Available online at www.sciencedirect.com

Borsa İstanbul Review

Borsa İstanbul Review 20-3 (2020) 292–300

http://www.elsevier.com/journals/borsa-istanbul-review/2214-8450

Full Length Article

The effect of product market competition on stability and capital ratio of banks in Southeast Asian countries

Md Aminul Islam [a], Olalere Oluwaseyi Ebenezer [a,*], Farid Ahammad Sobhani [b], Mohammad Shibli Shahriar [c]

[a] *School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis, Jalan Kangar-Alor Setar, Taman Pengkalan Jaya, 01000, Kangar, Perlis, Malaysia*

[b] *School of Business and Economic, United International University, Bangladesh*

[c] *Department of Business Administration, Daffodil International University, Bangladesh*

Received 20 November 2019; revised 16 March 2020; accepted 26 March 2020

Available online 29 April 2020

Abstract

This study analytically examines the effect of product market competition on the stability and bank capital ratio of Southeast Asian commercial banks. This paper use the sys-GMM dynamic panel data estimation technique in the study, based on data extracted from 63 unbalanced panels of commercial banks in ASEAN for the period 2009 to 2017, totaling 567 observations. The empirical findings reveal that the Lerner index has a positive and significant effect on stability at Malaysian and Singaporean banks. A negatively significant nexus between market competition and stability is reported for Indonesian and Thai banks. The competition–stability nexus shows no significant relationship at Filipino commercial banks. Further results show that product market competition has a positively significant influence on the capital ratio at banks in Malaysia, Singapore, Indonesia, and Thailand. By contrast, the nexus between product market competition and the capital ratio is negatively significant at banks in the Philippines. This empirical study has significant supervisory and regulatory implications in the ASEAN banking industry, especially in emerging and developing countries. The study provides support for the competition–stability view and suggests that banks in more competitive markets maintain a higher capital ratio in order to be able to absorb unexpected losses. The study gives credibility to the concept of a nexus between product market competition, stability, and the capital ratio using recent financial data from an emerging and developing economy perspective.

JEL classification: G2; G21; G32

Keywords: ASEAN; Capital ratio; Commercial banks; Competition; Stability

1. Introduction

The effective delivery of financial services, the quality of financial products, and the concentration of financial innovation are critical in product market competition among banks (Claessens & Laeven, 2004). Six reasons are offered in the literature for the importance of financial sector competition: first, it offers accessibility to financial services by households and firms (Beck, Demirguc-Kunt, & Maksimovic, 2004); second, it creates efficient functionality in the banking sector (Claessens & Laeven, 2005); third, it creates stability in the financial system (Boyd, De Nicolo, & Smith, 2004); fourth, it enables efficient management of financial intermediaries (Berger & Hannan, 1989); fifth, it maintains interbank market rates that improve monetary policy transmission (Van Leuvensteijn, Kok Sorensen, Bikker, & van Rixtel, 2008);

* Corresponding author.

E-mail addresses: amin@unimap.edu.my (M.A. Islam), oluwaseyi218@gmail.com (O.O. Ebenezer), drfasobhani@gmail.com (F.A. Sobhani), shibli@daffodilvarsity.edu.bd (M.S. Shahriar).

Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

https://doi.org/10.1016/j.bir.2020.03.001

and, lastly, it fosters and drives inclusive industrial and economic growth (Allen & Gale, 2004).

Debates on the influence of product market competition on bank stability have increased, and the question of whether competition critically enhances the soundness of the financial system remains open (Berger, Klapper, & Ariss, 2009). This study examines the tools that enable competition to affect bank stability. Interestingly, two basic channels that drive the effect of competition on stability have been revealed (Vives, 2011). The first channel argues that intense competition increases volatility by aggravating management problems of depositors on the liability side and stimulating a bank run that may become systemic. The other channel is the growing need to take on additional risks on both sides of the balance sheet and, in so doing, increase the probability of failure. The structure of bank funding since the financial crisis of 2007 has also been identified, and financial innovation in banking activities is perceived as a potential source through which stability might be affected by competition (OECD, 2010). Likewise, credit default swaps, loan sales, and derivatives are dynamic financial instruments that cause recurrent instability in the financial sector.

