield higher profitability than smaller banks.

3.4 Regression Analysis

Two versions of the outcomes are presented in Table 6 and Table 7. Table 6 displays the regression outcomes of the performance and structure using the CR5 measure as a market concentration proxy. In Table 7, the HHI model is taken as a proxy variable.

Table 6. Random Effects Model (CR5)

ROA	Coefficients	Standard Errors	p-values
CRLOANS5	0.024*	0.041	0.09
MSASSETS	0.139***	0.036	0.001
TE	0.033*	0.033	0.084
SE	0.016***	0.009	0.008
OE	-1.335***	0.247	0.001
LR	0.022	0.021	0.254
BS	0.011	0.003	0.864
_cons	-0.017	0.046	0.674
R-square	0.6456		
Wald chi2(7)	68.646		
Prob > chi2	0.023		
Observations	200		

Notes: *** denotes significance at 1%, ** represents significance at 5%, and * shows significance at 10% levels.

Source: authors' own calculations.

Table 7. Random Effects Model (HHI)

ROA	Coefficients	Standard Errors	p-values
HHILOANS	0.024*	0.167	0.100
MSASSETS	0.146***	0.054	0.001
TE	0.021**	0.032	0.046
SE	0.034***	0.009	0.008
OE	-1.277***	0.275	0.002
LR	0.010	0.016	0.348
BS	0.023	0.002	0.985
_cons	-0.036	0.030	0.204
R-square	0.7088		
Wald chi2(7)	67.54		
Prob > chi2	0.001		
Observations	200		

Notes: *** denotes significance at 1%, ** represents significance at 5%, and * shows significance at 10% levels.

Source: authors' own calculations.

As Table 6 demonstrates the p-values of models, it is evident that they are higher than 0.05, which points to the suitability of random model regression for this panel data. The regression results confirm that the coefficient of the market concentration is positive and statistically significant. This means that the higher market concentration improves the performance of Chinese banks. In the context of the banks' market share, the coefficient is also positive and statistically significant at a 1% significance level. Therefore, the banks' profit is fostered due to a rise in the market share. Since the direct approach (DEA method) is used to scale the banks' efficiency, the coefficients of technical and scale efficiency are significant at a 10% and 1% levels, respectively. This implies that bank efficiency is a crucial component of banks' profitability in China. Further analysis of explanatory variables highlights that the coefficient of operating expenses is significantly negative, whereas other control variables are statistically insignificant. Hence, the higher operating expenses adversely affect the banks' financial performance. Lastly, the R^2 value indicates that 64.5% variation in ROA is explained by the explanatory variables.

Table 7 shows the regression outcomes of the structure and performance model using HHI as a proxy variable. Hausman test suggests that random regression analysis is fit for the chosen panel data. The HHI coefficient is statistically significant, confirming that the higher market concentration of Chinese banks enhances their profit margins. From the perspective of banks' market share, the coefficient is statistically significant at a 1% significance level. The coefficient demonstrates that when market share increases, the bank's profit also increases. In this study, the DEA technique (a direct approach) is utilised to estimate the banks' efficiency. The TE's coefficient is statistically significant at a 5% level, whereas the SE's coefficient is statistically significant at a 1% level. The bank's efficiency is a vital component of its financial profitability. Furthermore, the coefficient of operating expenses is also statistically significant (negative) at a 1% level of statistical significance, confirming that greater operating expenses reduce banks' profitability. Apart from that, the other control variables were found to display an insignificant effect on ROA of the Chinese banking industry. Meanwhile, the R^2 value reflects that explanatory variables predict 70% of the variation in ROA.

4. Discussion

This study investigates the effect of market concentration and efficiency on the Chinese commercial banks' financial performance for the time period from 2015 to 2024. The study findings contribute valuable insights how structural characteristics of the Chinese banking sector affect financial profitability, and offer valuable implications for both bank managers and policymakers.

Firstly, the trend analysis and descriptive statistics highlight that Chinese commercial banks function in a moderately concentrated market, with five large banks consistently holding a dominant share. Nevertheless, a slight downward trend in loan concentration (CR5) highlights increasing competition over the analysed time period. Despite such a shift, the overall scale and technical efficiencies of this sector demonstrate consistent improvement throughout the chosen study period, reflecting progress in terms of resource utilisation and optimisation of operational scale.

