# Manuscript Details

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**Abstract**

This paper contributes to the empirical literature on banking profitability by testing the impacts of competition and shadow banking on bank profitability using a sample of 100 Chinese commercial banks over 2003-2013 with 417 and 395 observations. The current study fills the gaps in the empirical studies by examining the competition in different banking markets (i.e. deposit market, loan market and non-interest income market) in China and further evaluating their impacts on bank profitability. The findings show that the non-interest income market has a higher level of competition compared to the deposit market and loan market. It is further reported that a lower level of competition in deposit market leads to an increase in the profitability of Chinese commercial banks. Finally, the results suggest that shadow banking improves the profitability of Chinese banks.

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| **Keywords** | Shadow banking, bank competition, bank profitability, China |
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Revision on Paper in NAJEF_2016_97

*Dear Editor*

*We are grateful to you and the reviewers for the thoughtful reports as well as thorough and valuable comments, and are grateful for the opportunity to respond to your comments. In the following, we outline the revisions made in response to all comments. By all means the paper benefited considerably from all comments received.*

Reviewer 1

**I am generally positive about the paper but I think that the paper should have stronger motivation, clearer focus, and better discussion of the literature. I also think that the paper should say something about recent literature on shadow banking in China that is possible to find after a brief search on google, as, for example:**

1. **Shadow Banking: China's Dual-Track Interest Rate Liberalization, Hao Wang, Honglin Wang, Lisheng Wang, Hao Zhou, First Draft: May 2015**
2. **Interest Rate Liberalization in China, Prepared by Tarhan Feyzioğlu, Nathan Porter, and Előd Takáts, Authorized for distribution by Nigel Chalk August, 2009, IMF Working Paper , Asia and Pacific Department**
3. **China: The path to interest rate liberalization, J.P. MORGAN GLOBAL LIQUIDITY, july 2015**
4. **Financial Repression and Interest Rate Liberalization in China, Bo Hu, April 2014**
5. **Comparison of Bank Profitability in China and the USA, Ning Ding, Hung-Gay Fung, Jingyi Jia, China & World Economy / 90–108, Vol. 25, No. 1, 2017.**

Response to this comment: Thank you very much for this helpful comment. The revised manuscript now has stronger motivation, clearer focus and better discussion of the literature. To be more specific, as reflected by the Introduction of the revised manuscript, it has been restructured and rewritten. In addition, the above mentioned literature on shadow banking in China has been discussed.

**The title of the paper is misleading since the objective is to test the impact of interest rate liberalization and of shadow banking on profitability of Chinese banking, and that should be emphasized. On the other hand, what is the impact of interest rate liberalization? Why does section 3 is concerned with competition?**

Response to this comment: Thank you very much for this comment. The title of the manuscript has been changed to "The impacts of competition and shadow banking on profitability: evidence from the Chinese Banking Industry".

**The abstract needs to be more precise concerning the issue studied.**

Response to this comment: Thank you very much for this comment. The abstract has been completely re-written to more precisely address the issue studied.

**Authors need to justify some sentences: "The Chinese banking sector has undergone sustainable and healthy development through several rounds of banking reforms initiated by the government since 1978."**

Response to this comment: Thank you very much for this comment. This sentence has been re-written and justified to read as: "The Chinese government has initiated several rounds of banking reforms since 1978. The main purpose of these banking reforms has been to increase competitive conditions, enhance stability and improve the performance of the Chinese banking sector (Tan, 2016b)".

**Some typos were detected: "Thus, Chinse commercial banks have taken effort to further develop the non-interest generating businesses, which not only can reduce the bank risk, but also significantly promote the bank profitability." (page 4)**

Response to this comment: Thank you very much for this comment. The sentence has been re-written to read as: "Thus, the Chinese commercial banks have sought to further develop the non-interest generating businesses, which can not only reduce bank risk, but also significantly promote bank profitability".

**"Although these figures kept increasing over the periods, Chinese commercial banks tend to favour providing loans to state-owned enterprises2, and the micro, small and medium-sized enterprises are very difficult to obtain loans from commercial banks." (page 4)**

Response to this comment: Thank you very much for this comment. This sentence has been removed from the revised manuscript.

**"Rather than using the principal component analysis, few studies used the fixed or random effort estimator to evaluate the profitability of Chinese commercial banks (Sufian and Habibullah, 2009 and Sufian, 2009). (page 7)**

Response to this comment: Thank you very much for this comment. This sentence has been re-written to read as: "Rather than using the principal component analysis, a few studies used the fixed or random effect estimator to evaluate the profitability of Chinese commercial banks".

**Please make an attempt to shorten your sentences to improve readability. Many sentences are almost the entire length of a paragraph. For example, "Due to the fact that JSCBs have more liberalized environment compared to SOCBs, which has been significantly influenced by government intervention, in order to deal with the competition and increase the income source, JSCBs are more actively engaged in lending to small and medium enterprises in the private sector." (pages 4 and 5)**

Response to this comment: Thank you very much for this comment. This sentence has been re-written to read as "Because of the strong government intervention, the SOCBs mainly engage in providing credits to large state-owned enterprises. In comparison, JSCBs are more actively engaged in providing funds to small and medium enterprises. This is mainly attributed to the liberalised environment and less government intervention".

**Comparisons with previous literature results are scarce.**

Response to this comment: Thank you very much for this comment. More comparisons with previous literature results have been provided in the results section.

**The topic is noteworthy and the techniques used to arrive at the conclusions are appropriate, however I have several concerns about the paper in its current form.**

**There is no justification and detailed characterization for the variables chosen. A table is needed. Table 1 needs information about unities and data source note. Table 2 needs data source note. Table 4 needs some analysis.**

Response to this comment: Thank you very much for this comment. Table 1 has been revised to Figure 1, while the data source has been noted under the figure. The data source is added in Table 2. Some analysis on Table 4 has been provided in the main text. A separate session has been provide to talk about the dependent variables as well as independent variables selection. Please see section 3.1 for detail and also this discussion is corresponding to Table 4.

**Figures lack a vertical axis label. It is assumed to be %, but must be included to adhere to journal format. Figures also requisite data source note. Please update accordingly.**

Response to this comment: Thank you very much for this comment. The vertical axis labels have been changed to be % and the data source for all the figures have been provided under the figures.

**Authors need to explain how their study fits into the literature.**

Response to this comment: Thank you very much for this comment. This has been explained by the second paragraph on Page 6.

Reviewer 2:

**The paper needs to be proof-read by a specialized editor. There are quite a few English mistakes, with missing prepositions, etc.**

Response to this comment: Thank you very much for this comment. The revised version of the manuscript has been proof read and I believe that there are no grammar and typos issues.

**The abstract should include the number of observations and the number of banks.**

Response to this comment: Thank you very much for this comment. The number of observations and the number of banks have been included.

**The paper looks at two different aspects, which, however, are not independent from each other. One aspect is the impact of competition in banking markets on bank performance. The other aspect refers to the impact of shadow banking on bank performance. These two aspects are considered as independent and respective proxies are included in the empirical model to explain bank performance. As a matter of fact, the extent of shadow banking is likely to be influenced by the intensity of competition of banking markets, and vice versa.**

**One should think about modelling the two aspects within an appropriate system of equations, e.g. a simultaneous equation model.**

Response to this comment: Thank you very much for this comment. This comment is very useful and constructive, I have clearly point out this issue in the area of future research by the end of the manuscript.

**The paper does not reflect the insights from the newer literature in industrial organization about the relationships of market concentration, the intensity of competition and firm profitability. A higher market concentration does not necessarily imply less competition and necessarily cause higher firm profits. The causality could also go the other way around, i.e., the higher market concentration could be the result of a higher competition, with the respective impacts on firm performance. The paper should include the new industrial organization literature on that issue.**

Response to this comment: Thank you very much for this comment. The sub-section in the literature review has a discussion on the new empirical industrial organization literature.

**Table 1: these data could be represented better by a graph**

Response to this comment: Thank you very much for this comment. The data in Table 1 has been represented by a graph. Please see figure 1 for detail.

**The paper should include a generally accepted definition of the term shadow banking at the appropriate place.**

Response to this comment: Thank you very much for this comment. The definition of shadow banking has been provided in the manuscript. Please see footnote 2 for detail.

**Table 2: Shouldn't be the volumes of the shadow banking be compared to the traditional banking markets? The GDP may grow, so does the shadow banking and the traditional banking. The paper wants to compare shadow banking with traditional banking, the the relevant information for this comparison need to be provided.**

Response to this comment: Thank you very much for this comment. The volumes of the shadow banking and the traditional banking has been compared in the revised manuscript. The ratio of domestic credit to private sector by banks to GDP has been used to measure the size of traditional banking and relevant information has been provided (see the last column of Table 2).

**Literature review: The newer contributions in IO about competition and how to measure it (see also comment above) are missing. There also exist a few papers which use the Boone indicator to measure competiton. Those papers have to be included. It would probably be a good idea to include two sections in the literature review. One that deals with the papers on banking performance in general, and another one which focuses on 2 this newer literature related to the intensity of competition, incl. the applications in the banking sector.**

Response to this comment: Thank you very much for this comment. The literature review now has been divided into two sections in the revised manuscript, one focused on the discussion of

bank performance and the second section concentrated on discussing the new empirical industrial literature.

**Furthermore, it is not enough to include a table with the papers that dealt with the topic. One needs to elaborate about them in the text.**

Response to this comment: Thank you very much for this comment. The literature in the table has been elaborated in the main text.

**The papers about the econometric aspects, i.e., the estimation techniques should be mentioned in the chapter methodology, where the estimation technique should be described and discussed. (see also comment later on).**

Response to this comment: Thank you very much for this comment. The estimation technique has been described and discussed. This response is also for the last comment.

**After the chapter with the literature review one should include a chapter that explains the models and the selection of variables. Given the focus of the paper, this section should include two parts. One part which explains the LHS variable and its determinants. Another part should focus on how the intensity of competition and how to measure it. This part includes the Boone indicator.**

Response to this comment: Thank you very much for this comment. The revised version of the manuscript addressed this issue by separate the methodology section. To be more specific, section 3.1 explains the LHS variable and its determinants and section 3.2 focuses on measuring competitive condition using Boone indicator.

**Also, given that the Boone indicator is based on many assumptions and has also its weaknesses, alternative competition indicators should be considered and tested in the paper. The HHI and the Lerner index are two examples.**

Response to this comment: Thank you very much for this comment. Alternative competition indicators are used to check the robustness of the results, and they are reported in Table 10 and Table 11.

**The chapter with the data description should only include the description of the data. Also, I would move section 4, which could be significantly shortened, in the chapter Data description. This chapter could include a section with the comparison of the different competition indicators.**

Response to this comment: Thank you very much for this comment. The revised version only includes the description of the data in the data description, section 4 has been shortened and moved to the chapter data description and the comparison of different competition indicators has been provided in the literature review section and also the first paragraph of section 3.2.

**Figures 2 to 4 are redundant, and all the information should be represented in one figure (Fig. 5).**

Response to this comment: Thank you very much for this comment. Figures 2 to 4 and related description and discussion have been removed from the manuscript.

**The empirical model is missing. One should see the econometric model which is estimated, and the formal model has to be added at the relevant position in the paper.**

Response to this comment: Thank you very much for this comment. The empirical model has been clearly specified in the revised manuscript by adding subtitles in the methodology section.

**There are no or insufficient information about the estimation technique. GMM is mentioned in the literature review. Nothing is said later on.**

Response to this comment: Thank you very much for this comment. The estimation technique has been described and discussed. See page 23 for detail.

# The impacts of competition and shadow banking on profitability: evidence from the Chinese Banking Industry

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# The impacts of competition and shadow banking on profitability: evidence from the Chinese Banking Industry


## Abstract

This paper contributes to the empirical literature on banking profitability by testing the impacts of competition and shadow banking on bank profitability using a sample of 100 Chinese commercial banks over 2003-2013 with 417 and 395 observations. The current study fills the gaps in the empirical studies by examining the competition in different banking markets (i.e. deposit market, loan market and non-interest income market) in China and further evaluating their impacts on bank profitability. The findings show that the non-interest income market has a higher level of competition compared to the deposit market and loan market. It is further reported that a lower level of competition in deposit market leads to an increase in the profitability of Chinese commercial banks. Finally, the results suggest that shadow banking improves the profitability of Chinese banks.



