

DOES BANK RISK DRIVE COMPETITION IN ASIAN EMERGING MARKETS?

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ABSTRACT

The effect of risk taking on competition is proved by the theoretical model of Spierdijk and Zaouras (2017) and mixed empirical evidence using the US and European data (see e.g. De Guevara et al., 2005; Boyd et al., 2009; Cai, Le, & Vo, 2019). However, it is lack of empirical evidence about the effect of risk taking on competition using data of Asian countries or emerging countries. This paper fills that gap by examining the relationship between risk and competition for a sample of 564 commercial banks and banks holding companies from nine Asian emerging markets for the period 2011-2015. The paper shows that there is no clear relationship between risk-taking and competition in the sample of nine Asian emerging markets. This finding is consistent with that of De Guevara et al. (2005) and, thus, the theoretical model about the effect of risk on competition built by Spierdijk and Zaouras (2017) is confirmed and raises concerns about whether banks control their risk-taking in safe range so that their risk taking does not affect their competition.

Keywords: Bank competition, Risk-taking, Asian emerging banking industry

1. INTRODUCTION

Banks and other financial institutions play an essential role in the development of Asian emerging countries. The importance of financial system has been proved in depressions in 1997 and 2008. Before 1997, the economic system in emerging Asian countries grew remarkably faster than that of developed industries, namely the U.S and European. Hence, the government in this region became overconfident and decided to expand the economy by borrowing more from foreign capital, boosting local consumption, and encouraging foreign investment. However, these strategies cannot adapt to economic development, which exposed their serious shortcomings

such as lack of transparency, ineffective financial regulation, and other financial problems. Since 1997, all the weaknesses were exposed and the government was not able to control the situation immediately and as a consequence, a large number of banks in the Asia-Pacific area, especially in emerging Asian markets, declared bankruptcy. After this period, the banking system follows some strategies to address the problems, such as reforming the structures, enhancement in supervision and regulation, and financial integration. Besides, many small-sized and medium-sized banks chose to emerge with large-scaled banks after the depression period to avoid bankruptcy declaration and reduce pressure on the economy.

To overcome depression caused by the financial crisis in the US, the government in emerging countries reinforce international regulations on capital and liquidity to maintain the stable banking sector and boost the efficiency of the banking sector. Banks in Asian emerging countries also upgraded the operational and financial services as well as deploy new services such as investment and consulting services thanks to advance technology. However, domestic banks also faced challenges from foreign penetration due to financial integration between emerging countries (Fu et al., 2015) and the Greek crisis in 2010 (Soedarmono, 2010). To be more specific, foreign banks contribute capital to local banks as well as open branches in emerging Asian countries. Besides, non-bank financial industry expands their operations in the lending activities (Hawkins & Mihaljek, 2009).

According to Jeon et al. (2011) and Soedarmono et al. (2013), banks in emerging Asian countries are more competitive after the financial crisis in 2008, and this change is stated as the factor which impacts negatively on both banking industry and the economic growth. Different from above researches, Rakshit and Bardhan (2019) conclude that the competitive banking sector in emerging Asian economies significantly impact the economic growth in the 1997-2016 period. Besides these studies, there are various researches of other scholars focus on the competitive situation through estimating the impact of competition on the bank risk and other macro variables (Fu et al., 2014; Wu et al., 2019). However, there is a limitation of studies about the impact of risk-taking on competition. Recent studies in developed countries have mentioned bank risk as the determinant of the competition such as De Guevara et al. (2005), Boyd et al. (2009), Spierdijk and Zaouras (2017) and Cai et al. (2019). Thus, this research will examine whether risk-taking is a factor driving banking competition with a sample size of commercial banks and banks holding companies of emerging Asian countries. Besides, the period of the panel data is 2011-2015 because the emerging Asian economies have recovered from the financial crisis and the Lerner index in this period does not fluctuate much (Wu et al., 2018; Phan & Daly, 2019).

In the last decade, the emerging Asian banking industry has received much attention because emerging Asian countries are considered as velocity markets, which are dynamic and create favorable conditions for foreign investors. Besides, the difference between the rapid growth rate of banking industry in emerging markets and the stable development of advanced countries arouses the interest of scholars in the world. When the competition becomes well-known, more studies focus on analyzing the factors which drive the competition (Jeon et al., 2011; Soedarmono et al., 2013; Mirzaei & Moore, 2014; Erler et al., 2018). However, there is a limitation in researches which decide whether bank risk-taking is the determinant of the competition. Most of previous studies focus on the sample of developed countries. Therefore, this study is to address the impact of risk-taking on competition in emerging Asian banking industry during the five years from 2011 to 2015.