Scaled by ROA, the Chinese banks' financial performance also depicts an upward trend, although with some fluctuations, particularly during the year 2017 when a negative ROA was observed. This trend confirms a general strengthening of the Chinese banking sector's profitability post-2017, potentially due to internal reforms, macroeconomic recovery, and increased operational efficiencies.

Moreover, the correlation analysis supports the initial hypotheses by confirming positive associations between market concentration (CRLOANS5 and HHILOANS), market size (MSASSETS), efficiency measures (TE and SE), and profitability (ROA). These research findings suggest that larger banks with better operational efficiencies and higher market shares are inclined to realise improved financial outcomes. In contrast, higher loan ratios (LR) and operating expenses (OE) negatively influence financial profitability, projecting cost management and prudent lending practices as crucial areas for improving the financial performance of the banking sector.

Regression analysis further supports these associations. Both models using CR5 and HHI as proxies for market concentration establish a substantial and positive influence of concentration on profit margins. These results point out that a more concentrated banking sector in China is inclined to augment higher financial performance, confirming the SCP" hypothesis, where a more concentrated market structure enables the banking sector to hold greater market power and financial profitability.

Furthermore, the scale and technical efficiencies were found to noticeably uplift ROA, aligning with previous studies (such as Belkhaoudi et al., 2014; Ayadi, Ellouze, 2013). This highlights the significance of effective resource allocation and operational excellence in reinforcing the banks' performance. Nonetheless, the substantial negative impact of operating expenses stresses the vulnerability of profitability to cost inefficiencies, positing that controlling operational costs remains a strategic priority for the banking industry.

The proposed results are consistent with extant literature, such as that of Ab-Rahim and Chiang (2015), who believe that higher market concentration fosters bank performance. Consistent with the study findings, Belkhaoudi et al. (2014) and Ayadi, Ellouze (2013) also confirm that market share, technical efficiency, and scale efficiency exhibit a positive relationship with bank performance. However, contrasting research findings from Ahamed (2012) and Seelanatha (2010), which highlight possible adverse influences of concentration, remind us that these associations may vary across different banking systems and regulatory environments.

Overall, this research finds robust evidence that market structure, efficiency, and cost management are pivotal determinants of financial performance among commercial banks of China. Therefore, the Chinese banking sector should constantly optimise efficiency and control operational expenses to retain profitability in an evolving market landscape, whereas policymakers must balance promoting competition and financial stability.

Conclusions

The market structure (market concentration) and banking efficiency (SE and TE) exert a positive influence on the commercial banks' performance in China. Since banking efficiency is reported to impact the profitability of banks throughout the analysis, Chinese bankers must improve the commercial banks' efficiency performance. Besides, there also exists a need to implement further banking reforms, as this study has rejected the SCP hypothesis. Thus, the rise in the market share of the Chinese banking sector has positively affected their performance, despite several mergers and acquisitions (M&A) events that have significantly reduced the number of banks in China.

The key policy implications of this study are as follows. The nullification of the SCP hypothesis implies that the narrative to prevent the high concentration of the Chinese banking sector is rejected, since the higher market concentration does not reflect a downfall in banking performance and competition. From the banking efficiency perspective, the policymakers must support further M&A's among domestic commercial banks. Simultaneously, the Chinese government needs to pave the way for more M&A's by concentrating on efficient banks. Likewise, China must also support the commercial banks for the novel domestic competitive atmosphere triggered by foreign participation. Furthermore, the authorities also need to motivate the foreign banks' entry into the Chinese banking sector, since this initiative shall benefit the clients in terms of cheap and affordable banking services. Ultimately, the low operating costs will lead to improved cost efficiency performance of the Chinese banks.

There are also some limitations related to this study. For instance, this study is built around the Chinese context. Consequently, the study findings may not be generalised to other developing countries with different socio-economic conditions. Thus, future studies may endeavour to ascertain the influence of market structure and efficiency on the banks' performance in other developing economies. Further studies may undertake a comparative analysis of China with either emerged or emerging nations in the context of the influence of market structure and efficiency on the banks' performance. Besides this, further studies may analyse the effects of environmental variables, which encompass core determinants and macroeconomic variables, such as economic freedom, political aspects, financial liberalisation, and foreign ownership.

Literature

Ab-Rahim, R., Ab-Rahim, R., Chiang, S.N., Chiang, S.N. (2016), „Market structure and performance of the Malaysian banking industry“, *Journal of Financial Reporting and Accounting*, Vol. 14, No 2, pp.158-177.