Asian countries have experienced great financial changes over the past two decades. In 1997, they moved from expansionary economic liberalization to a severe crisis, and the source of this financial mayhem was perceived to be institutional issues. Sachs & Woo (2000) posited that these challenges include the sensitivity of corporate industry due to poor corporate governance and unsupervised economic liberalization in the 1980s, which led to unrestricted competition in the credit market, especially in real property markets. Park (2006, p. 294) perceived that financial institutions in Asia still encounter issues related to corporate governance, unprofessional conduct, inept management, and the weak governance of minority shareholders even with the attraction of foreign investment after the Asian crisis of 1997. Adams (2008) argues that bank risk is becoming a problem again in Asian countries, because private sector firms predominantly depend on banks as source of financing.

The implementation of sectoral reforms, for example, the consolidation and capitalization of banks, helps restrain excessive competition by banks in an attempt to bolster financial stability. However, the efficiency of these reforms has been questioned for several reasons. Evidence by Brana and Lahet (2009) preceding the Basel accords of 1988 in the pre-Asian crisis period shows that strict bank capital requirements were crucial in the Japanese banks' capital crunch, which led the foreign assets of Japanese banks in Thailand to shrink in the 1990s.

The nexus between product market competition, stability, and solvency in the context of Asian economies is new. This concept became more important because the trend toward financial globalization has driven banks in Asia to evolve both nationally and internationally (Moshirian, 2008).

The remainder of this study is structured as follows. In Section 2, we offer a review of the literature on the nexus between product market competition, stability and solvency. The sources and collection of data, variables measured, methodology, and econometric specifications are explained in Section 3. The descriptive statistics and empirical findings are discussed in Section 4, and Section 5 concludes the study.

2. Literature review

In recent years, a theoretical and empirical debate has been taken place over whether intense competition increases or decreases stability. The empirical and theoretical studies provide strong evidence for contrasting views on the competition–stability nexus in the financial sector (Berger et al., 2009; Carletti, 2008). This section summarizes the theoretical evidence that supports the competition–fragility and competition–stability hypotheses. The prior literature has argued that monopoly power moderates risk-taking by banks but has also held that an increase in competition reduces bank risk. The association between the market structure of banks and stability has triggered keen interest because of excessive bank risk-taking in the most recent financial crisis.

Earlier theoretical models offer ambiguous predictions. The seminal work of Keeley (1990) supports the view that aggressive competition among banks increases their risky behavior. The study contends that an upsurge in competition reduces loan and net interest margin rates, and as the chartered value (share price) of banks declines, their owners are more motivated to take on additional risk, thereby increasing their fragility. Other studies (e.g., Allen & Gale, 2004; Matutes & Vives, 2000; Wagner, 2010) support this view. Proponents of the "competition–fragility view" contend that banks with monopoly power operating in less competitive financial systems raise revenue and decrease financial instability by maintaining a higher level of capital, which serves as a shield against liquidity shocks and external economic shocks. More precisely, banks with greater market power benefit from increased profits and financial stability.

In addition, Boot and Thakor (2000) assert that because credit rationing is encouraged by large banks, they have less credit, but it is of higher quality, which enhances the banks' financial viability. Furthermore, it is perceived that market power could result in a high volume of loan portfolios, enhance the allocation of capital, and hence foster economic growth. A similar study posits that greater concentration in the banking sector and a decline in information asymmetry gives banks the ability to examine and distinguish among borrowers with low and high creditworthiness.

Alternatively, advocates of the "competition–stability view" posit that bigger banks will probably receive public guarantees and, hence, are incompetently managed and expected to fail. The notion of "too big to fail" in Mishkin (1999) means that the bigger the banks become, the more difficult it will be for managers to deal with the problem of moral hazard if they engage in riskier investments in the belief that they are safe from harm because of government guarantees. In addition, monopolistic banks that charge higher interest rates for loans might prompt borrowers to invest in risky assets so as to be reimbursed for increased loan costs. Hence, there is a possibility that loan defaults will increase and result in greater risk of bank failure (Boyd & De Nicolo, 2005).