2. LITERATURE REVIEWS

2.1 Banking competition

The concept of competition presents as a long-established principle in business majority. It has proved as the tool to boost the development of the industry and the economic growth (Finn, 2000; Cetoreli, 2004; Calgano & Falconieri, 2014; Jayakumar et al., 2018). In general, competition in economics appears when the producers lower their commodity prices to attract consumers to choose them among different goods and services (Guevara & Maudos, 2011). The degree of competition is measured through the market power index because market power refers to the ability of the firm can earn profits when maintaining the high product's price and low quantities in the competitive market (Sherril & Laura, 2017). Lower market power values suggest a high competition degree from banks (Demirgüç-Kunt & Pería, 2010).

Due to the importance of banking competition, it has been extensively investigated for industrial countries. For example, in the USA, Williams (2012) estimates the market power of the banking sector over the period 1980-2000. He shows the existence of monopolistic competition, although banks did not focus on scrambling for market share throughout 1985-1990. Erle et al. (2018) estimate the competition in the US before and after the financial crisis of 2008. They state there is high level of competition in the banking sector and it is homogeneity in regional banking industry in this period. Glass et al. (2019) displays the similar results about the competition after the financial crisis of 2008. In detail, they state that there is an increase in competition index in the US due to the decrease in the loan-deposit rate spread and the tighten regulation of banks before the crisis.

Bandt and Davis (2000) compare the market power index in the US and the European and show that the market is more competitive in the US. On the contrary, Bikker and Haaff (2002) find

opposite results that banks in Europe are more competitive than that in the US, Canada and Japan. In addition, these researchers blame that competition among large banks with international branches is higher than that of small banks, which have a limited number of overseas branches. With the enlargement of 25 member countries in the EU over the period 1998–2002, Staikouras and Fillipaki (2006) conduct a multi-country study and find that the result is the monopolistic competition, with high market power index in large-scaled banks. Weill (2013) uses a collection of banking data from 27 European countries over the period 2002-2010 to analyze the banking sector under two competitive indicators: the Lerner index and the Panzar-Rosse H statistics. The findings display that banking competition in the EU is stable during this period. Apergis et al. (2016) analyze the H-index of banking industry in 27 EU countries and provide evidence that the competition degree goes down after the crisis because of currency adoption and consolidation. However, monopolistic competition still exists across all EU economic blocks.

Similar to the European industry, the banking sector of emerging markets is used to be defined as monopoly markets with a weak legal system and a high level of corruption in financial system, which may constrain the development in banking industry (Mirzaei & Moore, 2014). After the market deregulation in the late 1980s, there are some transformations in the banking industry of emerging countries. Besides, more foreign banks decide to invest in Asian banking industry because of its economic potential. Jeon et al. (2011) estimate the influence of foreign entry on the banking competition in emerging markets and the result shows that there is a positive relationship between these indicators when foreign institutions open branches in the domestic markets. Instead of analyzing foreign penetration, Abiad et al. (2010) investigate whether financial reform policies impact on banking competition in 39 Asian markets. The result is that banks become more competitive while they follow financial reform policies which focus on diversifying the operation and allocating the capital in the banking sector. Similarly, Delis (2012) addresses the impact of restructuring strategies on the competition of banking sector. By calculating the Boone indicator for market power, he finds that the policies related to bureaucratic quality improve competition among banks when the countries meet the market criteria. In general, although the competition degree of the emerging markets increases due to the policy improvement, banks in these countries are still under competitive conditions.

In emerging Asia, the competition degree fluctuates through periods. According to Perera et al. (2006), revenues of South Asian banking industries are obtained under monopoly competition during the period 1995–2003. In the scope of ten Asian banking markets, Soedarmono et al. (2013) use Lerner index to measure competitive situations over the period 1999-2007 and find the monopoly competition in most banking industries, except for Malaysia and Thailand. After the financial crisis 2008, banks decided to reform the structure and improve regulations to

recover the financial system. Emerging Asian banks have developed groundbreaking strategic IT ventures, which support banks in diversifying their revenue and reduce the risk (Fu et al., 2014). Besides, government policies after crisis increase the competition in the region. For example, governments in Indonesia, Malaysia, Philippine and Thailand force banks into mergers/acquisitions to eliminate inefficient banks. Besides, these countries decide liberalization based on Banking Integration Framework (BIF). In India, governments have issued licenses to private owners after the crisis to encourage the competition in banking industry (Phan and Daly, 2019). For that reason, the competition in this region tends to increase again after the depression period (Khan et al., 2016; Ventouri, 2018).