Ahamed, M. (2012), „Market structure and performance of Bangladesh banking industry: A panel data analysis“, *Bangladesh Development Studies*, Vol. 35, No 3, pp.1-19.

Ahmed, S., Majeed, M.E., Thalassinou, E., Thalassinou, Y. (2021), „The impact of bank specific and macro-economic factors on non-performing loans in the banking sector: Evidence from an emerging economy“, *Journal of Risk and Financial Management*, Vol. 14, No 5, p. 217.

Al-Binali, T., Aysan, A.F., Dinçer, H., Unal, I.M., Yüksel, S. (2023), „New horizons in bank mergers: A quantum spherical fuzzy decision-making framework for analyzing Islamic and conventional bank mergers and enhancing resilience“, *Sustainability*, Vol. 15, No 10, p. 7822.

- Ayadi, I., Ellouze, A. (2013), „Market structure and performance of Tunisian banks“, *International Journal of Economics and Financial Issues*, Vol. 3, No 2, pp.345-354.
- Belkhaoui, S., Lakhal, L., Lakhal, F., Hellara, S. (2014), „Market structure, strategic choices and bank performance: a path model“, *Managerial Finance*, Vol. 40, No 6, pp.538-564.
- Berger, A.N. (2003), „The economic effects of technological progress: Evidence from the banking industry“, *Journal of Money, Credit and Banking*, pp.141-176.
- Bhatti, G.A., Hussain, H. (2010), „Evidence on structure conduct performance hypothesis in Pakistani commercial banks“, *International Journal of Business and Management*, Vol. 5, No 9, pp.174-187.
- Chen, S.H., Liao, C.C. (2011), „Are foreign banks more profitable than domestic banks? Home- and host-country effects of banking market structure, governance, and supervision“, *Journal of Banking & Finance*, Vol. 35, No 4, pp.819-839.
- Chen, X., Lu, C.C. (2021), „The impact of the macroeconomic factors in the bank efficiency: Evidence from the Chinese city banks“, *The North American Journal of Economics and Finance*, Vol. 55, p. 101294.
- Chirwa, E.W. (2003), „Determinants of commercial banks' profitability in Malawi: a cointegration approach“, *Applied Financial Economics*, Vol. 13, No 8, pp.565-571.
- Chirrcop, M. (2000), „Asian crisis, how and why?“, *The Secured Lender*, Vol. 56, No 1, pp.68-78.
- Chow, G.C. (2015), *China's Economic Transformation*, Hoboken: John Wiley & Sons.
- Dwivedi, P., Alabdooli, J.I., Dwivedi, R. (2021), „Role of FinTech adoption for competitiveness and performance of the bank: a study of banking industry in UAE“, *International Journal of Global Business and Competitiveness*, Vol. 16, No 2, pp.130-138.
- Essers, D. (2013), „Developing country vulnerability in light of the global financial crisis: Shock therapy?“, *Review of Development Finance*, Vol. 3, No 2, pp.61-83.
- Feghali, K., Mora, N., Nassif, P. (2021), „Financial inclusion, bank market structure, and financial stability: International evidence“, *The Quarterly Review of Economics and Finance*, Vol. 80, pp.236-257.
- García-Herrero, A., Gavilá, S., Santabábara, D. (2009), „What explains the low profitability of Chinese banks?“, *Journal of Banking & Finance*, Vol. 33, No 11, pp.2080-2092.
- Healey, D.J., Chenying, Z. (2017), „Bank mergers in China: what role for competition?“, *Asian Journal of Comparative Law*, Vol. 12, No 1, pp.81-114.
- He, W. (2024), „New Features and Risks of China's Cross-Border Capital Flows and Policy Recommendations“, *Highlights in Business, Economics and Management*, Vol. 24, pp.2278-2286.
- He, Z., Wei, W. (2023), „China's financial system and economy: a review“, *Annual Review of Economics*, Vol. 15, No 1, pp.451-483.
- Horobet, A., Radulescu, M., Belascu, L., Dita, S.M. (2021), „Determinants of bank profitability in CEE countries: Evidence from GMM panel data estimates“, *Journal of Risk and Financial Management*, Vol. 14, No 7, p. 307.
- Hua, X., Huang, Y. (2021), „Understanding China's fintech sector: development, impacts and risks“, *The European Journal of Finance*, Vol. 27, No 4–5, pp.321-333.
- Kashyap, A.K., Stein, J.C. (2023), „Monetary policy when the central bank shapes financial-market sentiment“, *Journal of Economic Perspectives*, Vol. 37, No 1, pp.53-75.
- Kumar, V., Thrikawala, S., Acharya, S. (2022), „Financial inclusion and bank profitability: Evidence from a developed market“, *Global Finance Journal*, Vol. 53, p. 100609.
- Laeven, L. (1999), *Risk and efficiency in East Asian banks*, World Bank Policy Research Working Paper No 2255, Washington, DC: World Bank.
- Lee, J.W. (2017), „China's economic growth and convergence“, *The World Economy*, Vol. 40, No 11, pp.2455-2474.
- Leightner, J.E. (2000), „Asia's financial crisis, speculative bubbles, and under-consumption theory“, *Journal of Economic Issues*, Vol. 34, No 2, pp.385-392.