De Nicolo, Bartholomew, Zaman, and Zephirim (2004) reveal that concentration in the banking system is highly correlated with greater systemic risk. This school of thought is also supported by De Nicolo and Loukoianova (2006), who find a significant and positive nexus between competition and bank risk. However, other studies find a negative nexus between bank competition and financial soundness (Uhde & Heimeshoff, 2009). Contrary to this evidence, Beck, Dermirguc-Kunt, and Levine (2006) propose that an upsurge in bank concentration does not necessarily lead to high fragility in the banking system. Hence, Schaeck, Cihak, and Wolfe (2009) claim a quid pro quo exists between risk-taking behavior and competition at banks. The study finds that banks functioning in a highly competitive environment maintain larger capital buffers and are unlikely to experience a systemic crisis.

More importantly, Berger et al. (2009) offer empirical support for the "competition–stability view." Their results show that banks with greater market power can tolerate additional risk in loan portfolios and confirm the "competition-fragility view" that banks with greater market power are usually exposed to less overall risk. Boyd, De Nicolo, and Jalal (2009) further assert that the probability of bank failure is significantly and positively associated with concentration. Fu, Lin, and Molyneux (2014) observe that higher concentration in the banking sector increases financial fragility, decreases price power, and exposes banks to higher risk. Soedarmono, Machrouh, and Tarazi (2013) show that in 12 Asian countries market concentration is related to increased insolvency, although banks are mostly well capitalized in less competitive markets.

More recent studies offer different justifications and contend that capital holdings that exceed the regulatory requirements are akin to market discipline for bank assets. We argue that banks are motivated to hold excessive capital because of competition, as this implies an obligation to control, monitor, and attracts borrowers who are creditworthy. Furthermore, the level of capitalization is perceived to have some influence on the type of lending behavior—for instance, banks that lend to borrowers who are information sensitive have higher capital ratios. The prior literature on the competition–stability/fragility nexus has been ambiguous on the role of competition in bank solvency and the avenue through which stability is affected by competition in the banking sector. This study addresses this gap and argues that regulatory requirements are the channel through which competition helps banks to become more financially stable.

3. Data and methodology

3.1. Data sources and definitions

The study uses bank financial data from a balanced panel of 63 banks across five Asian countries (Malaysia, Singapore, Indonesia, Thailand, and the Philippines) over the period 2009–2017, totaling 567 observations totaling 567 observations as indicated in Table 1. The dataset for competition, stability, the capital ratio, and bank-specific variables come from Thomson Reuters whereas the macroeconomic variables are sourced from the World Bank Development Indicator. The study focuses on the banking industry in ASEAN countries, which is one of the fastest-growing categories of depository institutions in ASEAN.

Little financial data and information on banks are available for Singapore. The data available are largely for the three local Singaporean banks, which are the largest in that country. These three banks are also the three largest in the ASEAN region in terms of assets.

3.1.1. Competition indicators

This study use the Lerner index as a proxy for gauging competition because it offers a comprehensive assessment of market power by describing the price markup over marginal cost. To determine total revenues, we employ the approach used by De Guevara et al. (2005) and Dermiguc-Kunt and Peria (2010) and measure bank production (TQ in Eq. (2)) by total assets, and price (P) is estimated as the ratio of total bank revenues to total assets. The sum of total interest expenses and total non-interest expenses proxy for total bank costs (TC). Berger et al. (2009) posit that the only proxy for competition calculated at the bank level is the Lerner index:

$$Lerner_{it} = \frac{Price_{it} - MC_{it}}{Price_{it}} \tag{1}$$

where $Price_{it}$ represents the bank output price i at time t, and MC_{it} is marginal costs i at time t. For the sake of simplicity and because the dataset we used is cross country, we do not compute MC, as is common in the literature from a *trans*-log cost function but simply compute it as the change in total cost divided by total output, as used by Oduor, Ngokab, and Odongo (2017).

$$MC_{it} = \frac{\Delta TC_{it}}{\Delta TQ_{it}} \tag{2}$$

where ΔTC_{it} is the change in total output. The Lerner index (LI) for each bank can therefore be computed, and the direct proxy for competition ascertains when MC is calculated and the price of output is determined. When $P = MC$, LI is zero, and the firm has no price power.