2.2 Bank risk-taking

According to Richard et al. (2009), risk is defined as the unexpected events or situations occur that lead to the loss. The scholars in the world estimate the risk-taking behavior to support the governments and regulators in preventing the loss in the banking industry. Regarding previous studies, scholars examine how bank risk influences the stability of the market and economic growth and they the results in the studies are mixed.

In European, risk-taking is proved impact negative impact on bank profitability in the period 1994-1998 (Staikouras & Wood, 2004). Hoffmann and Rodrigo (2011) measure the risk-taking by estimating the capital ratio and shows the significant relationship between risk and profitability in the US over the period 1995-2007. In Asia, there are also some studies measuring this relationship. Sufian and Chong (2008) find the negative relation between risk and profitability in Philippine's banking sector before the financial crisis (2008). In 2011, Sufian finds the similar evidence about relation in the Korean banking sector. After global crisis in 2008, this topic has raised awareness of the scholars over the world, especially in Asian region because of the spread of bankruptcy in many countries (Li et al., 2013). Phan and Daly (2019) show a negative relationship when measuring liquidity risk and its impact on the cost-efficiency of the banking system in six countries of emerging Asian region in 2005–2012. They suggest that banks need to reduce their liquidity risk in order to improve their performance. On the contrary, there also exists a positive relationship between risk and net interest margin, which is a proxy of bank profitability in a group of Chinese state-owned banks post and beyond the 2008 crisis (Park, 2013).

2.3 Bank risk and competition

The relationship between bank competition and risk-taking is still the argumentative topic. Many of the studies follow the Charter value hypothesis model (CVH model) and the model of Boyd and De Nicolo (BDN model) to analyze competition-risk-taking nexus. The former was

formed by Allen and Gale, anticipating that bank's risk of failure increases based on the competitive condition in industry, and this index maximize under perfect competition condition. While latter, built by Boyd and De Nicolo (2005), is the extension of the former. In their model, the banks still provide loan with the insured deposits to the firms; however, depositors choose the level of risk in investment while the banks offer the loan rates. In this situation, the risk-taking is impacted by both depositors and banks. To be more specific, in the case of project investments of the firm, banks decrease the loan rates to attract the companies as well as compete with others in the industry. Based on these two studies, the research of Spierdijk and Zaouras (2017) investigates the impact of bank-risk taking on banking competition.

Spierdijk and Zaouras (2017) investigate "the other side" of the relationship between competition and bank risk by following the model of Boyd and De Nicolo (2005). To be more specific, they evaluate how bank risk and other market power drivers interconnect with competition. In their model, the Lerner index is a proxy of market power and it is a function of risk-taking variable and other variables such as the number of competitors, inverse price elasticity of the loan market and bank market power in the deposit market.

In addition, the model of Spierdijk and Zaouras (2017) choose the same situation with the BDN model: banks and firms (depositors) who cooperate in an investment project are risk-neutral and banks cannot observe the risk-shifting choices of the firms. In this case, Lerner index is calculated as follow:

$$\ell (D_t, Z) = \frac{r_L(Z) - r_D(Z) - \alpha - r'_L(Z)D_t}{r_L(Z)}$$

D is the total deposit, r_L is the loan rate of loan market, r_D is the loan rate of deposit market and Z equals the total deposit multiply the number of banks in the market.

Due to Cournot–Nash equilibrium, Lerner index is measure as followed:

$$\ell (D_t, Z) = \frac{D}{Z} (\varepsilon_L^{-1}(D_t, Z)W(D_t, Z) - \varepsilon_D^{-1}(D_t, Z) \frac{r_D(Z)}{r_L(Z)} (1 - W(D_t, Z)))$$

Where

$$W(D, Z) = \frac{1}{1 + \varepsilon_P(D, Z)} \text{ and } \varepsilon_P \text{ is bank's elasticity of risk shifting } (W(D, Z) < 1 \text{ and } \varepsilon_P > 0)$$