**Keywords:** Shadow banking, bank competition, bank profitability, China

**JEL classification**: G21, C23

## 1. Introduction

The Chinese government has initiated several rounds of banking reforms since 1978. The main purpose of these banking reforms has been to increase competitive conditions, enhance stability and improve the performance of the Chinese banking sector (Tan, 2016b). The main purpose of these banking reforms has been to increase competitive conditions, enhance stability and improve the performance of the Chinese banking sector. With regards to the competitive condition in the Chinese banking industry, it is noticed that the state-owned commercial banks (SOCBs)[1] still dominate the industry. However, according to statistics from the China Banking Regulatory Commission (CBRC), the share of SOCB assets in total banking sector assets decreased between 2003 and 2013 to a low point of 43.3%. On the other hand, the joint-stock commercial banks (JSCBs) and city commercial banks (CCBs) have kept increasing in size and in 2013 they held 17.8% and 10.03% of total banking sector assets. Therefore, this statistic shows that the competitive condition is still quite low given that the five largest banks hold more than 40% of total banking sector assets. Figure 1 summarises the assets of SOCBs, JSCBs, CCBs and total banking institutions in China over the period 2003-2013.

<<Figure 1---about here>>

In order to improve the competitive conditions in the deposit market and the loan market, the Central Bank of China (the Peoples' Bank of China) had made efforts to liberalise the interest rate since 1996. From 20th July 2013 and 23rd October 2015, the loan interest rate, as well as the deposit interest rate in China, had been liberalized. The process of interest rate liberalisation in these two different markets is supposed to have an impact on their competitive conditions. In the Chinese

[1] There are five state-owned commercial banks in China now, including Bank of China, Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China and Bank of Communication.

banking industry, the traditional interest generating activities still contribute to the largest proportion of bank income; however, interest generating activities are affected significantly by economic cycles as well as by credit risk. Thus, the Chinese commercial banks have sought to further develop the non-interest generating businesses, which can not only reduce bank risk, but also significantly promote bank profitability. The effectiveness of interest rate liberalisation, in other words, the impact of interest rate liberalisation on the competitive conditions in the deposit market, the loan market, as well as the non-interest income market in China, has been a concern not only for the Chinese government and banking regulatory authorities in China, but should also be investigated by academic researchers in order to provide evidence with regard to the effectiveness of Chinese financial reforms. In addition, a piece of academic research should be pioneered to test the impact of competition in different banking markets on bank profitability. The evaluation of this issue will provide information to the Chinese government and banking regulatory authorities to assist them in making relevant policies to improve bank profitability in China.

Although the financial reform in China, as characterised by the interest rate liberalisation, is supposed to increase the competitive conditions in different banking markets in China, because of the specific and special characteristics of the Chinese banking industry, the banking sector still allocates the credits (providing loan services) focusing on large or state-owned enterprises and the medium and small size enterprises find obtaining loans difficult, and thus, it is very difficult for them to be competitive and survive in the market. This biased treatment to the micro, small and medium-sized enterprises has a significant and negative impact on Chinese economic growth. Elliott et al. (2015) report that the small and medium-sized enterprises in China provided 70% of employment in 2012 and 60% of China's GDP is attributed to the contribution from the small and

medium-sized enterprises, although they received just 30% of bank loans. Because of the strong government intervention, the SOCBs mainly engage in providing credits to large state-owned enterprises. In comparison, JSCBs are more actively engaged in providing funds to small and medium enterprises. This is mainly attributed to the liberalised environment and less government intervention. In particular, the CCBs, because of their size, are locked out of state-owned enterprises lending and focus their lending on city level infrastructure construction, as well as private sector lending.

As indicated previously, although some JSCBs and CCBs are engaged in private sector lending, small and medium-sized enterprise in China can only receive a very small percentage of credit allocated by commercial banks. Most of the funds for small and medium-sized enterprises are from shadow banking[2]. Table 1 shows the size and composition of China's shadow banking over the period 2003-2013 (Elliot et al., 2015). The table shows that the percentage of shadow banking in GDP over the examined period kept increasing, in other words, the shadow banking is becoming more and more important in China. In comparison, the ratio of domestic credit provided to the private sector by banks over GDP is used as the measurement of size of traditional banking, which is shown by the last column of the table. It is shown that, although the figures are significantly larger than the ones for shadow banking, traditional banking had undergone strong volatility over the period. As an alternative method to receive funds besides the credits granted by commercial banks, shadow banking is supposed to have a significant impact on the operation and performance of commercial banks. On the one hand, shadow banking takes away businesses from small and medium enterprises, the resultant reduction in the volumes of businesses engaged in by

[2] The Financial Stability Board (2013) defines shadow banking as credit intermediation involving entities and activities outside the regular banking system.

commercial banks is supposed to decrease their profitability. On the other hand, the existence and development of shadow banking gives commercial banks more funds available to grant credits to large and state-owned enterprises; the resultant increase in the volume of these businesses is supposed to increase their bank profitability. In addition, shadow banking also gives commercial banks more available funds to engage in other non-interest generating business, which is expected to boost the profitability of Chinese commercial banks, thus, the impact of shadow banking on the profitability of Chinese commercial banks is unclear. Testing the impact of shadow banking on bank profitability not only significantly contributes to the empirical banking literature, but more importantly, provides more policy implications to the Chinese government and relevant regulatory authorities to better regulate the shadow banking market in China, improve commercial bank profitability and re-consider the dilemma of small business difficulty in obtaining credits.

<<Table 1---about here>>

Some of the recent research tried to discuss the impacts of shadow banking and interest rate liberalisation. Wang et al. (2016) argue that the efficiency gain can be achieved by shadow banking, due to the fact that credit can be rescaled to fund the more productive, yet deprived private enterprises. However, the additional efficiency gain cannot be achieved by interest rate liberalisation because the credit misallocation in favour of the less productive state-owned enterprises is magnified. Similar to the argument of Wang et al. (2016), Feyzioglu et al. (2009) find that interest rate liberalisation will lead to higher interest rates, discourage marginal investment, improve the effectiveness of intermediation and monetary transmission and enhance the financial access of unobserved sectors. In addition, Shelvin and Wu (2015) argue that interest rate liberalisation, on the one hand, will lead to more accurate, market-driven interest rates, a broad range of financial products and more competition, while, on the other hand, it will create greater

uncertainty, risk and instability. This positive impact of interest rate liberalisation on bank competition is further confirmed by Ding et al. (2017). The relationship between interest rate liberalisation and shadow banking is also investigated by Hu (2014). The findings suggest that if the priority of getting credit from the official banks still goes to the state-owned firms, interest rate liberalisation may not lead to a shrinkage of the shadow banking industry.

In summary, the current study fills the gaps in the empirical literature in the following three ways: 1) testing the competitive conditions in different banking markets in China, this being of particular importance considering that China was engaged in the process of interest rate liberalisation, a process just finished in 2013; 2) examining the impacts of competition in different banking markets on bank profitability. This will provide evidence with regard to the effectiveness of interest rate liberalisation and provide policy implications to improve bank profitability. 3) Evaluate the impact of shadow banking on commercial bank profitability in China, which will not only be helpful for the Chinese government to better regulate the shadow banking market and improve commercial bank profitability, but also prove useful for the government to re-think the issue of small business difficulties in obtaining credit.

The findings show that shadow banking contributes to the profitability improvement of Chinese commercial banks. In addition, the results show that the non-interest income market has a higher level of competition compared to the other two markets during the early years of the examined period. Finally, the results suggest that Chinese commercial banks have higher profitability in a lower competitive deposit market.

This paper will be structured as follows: section 2 will review the empirical literature on bank profitability, which is followed by section 3, describing the data and methods. Section 4 reports the results, followed by discussing the robustness check in section 5. Finally, section 6 provides a summary and conclusion of the whole paper.

## 2. Literature Review

### 2.1. Literature review on bank profitability

The empirical literature on bank profitability focused on the US banking industry, European banking industry, and Asian economies as well as the Chinese banking industry. Most of the studies find that bank profitability is significantly affected by bank size, bank liquidity, bank capitalization, bank credit risk, bank efficiency and bank diversification as well as by GDP. Table 2 provides a summary of the empirical studies focusing on countries except China. The table shows that empirical studies in bank profitability can be mainly classified into five groups according to the methodology. To be more specific, some of the early studies used the ordinary least square estimator. Four of these studies focused on the investigation of the US banking industry and one study evaluated the profitability in the European banking industry. The results report that US bank profitability is significantly affected by bank size, bank risk and market share as well as by product differentiation. The second group of studies used the Granger causality test to examine profitability in the US banking industry and the findings show that bank profitability is significantly affected by the level of capitalisation. The third group of studies used the fixed effect estimator to assess the determinants of bank profitability. They focused on the investigation using a sample of banks from European countries, the Philippines and Portugal, as well as advanced and emerging economies. The results of the studies show that bank profitability is significantly affected by bank risk, bank capital and level of competition. The fourth group of studies employed GMM to estimate

the determinants of bank profitability. The findings of those studies indicate that bank profitability is significantly affected by credit risk, liquidity, capital, efficiency, diversification and income level of the specific country. Finally, the fifth group of studies used a combination of two methods (GMM and OLS, GMM and fixed effect estimator) to investigate the determinants of bank profitability. The results of these studies show that credit risk, capital and level of competition affect the bank profitability.

<<Table 2---about here>>

Profitability in the Chinese banking sector has been extensively tested by the empirical literature. Shih et al. (2007) evaluated the performance of a sample of Chinese commercial banks in 2002 under a principal component analysis. The results indicate that JSCBs have better performance compared to SOCBs and CCBs. Their findings further suggest that bank size does not have any significant impact on bank performance in China. This study did not give any consideration to the impacts of competition and shadow banking on bank profitability in China. With regard to the methodology used, the principle component analysis has a number of advantages, including low noise sensitivity and decreased requirement for capacity and memory. However, the covariance matrix is difficult to be evaluated in an accurate manner (Karamizadeh et al., 2013).

Rather than using the principal component analysis, a few studies used the fixed or random effect estimator to evaluate the profitability of Chinese commercial banks (Sufian and Habibullah, 2009 and Sufian, 2009). The results of Sufian and Habihullah (2009) suggest that credit risk has a significant and positive impact on the profitability of Chinese SOCBs and JSCBs. In addition, Sufian (2009) used four SOCBs and twelve JSCBs during 2000-2007 to examine the determinants of bank profitability in China. The results show that Chinese commercial banks with higher levels

of credit risk and higher levels of liquidity have higher profitability. Again, similar to Shi et al. (2007), these two studies did not have any intention to investigate the impacts of competition and shadow banking on bank profitability in China.

The fixed or random effect estimator is unable to deal with the issue of profit persistence, endogeneity as well as autocorrelation when estimating the determinants of bank profitability, thus, a growing number of recent literature used the GMM estimator to test profitability in the Chinese banking industry (Tan and Floros, 2012a, 2012b, 2012c). In particular, these studies examined the impact of competition on Chinese bank profitability, using 3-bank or 5-bank concentration ratio. The results of these studies do not find any significant impact of competition on bank profitability. Although these studies have considered the impact of competition on bank profitability in China, they did not consider the impacts of competition in different banking markets and shadow banking on bank profitability in China. In addition, concentration ratio as the competition indicator is unable to acknowledge market structure stability, level of product differentiation, entry barriers as well as operating cost (Maksimović and Kostić, 2012).

The GMM estimator was also used by Garcia-Herrero et al. (2009) to jointly test the impacts of efficiency and competition on bank profitability in China over the period 1997-2004. Rather than using the 3-bank or 5-bank concentration ratio as the competition indicator, they used the Hirfindahl-Hirschman index. The results show that Chinese commercial banks with higher levels of efficiency have higher profitability and there is no clear impact of competition on bank profitability in China. Although this study used an improved competition indicator to measure the level of competition in the Chinese banking industry, the Hirfindahl-Hirschman index embodies

both size inequality and firm numbers with weight, which are assumed a priori instead of being derived (Kwoka, 1977). In addition, similar to Tan and Floros (2012a, b, c), this study only considered the competition in the whole banking market, while different banking markets have been ignored and the impact of shadow banking on bank profitability in China was not considered.