In a competitive market, the index is rightly connected with the long-run equilibrium conditions in which $P = MC$, signifying that perfect competition takes a value of 0, and an absolute monopoly takes a value of 1, and $P < MC$ because of the banks' non-optimal behavior. Therefore, the Lerner index is 1 when the marginal cost is 0.

3.1.2. Stability and capital ratio indicators

We use a Z-score to proxy for banking sector stability, as it measures the possibility that bank profitability will decline as

a result of insolvency, when the value of debt is higher than the value of assets. It can be calculated as follows:

$$Z-score=\frac{ROA+CA}{\sigma ROA} \tag{3}$$

where *ROA* is the return on assets, *CA* is banks' ratio of equity to total assets, and σROA is the standard deviation of *ROA*. A lower (higher) *Z*-score implies a higher (lower) probability of insolvency risk. However, we use the ratio of total capital (sum of tiers 1 and 2) to risk-weighted assets to proxy for the capital ratio, reflecting a bank's capital strength (Anbar & Alper, 2011).

The study controls for factors that affect competition, stability, and the capital ratio. The liquidity ratio is measured by the ratio of liquidity assets to total assets, and the ratio of total operating expenses to gross revenue is used to proxy for the ratio of efficiency. The bank investment mix is described using the ratio of loans to total assets. Bank size shows the potential economies or diseconomies of scale and is proxied by using the natural log of total assets.

GDP growth is used to control for the influence of macroeconomic factors that are likely to affect performance in the banking sector. Inflation is proxied as the annual growth rate in the consumer price index (CPI). The return on assets measures bank performance with respect to the ability to generate profits after operating expenses are taken into consideration. It is estimated as profit before taxes over total assets.

3.2. Model specification

This study uses a multivariate econometric model, i.e., dynamic panel data generalized method of moments (GMM), to address the potential problems of intrinsic endogeneity, heteroskedasticity, and autocorrelation. The study performs a Sargan test, in which the null hypothesis denotes the exogeneity of the instruments, and the Arellano-Bond test, in which the null hypothesis connotes the absence of second-order autocorrelation of the estimation residuals.

The reliability and efficiency of the methodology is confirmed, as it solves the problem of serial correlation that may exist in the presence of a lagged dependent variable. In the model, the lag of the measures of stability is treated as endogenous in equation (4), whereas the lag of the measure of capital ratio is treated as endogenous in equation (5) and all other variables as exogenous. The empirical models are expressed as follows:

$$\begin{aligned} Zscore_{it} &= \alpha_0 + \delta Zscore_{it-1} \\ &+ \sum_{a=1}^{a} \beta_a Competition\ Var_t^a + \sum_{b=1}^{b} \beta_b BankLevel\ Var_t^b \\ &+ \sum_{c=1}^{c} \beta_c Macroeconomic\ Var_t^c + \upsilon_{it} + \mu_{it} \end{aligned} \tag{4}$$

$$\begin{aligned} CAR_{it} &= \alpha_0 + \delta CAR_{it-1} \\ &+ \sum_{a=1}^{a} \beta_a Competition\ Var_t^a + \sum_{b=1}^{b} \beta_b BankLevel\ Var_t^b \\ &+ \sum_{c=1}^{c} \beta_c Macroeconomic\ Var_t^c + \upsilon_{it} + \mu_{it} \end{aligned} \tag{5}$$

The study uses two-step system GMM to obtain perfect estimators, which are perceived to be perfect when the sum of the period (T) is small and the cross-sections (N) are large; the dependent variable is persistent (dynamic); it eliminates the presence of heteroskedasticity, individual-fixed effects with time-invariant characteristics, coupled with autocorrelation among individuals, commonly found in bank-level data.

4. Findings and discussions

This section analyzes and discusses the empirical findings from equations (4) and (5), providing a systematic explanation of the results regarding conventional banks in the ASEAN region.

4.1. Descriptive statistics

The descriptive statistics for all the variable modeled in this study are summarized in Table 2.

In Table 2, the average stability of Malaysian banks is 13 percent, with a standard deviation of 18 percent. Singapore has greater financial stability, with a mean of 128 percent and standard deviation of 78 percent. This implies that the banking sector is more stable in Singapore than any other ASEAN member country. In Indonesia, average bank stability is 34 percent whereas in the Philippines, it is 46 percent, and in Thailand it is 39 percent, with a standard deviation of 76 percent from the mean.