D/Z is the equilibrium market share of banks

ε_L^{-1} is the inverse price elasticity of market demand

ε_D^{-1} is the inverse price elasticity of market supply

Based on the model above, the market power index is affected by the elasticity of the market and risk-taking. Besides, the professional's test in four cases and the results of most situations is that the competition degree depends on the price elasticity of market demand but is limited by the degree of risk-shifting. Since the depositors can observe the choice of risk, they tend to take more risk and the banks tend to raise the loan rate (decrease the level of deposit) to anticipate this risk-shifting behavior even though the market demand for loans is relatively inelastic. In the case that banks choose to increase the deposit level to reduce the effect of risk-shifting behavior, the Lerner index will be low due to high marginal cost. In addition, the number of banks that present bank's market share also affects the competition degree.

2.3.1. Empirical studies

In general, most studies analyze the impact of the competition on the risk-taking behavior in both advanced industries (Cordella & Yeyati, 2002; Efthyvoulou & Yildirim, 2014; Horvath, Seidler, & Weill, 2016) and developing industries (Fu, Lin, & Molyneux, 2014; Khan, Kutan, Ahmad, & Gee, 2017; Nguyen, Skully, & Perera, 2012) whereas scholars rarely examine the effect of risk-taking on competition in the world. Most of these studies are about developed economies such as the US or European (De Guevara et al., 2005; Boyd et al., 2009; Cai, Le, & Vo, 2019)

De Guevara et al. (2005) measure the relationship among competition, elasticity of demand for loans, the market's size, interest rate and default risk. Only risk has insignificant relationship with competition and the professions state that there is no risk premium in competition. The research of Boyd et al. (2009) investigate the relationship of competition and risk-taking in the US in 2003 and developing banking industries in the period 1993-2004. In general, scholars show the results which are similar to the BDN model that the higher competition index is related to higher risk-taking index in both individual market sample and international sample. Different from the above studies, the researches of Cai et al. (2019) proved the impact of liquidity risk on the competition under Basel III in the US from 2000 to 2015. In this study, the liquidity risk is estimated by the net stable funding ratio and the liquidity coverage ratio, while the Lerner index is applied to estimate the market power. The scholars employ the OLS regression as well as GMM estimation and find the result that liquidity influences market power negatively and significantly.

3. METHODOLOGY

Data for this study is the bank-level data taken from Bankscope and the country-level data comes from World Bank, including commercial banks and banks holding company in emerging Asian economies over the period 2011-2015. In addition, there are some requirements for data

collecting process, included: (i) Banks in data set are active in the period 2011 - 2015 (ii) Banks with insufficient financial information are removed from the panel data. In general, there are 1721 observations with 564 banks in panel data. The information of each country is shown in Table 1. Besides, all of data is winsorized before measurement process.

Table 1: Sample distribution by countries

Countries	Number of observations	Number of banks
China	450	185
Indonesia	259	78
India	223	62
South Korea	88	22
Malaysia	144	50
The Philippines	104	40
Pakistan	103	41
Thailand	99	24
Taiwan	254	62
Emerging Asia	1726	564

3.1. Measurement of banking competition

Following Claessens and Laeven (2013) and Fu et al. (2014), The Lerner index is employed to measure the market power degree. According to Nguyen et al. (2012), the Lerner index is considered as the bank-level measurement of competition, and this ratio is not affected by the extent of the market when it is calculated based on bank revenue, therefore, it is more suitable for cross-sectional panel data than other methods. In addition, researchers do not need to tackle the econometric problems related to crucial parameter identification when employing the Lerner index (Shaffer & Spierdijk, 2017).

According to Coccoresse (2014), the Lerner index is measured as the proportion of difference of actual price and marginal cost and price. Under the standard assumption, the range of the Lerner index is 0 to 1. The higher index indicates less competition in the market. When the Lerner index equals 1, the banking industry is under the condition of monopoly, while zero Lerner degree means perfect competition in the banking sector. If this index less than 0, the competition would absent in the market. The Lerner index is estimated as follows:

$$Lerner_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$$

where P_{it} is the price of total assets measured as the proportion of total revenues to total assets for bank i at time t , and MC_{it} is the marginal cost of total assets for bank i at time t .