Tan (2016a) examined the impacts of risk and competition on bank profitability in China over the period 2003-2011 under a GMM estimation. Tan et al. (2017) tested the joint-impacts of risk, efficiency and competition on bank profitability in China over the period 2003-2013. Tan and Floros (2014) investigated the inter-relationships between risk, profitability and competition in the Chinese banking industry over the period 2003-2009 under a Seemingly Unrelated Regression analysis. These studies contributed to the previous studies by using Lerner index to measure the competitive conditions. This indicator has the advantages of measuring competition of different ownership types of Chinese commercial banks from the perspective of market power. However, Lerner index is unable to estimate the competitive conditions in different banking markets; in other words, these studies failed to identify the impacts of competition in different banking markets and shadow banking on bank profitability in China.

Finally, Tan and Anchor (2016) used an auto-regressive linear specification to examine the inter-relationship between risk and profitability in the Chinese banking industry under different econometric techniques, including fixed effect estimator, random effect estimator and between effect estimator, as well as GMM estimators. The results show that Chinese commercial banks with higher levels of risk have higher profitability and, in return, higher profitability of Chinese

commercial banks leads to higher risk-taking behaviour. Neither competition nor shadow banking was tested in this paper.

Giving the importance of shadow banking in China, as discussed in the introduction, its development is supposed to have a significant impact on performance of Chinese commercial banks; however, no research has addressed this issue. Furthermore, following the completion of interest rate liberalisation in China, what is the impact of this reform on competitive conditions in different banking markets in China? This question does not only interest Chinese government and banking regulatory authorities, but also provides more future research implications to other banking systems around the world.

### 2.2. New Empirical Industrial Organisation Literature

There are, in general, two approaches to measure competitive conditions in the market. One is the structural approach and the other one is the non-structural approach, derived from the New Empirical Industrial Organization Literature (NEIO). The obvious indicators used in the structural approach include concentration ratio as well as Hirfindal-Hirschman index and they are widely used in the empirical literature to measure the banking sector competition (Al-Muharrami et al., 2006, Fu et al., 2014, among others). The structural measure of competition is based on the structure-conduct-performance paradigm, which argues that, in a lower competitive environment, banks tend to collude with each other to get higher than normal profit. This argument was challenged by the efficient-structure (ES) hypothesis (Demsetz, 1973 and Pelzman, 1977). The efficient-structure hypothesis argues that it is efficiency rather than competitive condition, which leads to the change in the market structure and further impacts on the bank performance.

New Empirical Industrial Organization Literature has the advantage over the structural approach by being able to measure the level of competition through observing conduct directly. The The main measures in the New Empirical Industrial Organisation include Lerner index, Panzar-Rosse H statistic and conjectural variation model, as well as the Boone indicator. The Panzar-Rosse (1987) H statistic measures the extent to which a change in vector of input prices is reflected in gross revenue. The H statistic has a value ranging from minus infinity to 1, with figures equal to or smaller than zero indicating that the market is operated under monopoly, while if the value is between zero and 1, it indicates that the market is operated under the condition of monopolistic competition. If the value is equal to 1, it means that the market is operated under the perfect competition environment. The empirical literature has widely used this indicator to measure the competitive condition in the banking industry (Bikker and Haaf, 2002; Matthews et al., 2007; Goddard and Wilson, 2009; Barbosa et al., 2015; Tan, 2016c; among others).

The conjectural variable model was developed by Bresnahan (1982) and Lau (1982). The model is based on an inverse demand equation and a supply equation. The competition under this model is measured by the mark-up of price over marginal cost. If there is a zero value of conjectural variation, in other words, the output price equals marginal cost, it is indicated that the market is operated under the condition of perfect competition, while if the value is equal to 1, it is suggested that the market is operated under the condition of monopoly. A number of studies used this indicator to measure the level of competition in the banking sector (Bikker, 2003; Uchida and Tsutsui, 2005; Qin and Shaffer, 2014; among others).

The Boone (2008) indicator was developed under the assumption that banks with higher levels of efficiency have higher ability to increase their market share and bank size. This will further lead to an increase in the level of profit. This is also the main argument of efficient-structure hypothesis. The Boone indicator argues that competition improves the performance of efficient banks at the expense of less efficient ones. The value of the Boone indicator can be either positive or negative, with more negative figures indicating a higher level of competition, while as the value of the indicator increases, the level of competition increases. Recently, there is a number of literature investigating the competitive condition in the banking sector under this indicator (Delis, 2012; Tabak et al., 2012; Tan, 2016c; among others).

The Lerner index was developed by Lerner (1934), based on the assumption that market power can be reflected from profitability because higher profits achieved by the banks are an indication that there is a lower level of competition. The Lerner index is calculated by the difference between output price and marginal cost, then divided by the output price. The value of the Lerner index ranges from zero to one. The market is operated under the condition of perfect competition if the Lerner index is equal to zero, while as the value of the Lerner index increases, the level of competition declines. If the value of the Lerner index is equal to zero, it is indicated that the market is operated under the condition of monopoly. A number of empirical literature has used this indicator to measure competition in the banking sector (Cipollini and Fiordelisi, 2012; Fungacova et al., 2014; among others).

## 3. Variable selection, Methodology and data

### 3.1. Variable selection

#### 3.1.1. Selection of dependent variables

The main purpose of the current study is to investigate the impacts of competition in different banking markets and shadow banking on profitability in the Chinese banking industry. Comprehensive bank-specific, industry-specific and macroeconomic determinants are also included. The current study mainly focuses on two profitability indicators, which are return on assets (ROA) and net interest margin (NIM). These two indicators are widely used in the banking literature to measure the profitability of banks.

Return on Assets shows the banks' ability to generate profit through using financial and real investment resources. This indicator has been widely used in the empirical banking literature to measure bank profitability (Tan, 2014; Tan, 2016a, Tan et al., 2017; Tan and Anchor, 2016; among others). Net Interest Margin is also the typical profitability indicator which has been widely used in the banking literature (Tan and Floros, 2012a, 2012b, 2012c, among others). This indicator is different from ROA due to the fact that the former focused on banks' ability to obtain profit through interest generating activities, while the latter concentrated on banks' ability to generate profit from the total assets.

### 3.1.2. Selection of independent variables

**Bank-specific variables**

Credit risk: the credit risk in the current study is measured by the ratio of impaired loans to gross loans following Tan (2016b). A higher ratio indicates the bank has a higher level of credit risk. In theory, higher volumes of non-performing loans increase the banks' cost and further precede a decline in bank profitability. Thus, it is expected that Chinese banks with higher levels of credit risk have lower profitability.

Bank size: the bank size in the current study is measured by the natural logarithm of total assets following Tan (2016c). The empirical literature has different arguments with regard to its impact on bank profitability. On the one hand, large banks have higher ability to reduce the cost from economies of scale and scope (Iannotta *et al*., 2007; Mercieca *et al*., 2007 ; Elsas *et al*., 2010); on the other hand, it is argued that large banks have more serious asymmetric information problems, the increase in cost of monitoring the lending leads to a decline in bank profitability (Barros et al., 2007). Finally, some of the empirical studies suggest that bank size will increase bank profitability only to a certain point, after which further increase in bank size leads to a reduction in bank profitability (Berger and Humphrey, 1994, Athanasoglou et al., 2008). Thus, there is no a priori expectation with regard to the impact of bank size on bank profitability.

Bank diversification: the bank diversification in the current study is measured by the ratio of non-interest income to gross revenue following Tan (2016a). There is no a priori expectation with regard to this variable on bank profitability. On the one hand, more diversified banks have higher ability to reduce the cost derived from the benefit of economics of scale. This further promotes the bank profitability (Tan and Floros, 2012a, Jiang et al., 2003, among others). On the other hand, few empirical studies find that there is a negative impact of bank diversification on bank profitability due to the fact that stronger competition in the non-interest income activities compared to the traditional interest-generating activities reduces bank profit margin (Demirguc-Kunt and Huizinga, 1999; Gischer and Juttner, 2001; among others).

Liquidity: the liquidity in the current study is measured by the ratio of liquid assets to total assets following (Cihak and Poghosyan, 2009). Higher figures of this ratio indicate that the bank has a

higher liquidity level. On the one hand, larger volumes of liquid assets (higher liquidity) reduce the bank's ability to generate profit using its funds (i.e. larger volumes of cash in comparison to loans reduces bank's ability to generate interest income). This argument is in line with the finding of Molyneux and Thornton (1992). However, Bourke (1989) argues that if the bank does not have a good risk monitoring and management system, higher volumes of loans (lower liquidity) will lead to an accumulation of non-performing loans and further lead to a decline in bank profitability. Thus, there is no a priori expectation with regard to its impact on bank liquidity.

Capitalisation: the capitalisation in the current study is measured by the total regulatory capital ratio following Molyneux et al. (2015). Higher values of this ratio indicate that the bank has a higher level of capitalisation. There is no a priori expectation with regard to the impact of this variable on bank profitability. To be more specific, banks with higher levels of capital have lower funding cost because of their higher creditworthiness and also they need to borrow less; the reduction in the borrowing cost leads to an increase in bank profitability. In addition, banks with higher levels of capital can engage in risky lending activities. According to the risk-return hypothesis, this will also lead to an improvement in bank profitability. However, the findings of a few studies show that lower risk position comes with banks with higher levels of capital. This leads to a decline in bank profitability.

Overhead cost: the overhead cost in the current study is measured by the ratio of overhead expenses to total assets, following Tan (2016a). Higher values of this variable indicate that there is a higher volume of cost and further indicates that the bank does not control and manage the cost very well. There is no a priori expectation with regard to the impact of this variable on bank profitability. On

the one hand, higher volumes of operating cost without any doubt will have a negative impact on bank profitability. This argument is supported by the finding of Athanasoglou et al. (2008) with regard to the Greek banking industry. On the other hand, this operating cost may possibly come from higher salaries and wages, and according to the efficiency wage theory, higher levels of salary will significantly promote staff productivity, and further promote the bank profitability. This argument is supported by the finding of Ben Naceur (2003) in terms of the Tunisian banking industry.

Insolvency risk: the insolvency risk in the current study is measured by the Z-score following Iannotta et al. (2007). Higher values of this indicator mean that the bank has a lower level of insolvency risk. The empirical results from Tan and Anchor (2016) show that higher insolvency risk leads to higher profitability of Chinese commercial banks over the period 2003-2013. Thus, it is expected that the impact of insolvency risk on bank profitability is significant and positive.

**Industry-specific variables:**

Competition: the competition in the current study is measured by Boone (2008) indicator. As reviewed in the literature review, there are few studies that applied this indicator in measuring competition in the banking industry; however, there is no empirical study using this indicator to evaluate competition in the banking industry and further test its impact on bank profitability. Higher values of this indicator suggest that there is a higher level of competition in the market. The SCP hypothesis argues that in a lower competitive environment, banks tend to collude with each other and this collusion will lead to higher profitability. In other words, SCP hypothesis argues that there is a significant and negative impact of competition on bank profitability. The

efficient structure hypothesis argues that it is not the structure but the efficiency of the banks that has an impact on bank profitability. To be more specific, the efficient-structure hypothesis argues that efficient banks have larger market share at the expense of less efficient ones. This further leads to an increase in the concentration(decline in the competitive condition), and then further lead to an improvement in bank profitability. Thus, there is no a priori expectation with regard to the impact of this variable on bank profitability.

Banking sector development: banking sector development in the current study is measured by the ratio of banking sector assets to GDP, following Tan and Floros (2012a). Higher values of this variable indicate that there is a higher level of banking sector development. It is expected that the impact of this variable on bank profitability is significant and positive. A higher developed banking sector indicates that there is a higher demand of banking services. Although this will attract potential competitors into the banking markets, financial regulation in China still has high restrictions on entities in engaging in providing financial services. Thus, the increase in the demand for banking services and relatively shortage of supply leads to a higher price level for banking product and further leads to an increase in bank profitability.

Stock market development: the stock market development in the current study is measured by the ratio of market capitalization of listed companies to GDP, following Tan and Floros (2012b). Higher value of this variable indicate that there is a higher level of stock market development. It is expected that there is a significant and positive impact of this variable on bank profitability. A higher developed stock market will provide more information about public firms with regard to their credit conditions and records. This information is very important for the banks because they

can use this information to make accurate decisions with regard to credit granting. The resultant reduction in the volumes of non-performing loans leads to an increase in bank profitability.