In Malaysia, the average bank capital ratio is 14 percent, with a minimum of 4 percent and maximum of 90 percent. The capital ratio at Singaporean banks has an average value of 9 percent, with 0.6 percent standard deviation from the mean. The average capital ratio at Indonesian banks is 12 percent, with a minimum of 6 percent and maximum of 24 percent. The average capital ratio is 12 percent at Filipino banks and 10 percent at Thai commercial banks.

The average bank concentration ratio is 32 percent in Malaysia and 39 percent in Singapore. This suggests that

Table 1
Data distribution by country, 2009–2017.

	Malaysia	Singapore	Indonesia	Philippines	Thailand	Obs. by year
(2009–2017)	10	3	25	14	11	63
No. of Obs.	90	27	225	126	99	567

Source: Thomson Reuters.

Table 2
Summary of Descriptive Statistics by country, 2009−2017.

Var.	Malaysia				Singapore				Indonesia			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
ZScore	.138	.182	.039	.826	1.288	.788	.394	.3.695	.341	.326	.027	1.927
CAR	.147	.199	.039	.908	.089	.006	.074	.102	.123	.036	.060	.248
LI	.323	.074	.007	.580	.391	.092	.186	.508	.254	.117	-.127	.608
LATA	.089	.114	.007	.767	.073	.030	.040	.143	.089	.031	.033	.233
EFF	.056	.067	.019	.401	.024	.010	.016	.052	.081	.025	.003	.165
LTA	.619	.204.	.045	.831	.652	.084	.473	.804	.739	.079	.487	.976
SIZE	.185	.010	.156	.204	.195	.002	.190	.200	.246	.016	.215	.277
GDP	.047	.023	-.015	.074	.045	.042	−.006	.152	.053	.005	.046	.062
INFL	.022	.009	.005	.038	.017	.020	−.005	.052	.047	.017	.014	.064

Var.	Philippines				Thailand			
	Mean	SD	Min	Max	Mean	SD	Min	Max
ZScore	.464	.491	.065	4.575	.396	.767	.059	7.606
CAR	.122	.024	.065	.187	.099	.027	.040	.173
LI	.318	.068	.056	.519	.338	.072	.129	.542
LATA	.158	.058	.027	.343	.015	.007	.001	.030
EFF	.049	.015	.026	.087	.052	.012	.022	.082
LTA	.542	.121	.252	.845	.806	.067	.696	.979
SIZE	.194	.011	.166	.217	.204	.011	.177	.218
GDP	.057	.019	.011	.076	.031	.026	−.006	.075
INFL	.029	.012	.006	.047	.015	.016	−.009	.038

Notes: *CAR* = Capital adequacy ratio. *LI* = Lerner index. *LATA* = Liquid asset to total asset ratio. *EFF* = Cost to income ratio. *LTA* = Loan to total assets. *SIZE* = total asset of banks. GDP growth = gross domestic product. *INFL* = inflation rate.

the banking sector in Singapore is highly competitive. In Indonesia, the average bank concentration ratio is 25 percent, with a minimum of −12 percent and maximum of 60 percent. Filipino banks have an average concentration ratio of 31 percent, and Thai banks have a ratio of 33 percent.

The average liquidity ratio is 9 percent, with a minimum of 0.7 percent and maximum of 7 percent, at Malaysian banks; 7 percent, with a standard deviation of 3 percent from the mean, in Singapore. The liquidity ratio at Indonesian banks has a mean of 8 percent, with minimum of 3 percent and maximum of 23 percent. The average liquidity ratio is 15 percent at Filipino banks, while the mean liquidity ratio is 1 percent at Thai banks.

The average efficiency ratio is 6 percent at Malaysian banks, whereas the average efficiency ratio has a mean of 2 percent, *ceteris paribus,* at Singaporean banks. The average efficiency ratio is 8 percent at Indonesian banks, while the mean value is 5 percent in the Philippines. Thai banks have a mean value of 5 percent with a minimum of 2 percent and a maximum of 8 percent.