Then, the following translog cost function is estimated for each country separately to measure the marginal cost of banks:

$$\ln(C_{it}) = \beta_0 + \beta_1 \ln Q_{it} + \frac{\beta_2}{2} (\ln Q_{it})^2 + \sum_{j=1}^2 \beta_j \ln W_{j,it} + \frac{1}{2} \sum_{k=1}^2 \sum_{j=1}^2 \beta_{jk} \ln W_{j,it} \ln W_{k,it} + \sum_{j=1}^2 \gamma_j \ln Q_{it} \ln W_{j,it} + Year\ dummies + \varepsilon_{it}$$

C_{it} presents the total cost of bank i in time t . According to prior researches (e.g., Mirzaei & Moore, 2014; Ariss, 2010), there are one output (Q_{it}) and three input prices (W_{it}) which are in the Table 2:

Table 2: Variables of translog cost function

Variables	Definition	Formula
<i>Output variables</i>		
Q_{it}	Total asset of the bank	Total bank asset
<i>Input variables</i>		
$W_{1,it}$	Cost of deposit of bank	$\frac{\text{Interest expense}_{it}}{\text{Total deposit}_{it}}$
$W_{2,it}$	Cost of labor of banks	$\frac{\text{Personel expense}_{it}}{\text{Total asset}_{it}}$
$W_{3,it}$	Cost of physical capital	$\frac{\text{Other non – interest expense}_{it}}{\text{Fixed asset}_{it}}$

3.2. Measurement of risk-taking

After the crisis, the Basel Committee on Banking Supervision issued the Basel Accords, which recommend the policies for banks in terms of different types of risk and risk measurement. Basel II and Basel III suggest two standard measurements in banking sector, such as Value-at-Risk (VaR) and Expected Shortfall (ES). Besides, there are other methods based on market data such as CAPM and accounting data such as ROA or z-score. In the field of this paper, accounting-based measurement is more common because this method can be used to estimate the risk-taking for both listed and non-listed banks (Li et al., 2013), and it simplifies the research's process.

For the emerging economies and developing economies which are applied for Basel II, internal-rating based approaches are applied to set the change of capital response to risk in banking industry (Lepetit & Strobel, 2014). In previous studies, scholars use Z-score as a proxy for default risk (Boyd and Runkle, 1993; Chihák and Hesse, 2010). This index is used to the proxy for the insolvency of the bank's profitability and bank's risk (Lepetit & Strobel, 2014). According to Chiaramonte, Croci, and Poli, 2015, z-score index can also be applied to measure the distress events in banking industry during both normal and crisis years. This index is calculated as follow:

$$Z_{it} = \frac{ROA_{it} + \frac{E_{it}}{A_{it}}}{\sigma ROA_{it}}$$

where ROA is the return on assets, E/TA is the ratio of equity to total assets and σROA is the standard deviation of return on assets. The Z-score displays the insolvency risk of banks. In details, a bank will go bankrupt when its asset is less than its debt and the lower Z-score means higher proportion of bankruptcy (Boyd & Runkle, 1993; Laeven & Levine, 2009)

3.3. Other control variables

Following Prasad and Ghosh (2007), Ariss (2010) and Soedarmono (2010), there are some variables related to bank characteristics and market variables including bank size (SIZE), diversification (DIV), bank efficiency (EF) and banking concentration (CONC). Besides bank-specific variables, there are some macro variables such as the rate of real GDP growth (RGDP) and the inflation rate (CPI).

3.3.1. Bank size

Bank size is considered as the factor which measures the development of banks. Previous studies emphasize that larger banks tend to have higher market power and enjoy a lower degree of competition (see, for example, Bikker et al., 2006; Coccoresse & Santucci, 2019). Hence, firm size is forecasted to be negatively correlated with the market power index. Following Kishan and Opiela (2000), bank size is calculated as the natural logarithm of total assets.

$$SIZE = \ln(\text{total asset})$$

3.3.2. Bank diversification

After the financial crisis in 2008, banks in the world diversify their operations to recover their revenue and reduce the risks from the environments. According to Mirzaei and Moore (2014), diversification support for the competition in large banks while it weakens the competition

degree of smaller banks due to the undeveloped fee income activities in these banks. Thus, there will be different effects for types of banks. That is a negative correlation between diversification and market power for large banks and a positive correlation between diversification and market power with small banks. This index is measured as follow:

$$DIV = \frac{\text{Non – interest income}}{\text{Total income}}$$

3.3.3. Bank efficiency

Based on the study of Gonzalez (2009), the efficiency-structure hypothesis can be employed to explain the competition of banking industry. In emerging countries, most banks have difficulty in managing expenses because of poor management, bureaucracy and corruption in operation system. For that reason, this paper will employ cost-to-income ratio as the proxy of bank efficiency. It is measured as below:

$$EF = \frac{\text{Non – interest income}}{\text{Total income}}$$

3.3.4. Banking concentration

Concentration ratio is used to proxy for competition in banking industry. Recently, this index has been considered as the indicator of market structure and driving force of competition. Based on traditional Structure-Conduct-Performance hypothesis (Berger et al., 2004), high concentration ratio implies less competitive market, which indicates that a concentrated market is a signal of monopoly market. Therefore, concentration ratio impacts positively on the Lerner index.