Shadow banking: shadow banking in the current study is measured by the volume of shadow banking over the period 2003-2013. This study is the first piece of research investigating the impact of shadow banking on bank profitability and it is supposed the results will provide more important policy implications to the Chinese government to manage the shadow banking system. According to the discussion in the introduction, there is no a priori expectation with regard to the impact of this variable on bank profitability.

**Macroeconomic variables:**

Inflation: the inflation level in the current study is measured by the annual inflation rate. There is no a prior expectation with regard to the impact of this variable on bank profitability. Perry (1992), one of the first to test the impact of inflation on bank profitability, argues that the impact will depend on whether the inflation is anticipated or not. If the banks have the ability to anticipate the inflation level and adjust the interest rate and manage the operating expenses accordingly, the revenue of the banks will increase faster than the increase in the cost, and this will lead to an improvement in bank profitability. Otherwise, higher inflation will lead to a decline in bank profitability.

GDP growth: the GDP growth in the current study is measured by the annual GDP growth rate. There is no a priori expectation with regard to the impact of this variable on bank profitability. On the one hand, economic boom indicates that there is higher demand for bank credit, the increase

in the loan level can lead to an increase in the interest revenue and profitability (Bikker and Hu, 2002); on the other hand, the bank entry barrier will be lowered due to the economic growth, and the resultant increase in the level of competition in the banking market leads to a decline in bank profitability (Tan and Floros, 2012b).

### 3.2. Methodology

Earlier in the literature review section, the different competition indicators used in the banking literature have been briefly compared and discussed, including n-bank concentration ratio, Herfindahl-Hirschman index and Lerner index. Another two main competition indicators, as discussed in the new empirical organisation literature, (conjectural variable model and Panzar-Rosse H-statistic) also have their own disadvantages. Compared to the conjectural variable model, the Boone indicator is not only able to estimate the competitive condition of different banking markets, but this indicator requires little data (Leuvensteijn et al., 2007). In terms of the Pazar-Rosse H statistic, because it was developed on the basis of a static model, there would be no predictions on the value, which is one of the weaknesses of that indicator (Leuvensteijn et al., 2011), and this weakness indicates that this indicator has suffered from a degree of uncertainty. In addition, Claessens and Laeven (2014) argue that, due to the market entry and exit, this test cannot fulfil the overall market equilibrium requirement, which further influences the interpretation of the analysis.

#### 3.2.1 Methodology to measure competition in different banking markets -Boone indicator

The current study uses the method proposed by Boone (2008) to measure the competition. The Bonne indicator holds the idea that the performance of efficient firms is improved and the performance of inefficient firms is weakened by competition. The basic logic of Boone indicator

is in line with the argument of efficiency structure hypothesis, as developed by Demsetz (1973), which links the influence of efficiency on performance. The performance can be measured by profit or market share. A stronger effect will lead to a more negative Boone indicator. The Boone indicator for bank i can be defined by the simplest equation as follows:

$$LN(MS_{ki}) = \alpha + \beta LN(MC_{ki}) \quad (1)$$

Where i represents the specific bank, k stands for a specific bank output, MS is the market share, while MC measures the marginal cost. $\beta$ denotes the Boone indicator. In this paper, we focus on the analysis of competition in different markets, reflecting interest income activities as well as non-interest generating businesses. This significantly contributes to the empirical banking literature, which just focuses on the examination of the whole banking market or only the loan market. Thus, K=loans, deposits, non-interest income.

The marginal cost is estimated on the basis of a translog cost function with four outputs (total loans, total deposits, securities and non-interest income) and two input prices (price of labour, price of capital). The specification of the translog cost function is shown below (Tabak et al., 2012):

$$LN(\frac{C}{W_2})_{it} = \delta_0 + \sum_j \delta_j LNY_{jit} + \frac{1}{2}\sum_j \sum_k \delta_{jk} LNY_{jit} LNY_{kit} + \beta_1 LN(\frac{W_1}{W_2})_{it} + \frac{1}{2}\beta_{11} LN(\frac{W_1}{W_2})_{it} LN(\frac{W_1}{W_2})_{it} + \sum_j \theta_j LNY_{jit} LN(\frac{W_1}{W_2})_{it} + \varepsilon_{it}$$

(2)

where C represents total cost of the bank, Y represents four outputs, including total deposits, total loans, non-interest income and securities, W stands for two input prices with W1 representing the price of funds, which is measured by the ratio of interest expenses to total deposits, W2 represents the price of capital, which is measured by the ratio of non-interest expenses to fixed assets. Two input prices are considered due to the fact that non-interest expenses include the labour cost as well (Hasan and Morton, 2003). In other words, the price of capital considers the factors relating

to the price of physical capital as well as the price of human capital. The linear homogeneity is ensured by normalising the dependent variable and W1 by anther input price, W2. The summary statistics of the variables are reported in Table 3. The statistics provided in Table 3 show that as compared to the price of funds, the Chinese commercial banks have a larger difference in the price of capital. This finding indicates that the Chinese commercial banks should place more emphasis on controlling the non-interest expenses. In addition, with regard to the banking outputs, the table suggests that Chinese commercial banks have the largest difference in generating the non-interest income, while they have the smallest difference in generating deposits.

<<Table 3---about here>>

The marginal cost of loans can be obtained by taking the first derivative of the dependent variable in the above equation in relation to the output loans as follows:

$$MC_{ilt} = (\frac{C_{it}/W_2}{Y_{ilt}})(\delta_{j=l} + 2\delta_{ll}LNY_{ilt} + \sum_{k-1....k,k\neq l}\delta_{lk}LNY_{ikt} + \theta_l LN(\frac{W_1}{W_2})) \qquad (3)$$

The marginal cost of deposit and non-interest income can be obtained similarly by taking the first derivative of the dependent variable in the above equation in relation to the outputs deposits and non-interest income as below:

$$MC_{idt} = (\frac{C_{it}/W_2}{Y_{idt}})(\delta_{j=d} + 2\delta_{dd}LNY_{idt} + \sum_{k-1....k,k\neq d}\delta_{dk}LNY_{ikt} + \theta_l LN(\frac{W_1}{W_2})) \qquad (4)$$

$$MC_{\text{int}} = (\frac{C_{it}/W_2}{Y_{\text{int}}})(\delta_{j=n} + 2\delta_{nn}LNY_{\text{int}} + \sum_{k-1....k,k\neq n}\delta_{nk}LNY_{ikt} + \theta_l LN(\frac{W_1}{W_2})) \qquad (5)$$

### 3.2.2. Empirical model to investigate the impacts of competition and shadow banking on bank profitability

Endogeneity, unobserved heterogeneity and correlation between regressors and lagged dependent variable make fixed or random effects not suitable for the estimation. Arellano and Bond (1991)

derive a consistent GMM estimation for this model. It is a single left hand-side variable that is dynamic, depending on its own past realisations. The Arellano and Bond (1991) estimation uses all available lagged values of the dependent variable and lagged values of the exogenous regressors as instruments; it is called difference GMM. This method is criticised by Arellano and Bover (1995) and Blundell and Bond (1998), who argue that the GMM difference estimator is inefficient if the instruments are weak. Hence, they develop a new method, called GMM system estimator, which includes lagged levels as well as lagged differences. Roodman (2006) argues that GMM difference and system estimation can solve the problems of endogeneity, unobserved heterogeneity, autocorrelation and profit persistence. Bond (2002), however, argues that the unit root property makes the difference GMM estimator biased, while the system GMM estimator yields a greater precision result. The one-step system Generalized Method of Moments (GMM) (Arellano and Bover, 1995 and Blundell and Bond 1998) estimator is chosen in the current study to investigate profitability in the Chinese banking industry following Tan (2016a). Besides using the one period lag of profitability indicators, through the Sargan over-identifying test, we confirm that the capital, liquidity, overhead cost and competition will be treated as endogenous variables, while credit risk will be treated as a predetermined variable. Other variables do not suffer from any endogenous issue. In order to make sure there is no second order autocorrelation in the estimation, the predetermined variable is instrumented using levels lagged by one year period, while the endogenous variable is instrumented using levels lagged by two year periods. This study uses the following specification to investigate the impact of competition on profitability in the Chinese banking industry:

$$II_{it} = \mathrm{C} + \delta II_{i,\,t-1} + \sum_{j=1}^{j} \beta_j X_{it}^{j} + \sum_{l=1}^{l} \beta_l X_{it}^{l} + \sum_{m=1}^{m} \beta_m X_{it}^{m} + v_{it} + \mu_{it} \quad (6)$$

Where i refers to year and t refers to an individual bank, $II_{it}$ represents the profitability indicator for the specific bank at a specific year, C is the constant term, $II_{i,t-1}$ is one period lagged profitability. $X_{it}$ are determinants of bank profitability. They are grouped into bank-specific determinants, including credit risk, liquidity, capital, insolvency risk, bank size, overhead cost and bank diversification $X_{it}^{j}$; industry-specific determinants, including competition in different banking markets, size of shadow banking, stock market development, banking sector development $X_{it}^{l}$; and macroeconomic determinants, including inflation and GDP growth $X_{it}^{m}$. The unobserved bank-specific effect and the idiosyncratic error are represented by $\nu_{it}$ and $\mu_{it}$, respectively. $\beta_j$, $\beta_l$, and $\beta_m$ are coefficients to be estimated, while $\delta$ represents the speed of adjustment to equilibrium. Its value ranges from 0 to 1, with a higher figure representing slower adjustment and less competitive structure, while a lower figure indicates that there is a stronger competitive condition and a higher speed of adjustment.

### 3.3. Data

Our sample consists of data from five SOCBs, twelve JSCBs, and eighty-three CCBs. The sample covers the period 2003-2013 and the bank-specific data is collected from Bankscope database produced by Bureau Van Dijk (www.bvdinfo.com). The industry-specific and macroeconomic variables are retrieved from the website of China Banking Regulatory Commission (www.cbrc.gov.cn) and the World Bank database (data.worldbank.org). Due to the fact that not all the banks have available information for all the years, we opt for an unbalance panel dataset not to lose degrees of freedom. We use two different profit measures: ROA and NIM. The bank-

specific determinants of profitability include credit risk, liquidity, capital, insolvency risk, bank size, bank diversification and overhead cost. The industry-specific variables include competition, size of shadow banking, banking sector development and stock market development. With regards to the macroeconomic determinants, we include both annual inflation rate and annual GDP growth rate. Table 4 provides a summary of the variables used in the current study and their expected effects on bank profitability.

<<Table 4---about here>>

Table 5 shows the summary statistics of the independent variables used in the current study. The table shows that the difference in liquidity of Chinese commercial banks is smaller than the ones for credit risk and capital. The data indicates that Chinese banks have big differences in the degree of diversified activities engaged in. The statistics show further that there is a stronger volatility with regard to the development of the stock market than of the banking sector and the macroeconomic environment. The profitability of three different ownership types of Chinese commercial banks (SOCBs, JSCBs, and CCBs) is described in Figure 2. The figure shows that in general, SOCBs and CCBs have higher profitability than JSCBs.

<<Table 5---about here>>

<<Figure 2—about here>>

Comparing the competitive conditions among the above three different banking markets, it was noticed that over the period 2006-2013, the competitive condition in these three different markets was the same. The main difference was noticed during the period 2003-2005. Figure 3 shows that the competitive condition in the non-interest income market was the highest, in general, between 2003 and 2005 compared to the other two markets, while the competitive condition in the loan market and the deposit market were the same over the same period.

<<Figure 3---about here>>

## 4. Empirical results

Table 6 shows the results with regard to the impacts of shadow banking and competition in different banking markets on bank profitability in China. The results report that shadow banking has a significant and positive impact on bank profitability in China, as reflected by the significant and positive signs of this variable. This finding suggests that large volumes of shadow banking in China contribute to the profitability improvement of Chinese commercial banks. This finding can be further explained by the fact that the shadow banking system normally focuses on providing credits to micro, small and medium-size enterprises. This helps the Chinese commercial banks by providing them with more available funds to engage in larger volumes of business in granting credits to large and state-owned enterprises; the increase in the volumes of these businesses improves the NIM of Chinese commercial banks. In addition, due to the fact that the shadow banking system helps commercial banks provide credits to micro, small and medium enterprises. This will give commercial banks more available funds to engage in other non-interest income activities, which is supposed to increase the overall profitability (ROA) of Chinese commercial banks.