The investment mix (loan to asset ratio) of Malaysian banks is 61 percent, with a minimum of 4 percent and a maximum of 83 percent. This suggests that Malaysian banks have a higher volume of loan portfolios. The average investment mix at Singaporean banks is 65 percent, with a minimum of 47 percent and a maximum of 80 percent. Furthermore, the average investment mix at Indonesian banks is 73 percent, with minimum of 48 percent and a maximum of 97 percent. The average investment mix is 54 percent at Filipino banks and 80 percent at Thai banks.

The average size of Malaysian banks is approximately Rm19 million. The mean value of Singaporean banks is $20 million. The average size of Indonesian banks is Rp25 million. The average size is ▫19 million at Filipino banks and ฿20 million at Thai banks. The average growth rate in the gross domestic product (GDP) during the period studied was 5 percent in the ASEAN banking sector. Finally, the average inflation rate is 3 percent across ASEAN, which suggests that during the period studied, growth in the inflation rate was relatively low.

5. Discussion of empirical findings

The coefficient estimations are in Table 3, with the Z-score as the dependent variable for aggregated data for all banks and disaggregated data for individual countries. The diagnostic tests in the two-step system GMM estimator in Table 3 confirm that the models in the study are well specified and valid. Therefore, the outcome from the diagnostic tests confirm that the models can be used for further empirical analysis.

The results for Malaysian banks indicate that the Lerner index has a positive and significant impact on bank stability. This means that an increase in market power leads to an improvement in the stability of Malaysian banks, leading to a decrease in the probability of bank default. Some schools of thought have held that an upsurge in bank concentration does not necessarily lead to high fragility in the banking system but that banks with greater market power can tolerate additional risk in their loan portfolio and thereby increase their financial stability. This result is consistent with De Nicolo and Loukoianova (2006) and contrary to the

Table 3
Result of Z-score Sys-GMM model by country.

Variables	Malaysia Model 1		Singapore Model 2		Indonesia Model 3		Philippines Model 4		Thailand Model 5	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
L.Zscore	.680	4.25***	.963	5.66***	.632	46.09***	1.035	8.91***	1.417	5.46***
LI	.158	1.92*	1.158	1.84*	-.061	−2.86***	-.024	−0.32	−1.644	−2.31**
LATA	.023	0.30	-.383	−1.84*	1.143	5.75***	−4.592	−4.48***	−52.228	−0.77
EFF	2.959	3.83***	1.225	2.09**	−2.885	−7.65***	−1.102	−2.79***	−89.381	−2.32**
LTA	-.010	−1.05	.965	2.03**	.636	8.88***	−1.156	−1.40	-.12.057	−1.85*
SIZE	3.094	2.30**	−3.224	−0.41	−1.079	−2.75***	.024	0.00	9.107	0.87
GDP	1.081	3.08***	1.531	1.47	4.711	2.25**	.196	4.41***	−1.192	−0.59
INFL	−1.035	−1.15	5.836	3.14***	−1.819	−6.51***	.230	3.23***	−9.191	−2.78***
_cons	4.986	2.32**	-.285	−0.03	−2.010	−4.39***	−1.967	−0.18	28.709	1.30
AR1	.9753 (0.3294)		.8635 (0.4027)		−1.9978 (0.0457)		−1.7891 (0.0736)		-.6653 (0.5059)	
AR2	1.8174 (0.0692)		1.3520 (0.6934)		1.1822 (0.2371)		−1.4402 (0.1498)		-.6408 (0.5216)	
Hansen Test	.01057 (1.0000)		13.0976 (0.8732)		17.2827 (0.9923)		4.2838 (1.0000)		1.0645 (1.0000)	
F Test	8116.52 (0.0000)		47.51 (0.0000)		106412.00 (0.0000)		218.08 (0.0000)		150.31 (0.0000)	
No of Instruments	43		29		43		43		43	
Observations	90		27		225		126		99	

Notes: *CAR* = Capital adequacy ratio. *LI* = Lerner index. *LATA* = Liquid asset to total asset ratio. *EFF* = Cost to income ratio. *LTA* = Loan to total assets. *SIZE* = GDP growth. *INFL* = inflation rate. Significant at *** 1%, ** 5%, * 10%.