$$CONC = \frac{\text{Sum of total asset of three largest banks}}{\text{Total asset of all banks}}$$

3.3.5. Country-level variables

In the case of panel data, macroeconomic variables which present the size, the development and stability of the economy. In this paper, the GDP growth rate and inflation rate are added up the regression model.

3.4. Model specification

The study tests whether bank-risk taking impacts on competition by employing bank-level data from emerging Asian economies. The study conducts the model of banking competition as the dependent variable to address the association between competition and bank risk. The descriptive of variables in this formula is presented in Table 3:

$$\text{LERNER}_{it} = \beta_1 \text{RISK}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{DIV}_{it} + \beta_4 \text{EF}_{it} + \beta_5 \text{CONC} + \beta_6 \text{RGDP}_{it} + \beta_7 \text{CPI}_{it} + \alpha_i + \vartheta_t + \varepsilon_{it}$$

Table 3: Description of the variables

Dependent variable		
Lerner _{it}	Competition (Market power) of banks which is measured by Lerner index	$\text{Lerner}_{it} = \frac{P_{TA} - MC_{TA}}{P_{TA}}$
Independent variables		
RISK _{it}	Bank risk-taking which is measured as Z-score	$Z_{it} = \frac{ROA_{it} + E_{it}/A_{it}}{\sigma ROA_{it}}$
<i>Bank-level variables</i>		
SIZE _{it}	Bank size	$\ln(\text{total asset})$
DIV _{it}	Diversification	$\frac{\text{Non – interest income}}{\text{Total income}}$
EF _{it}	Banking efficiency	$\frac{\text{Total cost}}{\text{Total asset}}$
<i>Market-structure variables</i>		
CONC _{it}	Bank concentration ratio in each country	$\frac{\text{Sum of total asset of three largest banks}}{\text{Total asset of all banks}}$
<i>Macroeconomic variables</i>		
GDPR _{it}	The real annual growth rate of GDP	World Bank national data
CPI _{it}	Inflation rate of each industry	World Bank national data

4. RESULTS AND DISCUSSION

4.1. The relationship between risk and bank competition in emerging Asian countries

As is shown in Table 4, there is no significant relationship between risk-taking and banking competition in the full sample of emerging Asia as well as each country in this region. In the group of control variables, only bank characteristics impact significantly on bank competition. Bank efficiency impact negatively on the market power index at 10% significant. This result is similar with that of Delis and Tsionas (2009). With the support of technology and innovation in management, the banks in emerging Asia earn profit with lower operation costs and this is an advantage of banks in competitive market. In addition, fee income activities influence negatively on the competition of large-scaled banks and all emerging Asia because the banks' revenue in this region mainly come from traditional activities and non-interest income activities does not

focus on development (Mirzaei & Moore, 2014). The relationship between bank size and competition displays significant and negative result. According to Claessens and Laeven (2003), the large-scale banks are more competitive than smaller one because larger banks have more branches in operation in foreign region, which is considered as competitive markets.

Besides, the panel data is divided into two groups, including large-scaled banks and small-scaled banks. The results of large banks are similar to those of small banks. However, it is different in the impact of diversification on market power. In details, multi-production is the factors encourage large banks to be more competitive, but this factor decreases the competition index in small banks because less effective operation of small banks in emerging Asia does not suitable for them diversifying now (Nguyen et al., 2012).