The results show that higher levels of competition in the loan market lead to higher ROA of Chinese commercial banks. This is attributed to the fact that a higher competitive loan market can be an indicator that there is a business boom in the economy, while different companies seeking the loans have lower default risk,; the resultant reduction in the cost of monitoring the loans leads to an increase in bank profitability. In comparison, the findings suggest that a higher competitive deposit market leads to a decline in bank profitability (ROA). This can be mainly explained by the

fact that in a higher competitive deposit market, banks will try to increase the deposit interest rate, and the resultant increase in the interest expenses leads to a decline in ROA. Furthermore, more effort and resources will be given by the bank to attract more deposits from the market, and the resultant increase in the cost leads to a decline in ROA. This result is in accordance with the SCP hypothesis developed by Bain (1951)[3].

Credit risk is found to be significantly and negatively related to bank profitability in China. This can be explained by the fact that higher levels of non-performing loans reduce bank income and further precede a decline in bank profitability. This result is in line with the finding of Tan et al. (2017); however it is in contrast with the findings of Sufian and Habibullah (2009) and Sufian, (2009). The different findings are mainly attributed to the different methods used. The table further suggests that Chinese commercial banks with higher levels of capital have higher bank profitability in terms of ROA and NIM. This result is in line with Berger (1995b), but it is in contrast with the finding of Goddard et al. (2013). This is mainly attributed to the fact that the banking systems from different countries are investigated. The higher levels of capital held by Chinese commercial banks reduce the borrowing cost, which further increases bank profitability. The results indicate that bank size is significantly and negatively related to Chinese bank profitability, as reflected by the significant and negative signs of the variable. This result is in accordance with the findings of Smirlock (1985) and Goddard et al. (2001). The negative impact of size on bank profitability can be explained by the fact that large banks are difficult to manage (Tan and Floros, 2012a), which induces a larger amount of efforts, and the resultant increase in the cost leads to a decline in bank profitability. Overhead cost is found to be significantly and positively related to bank profitability

[3] The result from the current paper further extends the SCP hypothesis by clearly testing the impacts of competition in different banking markets on bank profitability.

in China, indicating that Chinese commercial banks with higher levels of overhead cost have higher profitability. This result is different from the finding reported by Tan and Floros (2012b). However, our results can be explained by the efficiency wage theory, which argues that higher cost derived from higher wage/salary to bank staff is supposed to significantly increase the labour productivity and the resulted improvement in revenue exceeds the labour cost. Therefore, higher overhead cost leads to higher bank profitability.

Our results show that bank diversification is significantly related to bank profitability in China; however, the sign of the variable is different between ROA and NIM. To be more specific, the findings suggest that Chinese commercial banks with a higher degree of business diversification have higher ROA but lower NIM. This result is in contrast to Gambacorta et al. (2014), who report that diversification is positively correlated with bank profitability only up to a certain degree, due to the fact that ROA focuses on a bank's ability to generate income from total assets, which considers both the interest generating businesses as well as non-interest income activities, while NIM concentrates on interest-generating activities only. Our results underline that Chinese commercial banks with more diversified businesses can generate higher income, while more resources/funds used in engaging in non-interest generating businesses reduces the volumes of traditional loan businesses, which further precedes a decrease in NIM of Chinese commercial banks. Finally, with regard to the macroeconomic determinants of bank profitability, the findings suggest that Chinese commercial banks have higher profitability in terms of ROA and NIM in a higher inflationary environment. This result is in line with the finding of Ariyadasa et al. (2017) in terms of the Sri Lankan banking industry. The higher inflationary environment is associated with higher loan interest rate, which will increase bank profitability (Tan and Floros, 2012a). In

theory, this result indicates that Chinese commercial banks have the ability to anticipate the interest rate and adjust the interest rate accordingly (Perry, 1992). Finally, the results suggest that higher GDP growth leads to higher NIM of Chinese commercial banks. This is in line with the findings of Demirguc-Kunt and Huizinga (1999) and can be explained by the fact that the demand for lending increases during cyclical upswings.

<<Table 6---about here>>

## 5. Robustness check

In order to check the robustness of the results, we estimate the impacts of shadow banking and competition on bank profitability by using just one specific competition indicator for a specific banking market in the model. To be more specific, Table 7, Table 8 and Table 9 test the impact of competition in the loan market, deposit market and non-interest market on bank profitability while controlling for other bank profitability determinants. In addition, the results are cross checked by using alternative competition indicators. The current study uses two alternative competition indicators, including Lerner index and Hirfindahl-Hirchman index following Tan (2016a), the results of which are reported in Table 10 and Table 11, respectively. We confirm some of the findings reported from Table 7 as follows: 1) bank profitability in terms of ROA and NIM is significantly and positively affected by the past year's profitability; 2) shadow banking has a significant and positive impact on bank profitability; 3) Chinese commercial banks have lower profitability in a higher competitive deposit market; 4) Chinese commercial banks with higher levels of credit risk have lower profitability; 5) capital has a significant and positive impact on bank profitability; 6) large Chinese commercial banks have lower NIM; 7) Chinese commercial banks with higher volumes of overhead cost have higher bank profitability; 8) Chinese commercial banks with more diversified businesses have higher ROA but lower NIM; 9) higher economic

growth leads to higher NIM of Chinese commercial banks; 10) inflation has a significant and positive impact on NIM of Chinese commercial banks.

<<Table 7---about here>>

<<Table 8---about here>>

<<Table 9---about here>>

<<Table 10---about here>>

<<Table 11---about here>>

## 6. Conclusion

This study uses a sample of Chinese commercial banks (SOCBs, JSCBs, CCBs) over the period 2003-2013 to test the impact of competition in different banking markets on bank profitability. Three different banking markets are analysed, which include the deposit market and loan market as well as the non-interest income market. This paper is the first empirical research to test the competitive conditions in different markets in the banking sector, while this study further tests the impact of competition in these markets on bank profitability in China under a one-step Generalized Method of Moments system estimator. More importantly, this is the first piece of research investigating the impact of shadow banking on commercial bank profitability in banking literature. The results suggest that shadow banking significantly contributes to the profitability improvement of Chinese commercial banks. In addition, the results show that the non-interest income market has a higher level of competition compared to the other two markets during the early years of the examined period. Finally, the results suggest that Chinese commercial banks have higher profitability in a lower competitive deposit market.

The results of the current paper provide important implications to the Chinese government, as well as to banking regulatory authorities to make relevant policies to reform the banking sector and

further improve bank performance as follows: 1) relevant policy should be made to further develop the shadow banking system in China; 2) Chinese commercial banks should be required to hold higher levels of capital; 3) relevant policy should be established and implemented to attract people with higher levels of professional knowledge and experience through higher salaries and also the staff should be better motivated through providing bonuses to improve their productivity; 4) Chinese commercial banks should further explore the business areas in terms of non-interest generating activities; 5) better regulation of deposit market is needed to reduce its competition.

The paper looks at two different aspects, which, however, are not independent from each other. One aspect is the impact of competition in banking markets on bank performance. The other aspect refers to the impact of shadow banking on bank performance. These two aspects are considered as independent and respective proxies are included in the empirical model to explain bank performance. As a matter of fact, the extent of shadow banking is likely to be influenced by the intensity of competition of banking markets, and vice versa. Future research can model the inter-relationships between shadow banking and competition in different banking markets under a simultaneous estimation technique.

**References:**

Al-Muharrami, S., Matthews, K. and Khabari, Y. 2006. Market structure and competitive conditions in the Arab GCC banking system. *Journal of Banking and Finance*, vol. 30, no.12, 3487–3501.

Arellano, M., Bond, S.R. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies, vol. 58, no. 2, 277–297.

Arellano, M. and Bover, O. 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, vol. 68, no. 1, 29-51.

Ariyadasa, C., Selvanathan, E. A., Siddiqui, M.A.B. and Selvanathan, S. 2017. On the profitability of commercial banks: the Sri Lankan case. Applied Economics, vol. 49, no. 21, 2106-2116.

Athanasoglou, P.P., Brissimis, S.N. and Delis, M.D. 2008. Bank-Specific, Industry-Specific and Macroeconomic Determinants of Bank Profitability. *Journal of International Financial Markets, Institutions and Money*, vol. 18, no. 2, 121-136.

Bain, J. S. (1951). Relation of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940. The Quarterly Journal of Economics, vol. 65, no. 3, 293-324.

Barbosa, K., Rocha, B.D.E. and Salazar, F. 2015. Assessing competition in the banking industry: a multi-product approach. Journal of Banking and Finance, vol. 50, 340–362.

Barros, C.P., Ferreira, C. and Williams, J. 2007. Analysing the determinants of performance of the best and worst European banks: a mixed logit approach. Journal of Banking and Finance, vol. 31, no. 7, 2189–2203.

Ben Naceur, S. 2003. The determinants of Tunisian banking industry profitability: panel evidence. In: Paper Presented at the Economic Research Forum (ERF) 10th Annual conference, 16–18 December, Morocco.

Berger, A.N. 1995a. The Profit-Structure Relationship in Banking-Test of Market-Power and Efficient-Structure Hypotheses. *Journal of Money, Credit and Banking*, vol. 27, no. 2, 404-431.

Berger, A. N. 1995b. The relationship between capital and earnings in banking. *Journal of Money, Credit and Banking*, vol. 27, no. 2, 432–456.

Berger, A.N., Humphrey, D. 1994. Bank scale economies, mergers, concentration and efficiency: the U.S. experience. In: Centre for Financial Institutions Working Papers 94-25. Wharton School Centre for Financial Institutions, University of Pennsylvania.

Bikker, J.A. and Haaf, K. (2002). Competition, concentration and their relationship: an empirical analysis of the banking industry. Journal of Banking and Finance, vol. 26, no.11, 2191–2214.

Bikker, J.A. and Hu, H. 2002. Cyclical patterns in profits, provisioning and lending of banks and procyclicality of the new Basel capital requirements. BNL Quarterly Review, vol. 221, 143-175.

Blundell, R. and Bond, S. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, vol. 87, no. 1, 115-143.

Bond, S. 2002. Dynamic panel data models: a guide to micro data methods and practice. Portuguese Economic Journal, vol.1, no. 2, 141–162.

Boone, J. 2008. A new way to measure competition. *The Economic Journal*, vol. 118, no. 531, 1245-1261.

Bourke, P. 1989. Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance*, vol. 13, no. 1, 65-79.

Bresnahan, T.F. 1982. The oligopoly solution concept is identified. Economics Letters, vol.10, no. 1-2, 87–92.

Blundell, R.W. and Bond, S. R. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models, Journal of Econometrics, vol. 87, no.1, 115- 143.

Čihák, M. and Poghosyan, T. 2009. Distress in European Banks: An Analysis Based on a New Data Set, IMF Working Paper 09/9.

Cipollini, A. and Fiordelisi, F. 2012. Economic value, competition and financial distress in the European banking system. Journal of Banking and Finance, vol. 36, no. 11, 3101–3109.

Claessens, S. and Laeven, L. 2004. What drives bank competition? Some international evidence. Journal of Money, Credit and banking, vol. 36, no. 2, 563–584.

Demirguc-Kunt, A. and Huizinga, H. 1999. Determinants of commercial bank interest margins and profitability: some international evidence. *World Bank Economic Review*, vol. 13, no. 2, 379-408.

Demsetz, H. 1973. Industry structure, market rivalry and public policy. *Journal of Law and Economics*, vol. 16, no. 1, 1-19.

Dietrich, A. and Wanzenried, G. 2014. The determinants of commercial banking profitability in low, middle, and high income countries. The Quarterly Review of Economics and Finance, vol. 54, no. 3, 337-354.

Dietrich, A. and Wanzenried, G. 2011.Determinants of bank profitability before and during the crisis: evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, vol. 21, no. 3, 307-327.

Elliott, D., Kroeber, A. and Qiao, Y. 2015. Shadowing banking in China: A primer. The Brookings Institution.

Delis, M. 2012. Bank competition, financial reform and institutions: the importance of being developed. Journal of Development Economics, vol. 97, no.2, 450–465.