- Liu, M., Li, C., Wang, S., Li, Q. (2023), „Digital transformation, risk-taking, and innovation: Evidence from data on listed enterprises in China“, *Journal of Innovation & Knowledge*, Vol. 8, No 1, p. 100332.
- Molyneux, P., Forbes, W. (1995), „Market structure and performance in European banking“, *Applied Economics*, Vol. 27, No 2, pp.155-159.
- Nurwati, E., Achsani, N.A., Hafidhuddin, D., Nuryartono, N. (2014), „Market structure and bank performance: Empirical evidence of Islamic banking in Indonesia“, *Asian Social Science*, Vol. 10, No 10, pp.105-115.
- O'Connell, M. (2022), „Bank-specific, industry-specific and macroeconomic determinants of bank profitability: Evidence from the UK“, *Studies in Economics and Finance*, Vol. 40, No 1, pp.155-174.
- Peng, Y. (2006), *The challenges of WTO entry to China's banking industry*, Cambridge: University of Cambridge.
- Pervan, M., Curak, M., Poposki, K. (2012), „Industrial concentration and bank performance in an emerging market: Evidence from Croatia“, *Advances in Finance and Accounting*, pp.366-371.
- Petria, N., Capraru, B., Ihnatov, I. (2015), „Determinants of banks' profitability: Evidence from EU 27 banking systems“, *Procedia Economics and Finance*, Vol. 20, pp.518-524.
- Rhoades, S.A. (1998), „The efficiency effects of bank mergers: An overview of case studies of nine mergers“, *Journal of Banking & Finance*, Vol. 22, No 3, pp.273-291.
- Rinz, K. (2022), „Labor market concentration, earnings, and inequality“, *Journal of Human Resources*, Vol. 57, Supplement, pp.S251-S283.
- Sachs, J.D., Woo, W.T. (2003), „China's economic growth after WTO membership“, *Journal of Chinese Economic and Business Studies*, Vol. 1, No 1, pp.1-31.
- Seelanatha, L. (2010), „Market structure, efficiency and performance of banking industry in Sri Lanka“, *Banks and Bank Systems*, Vol. 5, No 1, pp.20-31.
- Shaffer, S. (1993), „A test of competition in Canadian banking“, *Journal of Money, Credit and Banking*, Vol. 25, No 1, pp.49-61.
- Shin, D.J., Kim, B.H. (2013), „Bank consolidation and competitiveness: Empirical evidence from the Korean banking industry“, *Journal of Asian Economics*, Vol. 24, pp.41-50.
- Shih, M.S. (2003), „An investigation into the use of mergers as a solution for the Asian banking sector crisis“, *The Quarterly Review of Economics and Finance*, Vol. 43, No 1, pp.31-49.
- Simatele, M. (2015), „Market structure and competition in the South African banking sector“, *Procedia Economics and Finance*, Vol. 30, pp.xxx-xxx.
- Sufian, F. (2009), „Determinants of bank profitability in a developing economy: empirical evidence from the China banking sector“, *Journal of Asia-Pacific Business*, Vol. 10, No 4, pp.281-307.
- Sufian, F., Habibullah, M.S. (2009), „Bank specific and macroeconomic determinants of bank profitability: Empirical evidence from the China banking sector“, *Frontiers of Economics in China*, Vol. 4, No 2, pp.274-291.
- Tan, Y. (2016), „The impacts of risk and competition on bank profitability in China“, *Journal of International Financial Markets, Institutions and Money*, Vol. 40, pp.85-110.
- Tan, Y., Floros, C. (2012a), „Bank profitability and inflation: the case of China“, *Journal of Economic Studies*, Vol. 39, No 6, pp.675-696.
- Tan, Y., Floros, C. (2012b), „Bank profitability and GDP growth in China: a note“, *Journal of Chinese Economic and Business Studies*, Vol. 10, No 3, pp.267-273.
- Tan, Y., Floros, C. (2012c), „Stock market volatility and bank performance in China“, *Studies in Economics and Finance*, Vol. 29, No 3, pp.211-228.
- Tan, Y., Floros, C. (2014), „Risk, profitability, and competition: evidence from the Chinese banking industry“, *The Journal of Developing Areas*, pp.303-319.
- Tan, Y., Floros, C., Anchor, J. (2017), „The profitability of Chinese banks: impacts of risk, competition and efficiency“, *Review of Accounting and Finance*, Vol. 16, No 1, pp.86-105.