Table 4: The OLS regression model with firm-fixed effect

VARIABLES	(1) Emerging Asia	(2) Large-scaled banks	(3) Small-sized banks
RISK	3.42e-07 (6.12e-06)	-3.89e-05 (0.000141)	-3.62e-05 (2.86e-05)
SIZE	-0.00560*** (0.00156)	-0.0182*** (0.00621)	-0.00483*** (0.00148)
DIV	-0.121*** (0.0375)	-0.480*** (0.104)	0.116*** (0.0223)
EF	-0.00633*** (0.000267)	-0.00677*** (0.000679)	-0.00681*** (0.000166)
CONC	0.000304 (0.000658)	-0.000397 (0.00179)	0.000821* (0.000448)
GDPG	0.000129 (0.00514)	0.00451 (0.0134)	-0.00148 (0.00309)
CPI	0.00136 (0.00402)	0.00515 (0.0106)	-0.00162 (0.00244)
Constant	0.710*** (0.0565)	1.113*** (0.196)	0.647*** (0.0397)
Observations	1,726	849	877
R-squared	0.533	0.543	0.895

4.1.1. Interactive effect model

In this part, this paper examines the joint and interactive effects of bank-risk taking and other control variables on competition. As the evidence shown in Table 5 displays, there is no association between market power and bank risk. This result confirms that bank risk does not have a significant impact on bank competition despite the interaction of other variables

Table 5: The interactive effect of risk-taking and bank characteristics on the Lerner index

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
RISK	2.34e-05 (9.74e-05)	9.41e-06 (2.53e-05)	0.000131 (9.84e-05)	-1.01e-05 (6.43e-05)	7.31e-07 (4.84e-05)	8.69e-06 (7.44e-05)
RISK*SIZE	-1.24e-06 (4.77e-06)					
RISK*DIV		-7.58e-05 (0.000166)				
RISK*EF			-1.58e-06 (1.17e-06)			
RISK*CONC				2.77e-07 (2.13e-06)		
RISK*GDPG					-4.67e-07 (8.96e-06)	
RISK*CPI						-1.20e-06 (8.50e-06)
Constant	0.633*** (0.0580)	0.634*** (0.0579)	0.631*** (0.0579)	0.635*** (0.0580)	0.634*** (0.0580)	0.634*** (0.0580)
Observations	1,726	1,726	1,726	1,726	1,726	1,726
R-squared	0.498	0.498	0.498	0.498	0.498	0.498

The sample consists of 1726 observations. RISK is the label of bank risk-taking, estimated by z-score. SIZE is the bank size, which is proxy as natural logarithm of total assets. DIV is the bank diversification, computed as the ratio of non-interest income to total income. EF refers to bank efficiency, calculated as cost-to-income ratio. GDG is the GDP growth rate, and CPI is inflation rates. Note: * 1% level of significant; **5% level of significant; ***10% level of significant.

4.1.2. Robustness test

In order to test whether the risk-taking impact on competition or not, this study employs another measurement of competition, which is markup index. First, the paper does the OLS regression with firm fixed effect on the risk-competition nexus. As is shown in the Table 6, the risk-taking does not impact on the markup index and this result is similar to the test with Lerner index. Second, a polynomial term – squared Z-score is added to the equation to check whether it exists the U-shape relationship between risk-taking and market power. The result illustrates no nonlinear relationship between risk-taking and competition in emerging Asia.

Table 6: Robustness test

VARIABLES	Markup index	The Lerner index
RISK	-1.66e-06 (6.43e-06)	3.58e-07 (3.51e-05)
RISK^2		-4.29e-13 (9.02e-10)
SIZE	-0.0109*** (0.00164)	-0.00560*** (0.00157)
DIV	-0.181*** (0.0380)	-0.121*** (0.0375)
EF	-0.00376*** (0.000195)	-0.00633*** (0.000267)
CONC	-9.14e-05 (0.000692)	0.000304 (0.000659)
GDPG	-0.000342 (0.00540)	0.000129 (0.00514)
CPI	0.00241 (0.00423)	0.00136 (0.00405)
Constant	0.733*** (0.0587)	0.710*** (0.0565)
Observations	1,726	
R-squared	0.493	1,726

5. CONCLUSION

This research examines whether the risk-taking impact on the Lerner index, which is the proxy of competition in emerging Asian countries in the period 2011-2015 based on the suggesting

theoretical model of Spierdijk and Zaouras (2017). Besides, other control variables related to bank, market and country-level are also added to test the effect these determinants on market power. The robustness of this study shows that bank-risk taking does not impact the competition of the banking sector in emerging markets in Asia. This outcome is proved again in interactive model and robustness test with markup index as the competition measurement. In the group of control variables, there is a significant and negative relationship between bank-level variables and competition in emerging Asian banking industry. In details, bank size, bank diversification and bank efficiency encourage banking industry to be more competitive over the period 2011-2015.

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