Ding, N., Fung H. and Jia, J. 2017. Comparison of bank profitability in China and the USA. China and World Economy, vol. 25, no. 1, 90-108.

Elsas, R., Hackethal, A. and Holzhauser, M. 2010. The anatomy of bank diversification. Journal of Banking and Finance, vol. 34, no. 6, 1274–1287.

Financial Stability Board. Global Shadow Banking Monitoring Report 2013.

Feyzioglu, T., Porter, N. and Takats, E. (2009). Interest Rate Liberalization in China. IMF working paper, August 2009.

Fungacova, Z., Solanko, L. and Weill, L. 2014. Does competition influence the bank lending channel in the Euro area? Journal of Banking and Finance, vol. 49, 356–366.

Gambacorta, L., Scatigna, M. and Yang, J. 2014. Diversification and bank profitability: a nonlinear approach. Applied Economics Letters, vol. 21, no. 6, 438-441.

Garcia-Herrero, A., Gavila, S. and Santabarbara, D. 2009. What explains the low profitability of Chinese banks? *Journal of Banking and Finance*, vol. 33, no. 11, 2080-2092.

Garcia, M.T.M. and Guerreiro, J.P.S.M. 2016. Internal and external determinants of banks' profitability: The Portuguese case. *Journal of Economic Studies*, vol. 43, no. 1, 90-117.

Gischer, H., Juttner, D.J., 2001. Profitability and Competition in Banking Markets: An Aggregative Cross Country Approach. Otto-von-Gueriche University, Mimeo.

Goddard, J. A., Molyneux, P. M. and Wilson, J.O.S. 2001. *European banking: efficiency, technology and growth*, Chichester, Wiley.

Goddard, J., Molyneux, P. and Wilson, J. O. S. 2004a. Dynamic of growth and profitability in banking. *Journal of Money, Credit and Banking*, vol. 36, no. 6, 1069-1090.

Goddard, J., Molyneux, P. and Wilson, J. O. S. 2004b. The profitability of European banks: a cross-sectional and dynamic panel analysis. *The Manchester School*, vol. 72, no. 3, 363-381.

Goddard, J., Wilson, J.O.S., 2009. Competition in banking: a disequilibrium approach. Journal of Banking and Finance, vol. 33, no.12, 2282–2292.

Goddard, J., Molyneux, P., Liu, H. and Wilson, J.O.S. 2013. Do bank profits converge? *European Financial Management*, vol. 19, no. 2, 345-365.

Hasan, I. and Morton, K. 2003. Development and efficiency of the banking sector in a transitional economy: Hungarian experience. *Journal of Banking and Finance*, vol. 27, no. 12, 2249-2271.

Hoffmann, P. S. 2011. Determinants of the profitability of the US Banking Industry. *International Journal of Business and Social Science*, vol. 2, no. 22, 255-269.

Hu, B. (2014). Financial Repression and Interest Rate liberalisation in China. Indiana University.

Iannotta, G., Nocera, G. and Sironi, A. 2007. Ownership structure, risk and performance in the European banking industry. Journal of Banking and Finance, vol. 31, no. 7, 2127–2149

Jiang, G., Tang, N., Law, E., Sze, A. 2003. Determinants of bank profitability in Hong Kong. In: Hong Kong Monetary Authority Research Memorandum.

Karamizadeh, S., Abudullah, S. M., Manaf, A. A., Zamani, M. and Hooman, A. (2013). An overview of principal component analysis. Journal of Signal and Information Processing, vol. 4, 173-175.

Kutan, A. M., Ozsoz, E. and Rengifo, E. W. 2012. Cross-sectional determinants of bank performance under deposit dollarization in Emerging markets. *Emerging Markets Review*, vol. 13, no. 4, 478-492.

Kwoka, J. E. (1977). Large firm dominance and price-cost margins in manufacturing industries. Southern Economic Journal, Vol.44, no.1, 183-189.

Lau, L. 1982. On identifying the degree of competitiveness from industry price and output data. Economics Letters, vol. 10, no. 1-2, 93–99.

Lee, C., Yang, S. and Chang, C. 2014. Non-interest income, profitability and risk in the banking industry: A cross-country analysis. *The North American Journal of Economics and Finance*, vol. 27, 48-67.

Lee, C. and Hsieh, M. 2013. The impact of bank capital on profitability and risk in Asian banking. *Journal of International Money and Finance*, vol. 32, 251-281.

Lerner, A. P. 1934. The concept of monopoly and the measurement of monopoly power. The Review of Economic Studies, vol.1, no. 3, 157-175.

Leuvensteijn, M.V., Bikker, J.C., Rixtel, A.A.R.J.M.V. and Sørensen, C.K. 2011. A new approach to measuring competition in the loan markets of the euro area. Applied Economics, vol. 43, no. 23, 3155–3167.

Leuvensteijn, M.V., Bikker, J.A., Rixtel, A. van and Sørensen, C.K. 2007. A new approach to measure competition in the loan markets of the euro area, ECB Working Paper Series No. 768.

Maksimović, L. and Kostić, M. (2012). Limitations in the application of concentration indicators - example of insurance market in Serbia, Croatia, Slovenia, Romania and Austria. Scientific Discussion and Topic Review, May, 199-205.

Matthews, K., Murinde, V. and Zhao, T., 2007. Competitive conditions among the major British Banks. Journal of Banking and Finance, vol. 31, no. 7, 2025–2042.

Mercieca, S., Schaeck, K. and Wolfe, S. 2007. Small European banks: benefits from diversification? Journal of Banking and Finance, vol. 31, no. 7, 1975–1998.

Mirzaei, A., Moore, T. and Liu, G. 2013. Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking and Finance*, vol. 37, no. 8, 2920-2937.

Molyneux, P. and Thornton, J. 1992. Determinants of European bank profitability: A Note. *Journal of Banking and Finance*, vol. 16, no. 6, 1173-1178.

Molyneux, P., Fu, X. and Lin, Y. 2015. Bank competition, efficiency and liquidity creation in Asia Pacific. London: Palgrave Macmillan.

Panzar, J.C. and Rosse, J.N. (1987). Testing for "monopoly" equilibrium. *The Journal of Industrial Economics*, vol. 35, no. 4, 443–456.

Peltzman, S. 1977. The Gains and Losses from Industrial Concentration, *Journal of Law and Economics*, vol. 20, no. 3, 229-263.

Perry, P. 1992. Do banks gain or lose from inflation? *Journal of Retail Banking,* vol. 14, no. 2, 25-30.

Qin, B. and Shaffer, S. 2014. A test of competition in Chinese banking. Applied Economics Letters, vol. 21, no. 9, 602–604.

Rhoades, S. A. 1985. Market share as a source of market power: Implications and some evidence. *Journal of Economics and Business*, vol. 37, no. 4, 343-363.

Roodman, D. 2006. How to do xtabond2: an introduction to "Difference" and "System" GMM in Stata. Center for Global Development Working Paper Number 103.

Shelvin, A., Wu. L. 2015. China: The path to interest rate liberalisation. J.P Morgan Asset Management.

Shih, V., Zhang, Q. and Liu, M. 2007. Comparing the performance of Chinese banks: a principle component approach. China Economic Review, vol. 18, no. 1, 15–34.

Smirlock, M. 1985. Evidence on the (non) relationship between concentration and profitability in banking. *Journal of Money, Credit, and Banking*, vol. 17, no. 1, 69–83.

Staikouras, C. and Wood, G. 2004. The determinants of bank profitability in Europe. *International Business and Economic Research Journal*, vol. 3, no. 6, 57-68.

Sufian, S. and Chong, R. R. 2008. Determinants of Bank Profitability in a Developing Economy: empirical evidence from the Philippines. *Asian Academy of management Journal of Accounting and Finance*, vol. 4, no. 2, 91-112.

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, 201-307.

Sufian, F. and Habibullah, M. S. 2009. Bank specific and macroeconomic determinants of bank profitability: Empirical evidence from the China Banking Sector. *Frontier of Economics in China*, vol. 4, no. 2, 274-291.

Tabak, B. M., Fazio, D. M. and Cajueiro, D. O. 2012. The relationship between banking market competition and risk-taking: Do bank size and capitalisation matter? *Journal of Banking and Finance*, vol. 36, no. 12, 3366-3381.

Tan, Y. and Floros, C. 2012a. Bank profitability and inflation: the case of China. *Journal of Economic Studies*, vol. 39, no. 6, 675-696.

Tan, Y. and Floros, C. 2012b. Bank profitability and GPD growth in China: a note. *Journal of Chinese Economics and Business Studies*, vol. 10, no. 3, 267-273.

Tan, Y. and Floros, C. 2012c. Stock market volatility and bank performance in China. *Studies in Economics and Finance*, vol. 29, no. 3, 211-228.

Tan, Y. 2014. Performance, Risk and Competition in the Chinese Banking Industry. Oxford: Chandos Publishing.

Tan, Y. 2016a. The impacts of risk and competition on bank profitability in China. *Journal of International Financial Markets, Institutions and Money*, vol. 40, 85-110.

Tan, Y. 2016b. Investigating the Performance of Chinese Banks: Efficiency and Risk Features. London, UK: Palgrave Macmillan.

Tan, Y. 2016c. Efficiency and Competition in Chinese Banking. Oxford: Chandos Publishing.

Tan, Y. and Floros, C. 2014. Risk, profitability and competition: evidence from the Chinese banking. *Journal of Developing Areas*, vol. 48, no. 3, 303-319.

Tan, Y., Floros, C. and Anchor, J. (2017). The profitability of Chinese banks: impacts of risk, competition and efficiency. *Review of Accounting and Finance*, vol. 16, no.1, 86-105.

Tan, Y. and Anchor, J. 2016. Stability and profitability in the Chinese Banking Industry: evidence from an auto-regressive-distributed linear specification. Investment Management and Financial Innovations, vol. 13, no. 4, 155-163.

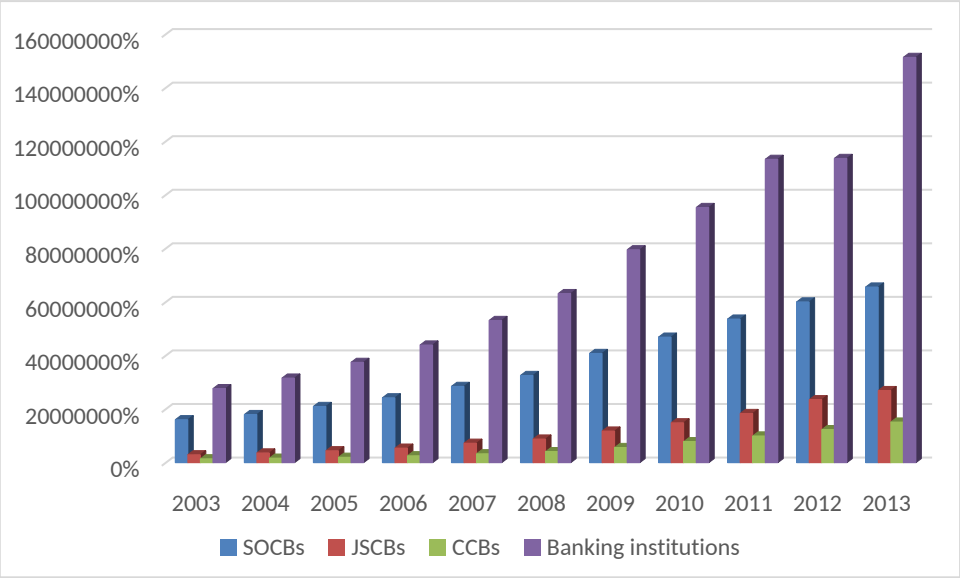
Tregenna, F. 2009. The fat years: the structure and profitability of the US banking sector in the pre-crisis period. *Cambridge Journal of Economics*, vol. 33, no. 4, 609-632.

Trujillo-Ponce, A. 2012. What determines the profitability of banks? Evidence from Spain. *Accounting and Finance*, vol. 53, no. 2, 561-586.

Uchida, H., and Tsutsui, Y. 2005. Has competition in the Japanese banking sector improved? Journal of Banking and Finance, vol. 29, no.2, 419–429.