Whited, T.M., Wu, Y., Xiao, K. (2021), „Low interest rates and risk incentives for banks with market power“, *Journal of Monetary Economics*, Vol. 121, pp.155-174.

Wu, L., Xu, L., Jiang, P. (2023), „State-owned venture capitals and bank loans in China“, *Pacific-Basin Finance Journal*, Vol. 77, p. 101923.

Xu, J., Yang, T., Zhuang, S., Li, H., Lu, W. (2024), „AI-based financial transaction monitoring and fraud prevention with behaviour prediction“, *Applied and Computational Engineering*, Vol. 77, pp.218-224.

Ye, Q., Xu, Z., Fang, D. (2012), „Market structure, performance, and efficiency of the Chinese banking sector“, *Economic Change and Restructuring*, Vol. 45, pp.337-358.

Yeung, G. (2021), „Chinese state-owned commercial banks in reform: inefficient and yet credible and functional?“, *Journal of Chinese Governance*, Vol. 6, No 2, pp.198-231.

Zhang, J., Wang, L., Wang, S. (2012), „Financial development and economic growth: Recent evidence from China“, *Journal of Comparative Economics*, Vol. 40, No 3, pp.393-412.

EFEKTYVUMO IR RINKOS STRUKTŪROS ĮTAKA FINANSINIAMS REZULTATAMS: EMPIRINIAI KINIJOS BANKININKYSTĖS SEKTORIAUS PAVYZDŽIAI

Honghai Xu, Qi Liu

Santrauka. Šiame straipsnyje aprašomas tyrimas, kurio metu analizuota rinkos struktūros įtaka Kinijos bankų veiklai 2015–2024 m., remiantis struktūros–elgesio–rezultatų paradigmos (angl. SCP) ir efektyvios struktūros (angl. ESH) hipotezėmis. Bankų efektyvumui įvertinti buvo taikytas duomenų apgaubimo analizės (angl. DEA) metodas, o Kinijos bankų rinkos struktūra vertinta pagal koncentracijos lygį. Taikant atsitiktinę regresinę analizę, abu kintamieji – rinkos struktūra ir bankų efektyvumas – kartu su kitais nepriklausomais kintamaisiais (rinkos dalis, paskolų santykis, banko dydis ir veiklos išlaidos) regresuoti su paaiškinamuoju kintamuoju, t. y. Kinijos bankų finansine veikla, išreikšta turto pelningumu (angl. ROA). Siekiant ištirti Kinijos bankininkystės sektoriaus veiklos rezultatus, atlikta tendencijų analizė. Regresinės analizės rezultatai atskleidė, kad rinkos struktūra ir bankų efektyvumas reikšmingai teigiamai veikia Kinijos bankų veiklos rezultatus, atitinkamai patvirtinta ESH ir atmesta SCP hipotezė. Tai reiškia, kad bankų efektyvumas ir rinkos struktūra (koncentracija) reikšmingai veikia Kinijos komercinių bankų pelningumo rodiklius. Struktūros požiūriu Kinijos bankų koncentracija yra linkusi mažėti, o dėl mažesnės rinkos koncentracijos Kinijos bankai yra konkurencingesni. DEA analizė parodė, kad Kinijos bankai veikia žemiau savo potencialaus efektyvumo lygio. Siekiant padidinti efektyvumą, bankams rekomenduojama optimizuoti sąnaudų valdymą.

Reikšminiai žodžiai: aplinkosaugos atskaitomybė (ER); įmonių socialinė atsakomybė (CSR); įmonių valdymas (CG); suinteresuotųjų šalių teorija.