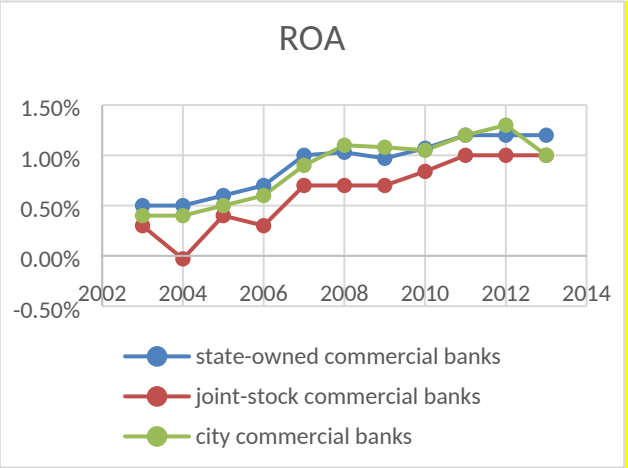
Wang, H., Wang, H., Wang, L., and Zhou, H. (2016). Shadow Banking: China's Dual-Track Interest Rate Liberalization. Available at SSRN: https://ssrn.com/abstract=2606081 or http://dx.doi.org/10.2139/ssrn.2606081

**Figure 1 Summary of the assets of SOCBs, JSCBs, CCBs and total banking institutions in China over the period 2003-2013**

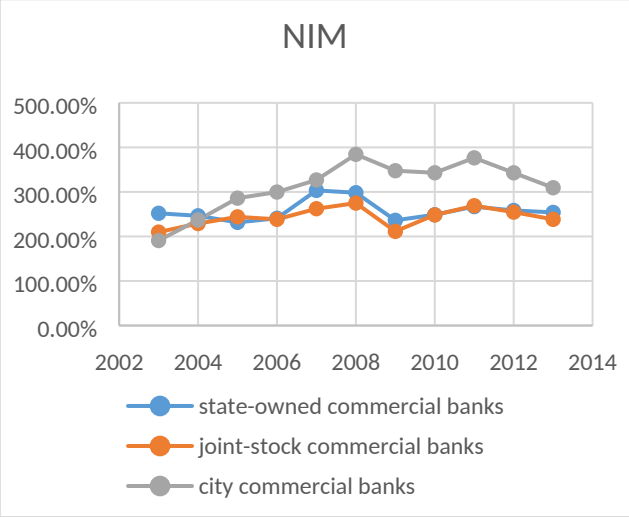



• The data above is collected from CBRC (China Banking Regulatory Commission) annual reports, and the figures are in RMB 100 million.

**Figure 2 The profitability of three different ownership types of Chinese commercial banks over the period 2003-2013**

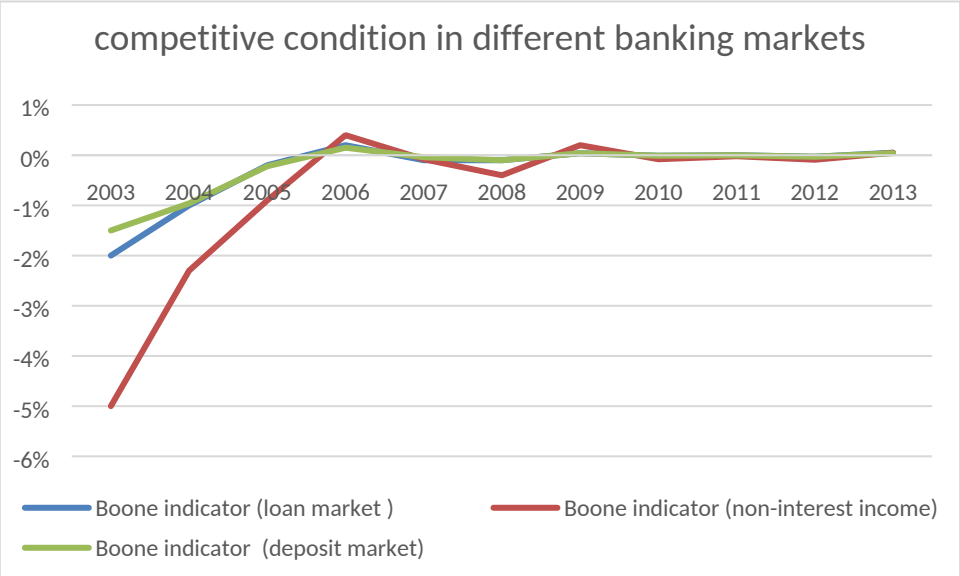



• The data is collected from Bankscope database




•The data is collected from Bankscope database

**Figure 3 Competitive condition in different banking markets in China over 2003-2013**




**• The graph is made of data from Bankscope database as well as own estimation.**

**Table 1 Size and composition of China's shadow banking during 2003-2013 (RMB 1 billion)**

| | Entrusted loans | Trusted loans | Bankers' acceptances | Interbank entrusted loan payment | Financial leasing | Small loan companies | Total | %GDP | Domestic credit to private sector by banks over GDP (%) |
|---|---|---|---|---|---|---|---|---|---|
| 2003 | 328 | 0 | 457 | | | | 784 | 6 | 125.52 |
| 2004 | 639 | 0 | 428 | | | | 1067 | 7 | 118.55 |
| 2005 | 836 | 0 | 430 | | | | 1266 | 7 | 111.81 |
| 2006 | 1105 | 172 | 580 | 444 | | | 2212 | 11 | 109.13 |
| 2007 | 1442 | 342 | 1250 | 558 | | | 3503 | 13 | 105.71 |
| 2008 | 1868 | 657 | 1357 | 738 | | | 4530 | 14 | 101.9 |
| 2009 | 2546 | 1093 | 1818 | 628 | | | 5995 | 17 | 124.2 |
| 2010 | 3421 | 1480 | 4152 | 1680 | 270 | 198 | 11111 | 27 | 126.29 |
| 2011 | 4717 | 1683 | 5179 | 1872 | 426 | 391 | 14180 | 29 | 122.75 |
| 2012 | 6001 | 2972 | 6229 | 2894 | 608 | 592 | 19207 | 36 | 128.49 |
| 2013 | 8551 | 4812 | 7004 | 3000 | 766 | 819 | 24952 | 42 | 133.8 |

• The data is collected from Elliott et al. (2015).

*Table 2*

| *References* | *Banking sector investigated* | *Data period* | *Methodology* | *Empirical results* |
|---|---|---|---|---|
| Smirlock (1985) | US banking industry | 1973-1978 | Ordinary least square estimator | Size is significantly and negatively related to bank profitability |
| Rhoades (1985) | US banking industry | 1969-1978 | Ordinary least square estimator | There is a significant and negative impact of risk on bank profitability |
| Molyneux and Thornton (1992) | European banking industry | 1986-1989 | Ordinary least square estimator | Liquidity is significantly and negatively related to bank profitability |
| Berger (1995a) | US banking industry | Decade of 1980s | Ordinary least square estimator | Banks with larger market share and differentiated products have higher profitability |
| Berger (1995b) | US banking industry | 1983-1989 | Grainger Causality test | There is a significant and positive relationship between capitalisation and bank profitability |
| Goddard et al. (2001) | European banking industry | 1989-1996 | Ordinary least square estimator | Scale economies and productive efficiency are positively related to profitability, while bank size has negative impact on profitability. |
| Staikouras and Wood (2004) | European banking industry | 1994-1998 | Fixed effect estimator | There is a negative impact of risk on bank profitability |

| | | | | |
|---|---|---|---|---|
| Goddard et al. (2004a) | European banking industry | 1992-1998 | GMM | There is a positive impact of diversification on bank profitability |
| Goddard et al. (2004b) | European banking industry | 1992-1998 | OLS and GMM | Capital-asset ratio has a significant and positive impact on bank profitability |
| Sufian and Chong (2008) | Philippine banking industry | 1990-2005 | Fixed effect estimator | Risk is significantly and negatively related to bank profitability |
| Athanasoglou et al. (2008) | Greek banking industry | 1985-2001 | GMM | There is no evidence in support of structure-conduct-performance paradigm in Greek banking industry |
| Tregenna (2009) | US banking industry | 1994-2005 | OLS and GMM | Bank concentration increases bank profitability |
| Dietrich and Wanzenried (2011) | Switzerland banking industry | 1999-2009 | GMM | Banks with more diversified activities have higher profitability |
| Hoffmann (2011) | US banking industry | 1995-2007 | GMM | There is a significant impact of capital ratio on bank profitability |
| Kutan et al. (2012) | A sample of banks from 36 dollarized banking system | 1991-2006 | Fixed effect and GMM | Credit risk has a significant and negative impact on bank profitability |
| Goddard et al. (2013) | European banking industry | 1992-2007 | GMM | Profitability is higher for banks that are efficient and diversified, while low for those that are higher capitalized |

| | | | | |
|---|---|---|---|---|
| Mirzaei et al. (2013) | A sample of banks from advanced and emerging economies | 1999-2008 | Fixed effect estimation | Lower competitive condition leads to higher bank profitability for advanced economies; however, this is not the case for emerging economies. |
| Trujillo-Ponce (2013) | Spain banking industry | 1999-2009 | GMM | Liquidity, capital and credit risk are significantly related to bank profitability |
| Lee and Hsieh (2013) | A sample of commercial banks from Asian Economies | 1994-2008 | GMM | Capital has a significant impact on bank profitability. |
| Lee et al. (2014) | Bank accounting data for 22 countries in Asia | 1995-2009 | GMM | Non-interest activities do not have a significant impact on bank profitability. |
| Dietrich and Wanzenried (2014) | A sample of commercial banks from 118 countries | 1998-2012 | GMM | The level of income of a specific country has a significant impact on bank profitability |
| Garcia and Guerreiro (2016) | Portuguese banking system | 2002-2011 | Fixed effect estimator | Capital and credit risk has a significant and negative impact on bank profitability |

**Table 3 Summary statistics**

| Variables | Observations | Mean | S.D | Min | Max |
|---|---|---|---|---|---|
| Total cost (interest expenses and non-interest expenses) | 777 | 3.35 | 0.97 | -0.79 | 6.86 |
| Price of funds (the ratio of interest expenses to total deposits) | 777 | 1.27 | 0.18 | 0.74 | 1.96 |
| Price of capital (the ratio of non-interest expenses to fixed assets) | 776 | 1.92 | 0.26 | 0.68 | 2.83 |
| Total loans | 784 | 4.59 | 0.99 | 0.34 | 7.95 |
| Securities | 782 | 4.21 | 1.04 | -0.41 | 7.87 |
| Non-interest income | 767 | 2.34 | 1.1 | -2.4 | 5.81 |
| Total deposits | 784 | 4.85 | 0.98 | 0.66 | 8.26 |

**Table 4 Description of the variables and their impact on bank profitability**

| Variables | Measurement | Expected effect | Source |
|---|---|---|---|
| **Profitability indicators** | | | |
| ROA | Net income/total assets | | **Bankscope** |
| NIM | Net interest income/earning assets | | **Bankscope** |
| **Bank-specific variables** | | | |
| Credit risk | impaired loans/gross loans | **-** | **Bankscope** |
| Liquidity | liquid assets/total assets | **?** | **Bankscope** |
| Capital | Total regulatory capital ratio | **?** | **Bankscope** |
| Insolvency risk | Z-score( $\frac{ROA + Equity/Assets}{Standard\ Deviation\ of\ ROA}$ ) | + | **Bankscope** |
| Bank size | natural logarithm of total assets | **?** | **Bankscope** |
| Bank diversification | Non-interest income/gross revenue | **?** | **Bankscope** |
| Overhead cost | Overhead expenses/total assets | **?** | **Banksocpe** |
| **Industry-specific variables** | | | |
| Bank competition | Boone indicator | **?** | |
| Banking sector development | Banking sector assets/GDP | + | **China Banking Regulatory Commission** |
| Stock market development | Market capitalisation of listed companies/GDP | **-** | **World Bank** |
| Shadowing banking | Size/volume of shadow banking | **?** | Elliot et al. (2015) |
| **Macroeconomic variables** | | | |
| Inflation | Annual inflation rate | **?** | **World Bank** |
| GDP growth | Annual GDP growth rate | **?** | **World Bank** |

**Table 5 Descriptive statistics of all variables considered in this study**

| Variables | Observations | Mean | S.D | Min | Max |
|---|---|---|---|---|---|
| Credit risk | 632 | 2.78 | 4.48 | 0 | 41.86 |
| Liquidity | 777 | 0.27 | 0.11 | 0.02 | 0.67 |
| Capital | 637 | 11.91 | 4.7 | 0.62 | 62.62 |
| Insolvency risk | 808 | 0.33 | 0.21 | 0.025 | 0.789 |
| Bank size | 843 | 4.9 | 0.992 | 0.71 | 8.51 |
| Bank diversification | 828 | 13.98 | 13.31 | -12.94 | 79.4 |
| Overhead cost | 788 | 0.01 | 0.004 | 0.002 | 0.04 |
| Banking sector development | 1100 | 2.22 | 0.24 | 1.98 | 2.66 |
| Stock market development | 1027 | 71.2 | 43.49 | 31.9 | 184.1 |
| Shadow banking | 1100 | 8073.36 | 7843.14 | 784 | 24952 |
| Inflation | 1227 | 2.86 | 1.92 | -0.77 | 5.86 |
| GDP growth rate | 1199 | 10.19 | 1.87 | 7.7 | 14.2 |

**Table 6 Empirical results: shadow banking, competition and bank profitability**

| | ROA | | NIM | |
|---|---|---|---|---|
| | coefficient | t-statistic | Coefficient | t-statistic |
| Lag of dependent variable | 0.37** | 2.44 | 0.52*** | 5.57 |
| **Bank characteristics** | | | | |
| Bank size | 0.0001 | 0.22 | -0.09** | -2.57 |
| Overhead cost | 0.27*** | 3.73 | 130.31*** | 8.13 |
| Bank diversification | 0.00004* | 1.85 | -0.03*** | -9.42 |
| Credit risk | -0.001** | -2.44 | -0.05* | -1.68 |
| Liquidity | -0.003 | -0.88 | 0.03 | 0.09 |
| Capital | 0.0002* | 1.87 | 0.03*** | 2.87 |
| Insolvency risk | -0.005 | -1.18 | -0.61 | -1.02 |
| **Industry characteristics** | | | | |
| Banking sector development | -0.0002 | -0.12 | 0.13 | -0.54 |
| Stock market development | -0.00001 | -0.67 | -0.001 | -0.43 |
| Shadow banking | 3.05e-07*** | 3.10 | 0.00003** | 2.10 |
| Boone indicator (loan) | -3.94* | -1.91 | 158.61 | 0.52 |
| Boone indicator (deposit) | 6.21** | 2.55 | 51.97 | 0.42 |
| Boone indicator (non-interest income) | -0.58 | -0.79 | -71.55 | -0.66 |
| **Macroeconomics** | | | | |
| Inflation | 0.0001 | 0.86 | 0.06*** | 2.66 |
| GDP growth rate | -0.0001 | -0.33 | 0.06** | 2.58 |
| F test | 199.09*** | | 1341.64*** | |
| Sargan test | 0.113 | | 0.137 | |
| AR(1) | -3.61 | 0.000 | -4.24 | 0.000 |
| AR(2) | -1.52 | 0.129 | -1.56 | 0.119 |
| No. of observations | 417 | | 395 | |

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

**Table 7 Empirical results: shadow banking, competition and bank profitability (loan market)**

| | ROA | | NIM | |
|---|---|---|---|---|
| | coefficient | t-statistic | Coefficient | t-statistic |
| Lag of dependent variable | 0.45*** | 2.97 | 0.56*** | 5.91 |
| **Bank characteristics** | | | | |
| Bank size | -0.00004 | -0.15 | -0.08** | -2.27 |
| Overhead cost | 0.26*** | 3.48 | 124.52*** | 7.68 |
| Bank diversification | 0.00004** | 1.98 | -0.03*** | -9.17 |
| Credit risk | -0.001** | -1.96 | -0.05 | -1.58 |
| Liquidity | -0.004 | -1.10 | 0.08 | 0.21 |
| Capital | 0.0002* | 1.70 | 0.03*** | 2.81 |
| Insolvency risk | -0.001 | -0.90 | -0.17 | -0.95 |
| **Industry characteristics** | | | | |
| Banking sector development | -0.002 | -1.42 | -0.25 | -1.08 |
| Stock market development | 0.00001 | 1.54 | -0.002** | -2.43 |
| Shadow banking | 4.47e-07*** | 5.20 | 0.00003*** | 2.90 |
| Boone indicator (loan) | 0.26 | 1.56 | 32.53** | 2.14 |
| **Macroeconomics** | | | | |
| Inflation | 0.0002** | 1.98 | 0.06*** | 4.96 |
| GDP growth rate | 0.0001 | 0.29 | 0.107*** | 3.35 |
| F test | 213.72*** | | 1469.18*** | |
| Sargan test | 0.1 | | 0.166 | |
| AR(1) | -3.78 | 0.000 | -4.25 | 0.000 |
| AR(2) | -1.45 | 0.148 | -1.51 | 0.132 |
| No. of observations | 417 | | 395 | |

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

**Table 8 Empirical results: shadow banking, competition and bank profitability (deposit market)**

| | ROA | | NIM | |
|---|---|---|---|---|
| | coefficient | t-statistic | Coefficient | t-statistic |
| Lag of dependent variable | 0.44*** | 2.91 | 0.55*** | 5.78 |
| **Bank characteristics** | | | | |
| Bank size | -0.00002 | -0.09 | -0.08** | -2.25 |
| Overhead cost | 0.26*** | 3.52 | 126.21*** | 7.74 |
| Bank diversification | 0.00004** | 1.97 | -0.03*** | -9.20 |
| Credit risk | -0.0007** | -2.03 | -0.06* | -1.74 |
| Liquidity | -0.003 | -1.06 | 0.095 | 0.25 |
| Capital | 0.0002* | 1.73 | 0.03*** | 2.84 |
| Insolvency risk | -0.002 | -0.97 | -0.21 | -1.13 |
| **Industry characteristics** | | | | |
| Banking sector development | -0.002 | -1.38 | -0.22 | -0.96 |
| Stock market development | 9.54E-06 | 1.28 | -0.003*** | -2.72 |
| Shadow banking | 4.36E-07*** | 5.13 | 0.00003*** | 2.73 |
| Boone indicator (deposit) | 0.32* | 1.73 | 44.3** | 2.28 |
| **Macroeconomics** | | | | |
| Inflation | 0.0002** | 2.06 | 0.07*** | 5.07 |
| GDP growth rate | 0.00004 | 0.23 | 0.07*** | 3.23 |
| F test | 214.79*** | | 1463.57*** | |
| Sargan test | 0.102 | | 0.195 | |
| AR(1) | -3.78 | 0.000 | -4.28 | 0.000 |
| AR(2) | -1.47 | 0.142 | -1.43 | 0.153 |
| No. of observations | 417 | | 395 | |

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

**Table 9 Empirical results: shadow banking, competition and bank profitability (non-interest income market)**

| | ROA | | NIM | |
|---|---|---|---|---|
| | coefficient | t-statistic | Coefficient | t-statistic |
| Lag of dependent variable | 0.45*** | 2.96 | 0.56*** | 5.93 |
| **Bank characteristics** | | | | |
| Bank size | -0.00005 | -0.19 | -0.08** | -2.29 |
| Overhead cost | 0.26*** | 3.50 | 124.08*** | 7.67 |
| Bank diversification | 0.00004** | 1.98 | -0.03*** | -9.38 |
| Credit risk | -0.0006* | -1.93 | -0.05 | -1.53 |
| Liquidity | -0.004 | -1.14 | 0.07 | 0.20 |
| Capital | 0.0002* | 1.68 | 0.03*** | 2.80 |
| Insolvency risk | -0.0008 | -0.55 | -0.09 | -0.52 |
| **Industry characteristics** | | | | |
| Banking sector development | -0.002 | -1.40 | -0.02 | -1.09 |
| Stock market development | 9.04E-06 | 1.20 | -0.003*** | -2.73 |
| Shadow banking | 4.36E-07*** | 5.13 | 0.00003*** | 2.83 |
| Boone indicator (non-interest income) | 0.11 | 1.57 | 13.55** | 2.06 |
| **Macroeconomics** | | | | |
| Inflation | 0.0002** | 2.10 | 0.07*** | 5.07 |
| GDP growth rate | 0.0001 | 0.37 | 0.07*** | 3.50 |
| F test | 216.52*** | | 1474.08*** | |
| Sargan test | 0.1 | | 0.154 | |
| AR(1) | -3.81 | 0.000 | -4.25 | 0.000 |
| AR(2) | -1.43 | 0.152 | -1.52 | 0.128 |
| No. of observations | 417 | | 395 | |

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

**Table 10 Empirical results: shadow banking, competition and bank profitability (Lerner index as competition indicator)**

| | ROA | | NIM | |
|---|---|---|---|---|
| | coefficient | t-statistic | Coefficient | t-statistic |
| Lag of dependent variable | 0.48*** | 2.99 | 0.44*** | 5.97 |
| **Bank characteristics** | | | | |
| Bank size | -0.00001 | -0.11 | -0.03** | -2.38 |
| Overhead cost | 0.36*** | 3.90 | 124.55*** | 7.73 |
| Bank diversification | 0.00008** | 1.95 | -0.09*** | -10.38 |
| Credit risk | -0.0003* | -1.96 | -0.05 | -1.18 |
| Liquidity | -0.009 | -1.11 | 0.05 | 0.22 |
| Capital | 0.0009* | 1.66 | 0.03*** | 2.88 |
| Insolvency risk | -0.001 | -0.5 | -0.1 | -0.58 |
| **Industry characteristics** | | | | |
| Banking sector development | -0.01 | -1.48 | -0.05 | -1.01 |
| Stock market development | 0.06 | 1.13 | -0.007*** | -2.88 |
| Shadow banking | 0.07*** | 9.13 | 0.0001*** | 2.83 |
| Lerner index | 0.19 | 1.13 | 13.6 | 1.11 |
| **Macroeconomics** | | | | |
| Inflation | 0.001** | 2.12 | 0.09*** | 5.18 |
| GDP growth rate | 0.001 | 0.38 | 0.05*** | 3.99 |
| F test | 218.38*** | | 474.1*** | |
| Sargan test | 0.13 | | 0.15 | |
| AR(1) | -3.22 | 0.000 | -4.43 | 0.000 |
| AR(2) | -1.34 | 0.125 | -1.25 | 0.182 |
| No. of observations | 417 | | 395 | |

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

**Table 11 Empirical results: shadow banking, competition and bank profitability (Hirfindah-Hirchman index as competition indicator)**

| | ROA | | NIM | |
|---|---|---|---|---|
| | coefficient | t-statistic | Coefficient | t-statistic |
| Lag of dependent variable | 0.43*** | 2.93 | 0.48*** | 5.98 |
| **Bank characteristics** | | | | |
| Bank size | -0.00009 | -0.29 | -0.09** | -2.25 |
| Overhead cost | 0.58*** | 4.96 | 125.08*** | 8.18 |
| Bank diversification | 0.00005** | 1.88 | -0.05*** | -9.58 |
| Credit risk | -0.0009* | -1.93 | -0.05 | -1.22 |
| Liquidity | -0.003 | -1.04 | 0.07 | 0.10 |
| Capital | 0.0007* | 1.69 | 0.06*** | 2.82 |
| Insolvency risk | -0.001 | -0.53 | -0.1 | -0.25 |
| **Industry characteristics** | | | | |
| Banking sector development | -0.01 | -1.42 | -0.09 | -1.03 |
| Stock market development | 0.08 | 1.19 | -0.01*** | -3.73 |
| Shadow banking | 0.05*** | 5.58 | 0.0001*** | 2.88 |
| Hirfindah-Hirchman index | 0.18 | 1.51 | 13.6 | 1.38 |
| **Macroeconomics** | | | | |
| Inflation | 0.003** | 2.22 | 0.03*** | 5.38 |
| GDP growth rate | 0.001 | 0.22 | 0.09*** | 3.88 |
| F test | 216.25*** | | 455.98*** | |
| Sargan test | 0.18 | | 0.14 | |
| AR(1) | -3.18 | 0.000 | -4.52 | 0.000 |
| AR(2) | -1.19 | 0.215 | -1.23 | 0.219 |
| No. of observations | 417 | | 395 | |

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.