"competition−fragility view" (Berger et al., 2009). Furthermore, efficiency has a significant and positive effect on stability, which suggests that at Malaysian banks an increase in efficiency enhances stability. Bank size also has a significant and positive effect on stability, which suggests that an increase in bank size enhances stability at Malaysian banks. Similarly, GDP has a positive and significant effect on stability, which implies that economic growth raises stability at Malaysian banks.

The empirical findings for Singaporean banks reveal that the Lerner index has a significant and positive impact on bank stability. This signifies that increased market power reduces the probability of default in the Singaporean banking system. The reason is likely that banks with greater market power benefit from increased profits and financial stability. This is consistent with De Nicolo and Loukoianova (2006). The liquidity ratio has a significant and negative impact on bank stability, implying that an increase in liquidity reduces bank stability. However, efficiency has a significant and positive effect on bank stability. This suggests that an increase in bank efficiency increases bank stability. The investment mix also has a significant and positive effect on bank stability. The implication is that a rise in the investment mix leads to improvement in bank stability. The rate of inflation has a significant positive effect on bank stability, which infers that an increase in the inflation rate enhances bank stability.

The results for Indonesian banks show that the Lerner index has a negative and significant impact on bank stability. This further reveals that increased competition leads to a decrease in bank stability, thereby increasing the probability of bank default. Prior studies suggest that increased bank concentration is highly correlated with greater systemic risk. This is contrary to the "competition−stability" view detailed in De Nicolo et al. (2004) and Uhde and Heimeshoff (2009). The control variables (liquidity, investment mix, and GDP) have a positive and significant effect on bank stability, which indicates that an increase in liquidity, the investment mix, and GDP increase bank stability. However, efficiency, size, and the inflation rate have a negative and significant effect on bank stability in Indonesia, which suggests that a decline in efficiency, bank size, and the inflation rate increase bank stability.

At Filipino banks, the Lerner index has a negative but insignificant impact on stability. The liquidity and efficiency ratios have a negatively significant influence on bank stability, which suggests that a decline in the liquidity and efficiency ratios lead to improvement in bank stability. The macroeconomic variable, i.e., GDP, and the inflation rate have a positive and significant effect on bank stability, which suggests that economic growth helps foster financial stability at banks.

Lastly, the findings for Thai banks show that the Lerner index (market power) has a significant and negative effect on bank stability, which suggests that an increase in market power reduces bank stability, and vice versa. The efficiency ratio has a significant and negative impact on bank stability, which implies that an increase in efficiency decreases bank stability. Finally, the investment mix ratio and the inflation rate both have a significant and negative impact on bank stability. The empirical results for the capital adequacy ratio (CAR) sys-GMM model by country are in Table 4.

The empirical model presented in Table 4 shows that the Lerner index has a positive and significant impact on the capital ratio. These findings suggest that an increase in market power leads to an improvement in bank capitalization. Our study shows that an increase in market power and/or competition often drives banks to maintain higher bank capitalization, a finding that is in line with Berger et al. (2009). It is asserted by Berger et al. (2009) that equity capital is held by banks as a cushion to absorb losses from operating activities.

Table 4
Result of CAR Sys-GMM model by country.

Variables	Malaysia Model 6		Singapore Model 7		Indonesia Model 8		Philippines Model 9		Thailand Model 10	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
L.CAR	1.411	3.43***	.743	2.01**	.513	11.56***	.452	3.36***	−2.557	−2.18**
LI	.002	2.28**	.045	2.09**	.113	4.73***	−1.354	−2.47***	.002	1.70*
LATA	-.019	−1.40	-.060	−0.50	-.072	−2.00**	−1.036	−0.82	-.0002	−0.25
EFF	.595	4.06***	.037	1.82*	-.004	-.2.40**	-.197	−0.52	-.0215	−2.25**
LTA	-.005	−1.99**	-.050	−1.70*	-.086	−3.79***	1.271	1.65*	-.0348	−1.90*
SIZE	4.564	2.88***	−5.459	−2.11**	−1.855	−5.46***	−5.873	−2.03**	.125	2.01**
GDP	.194	4.01***	-.018	−1.98**	−2.098	−12.34***	-.654	−0.33	-.0009	−2.84***
INFL	-.127	−3.66***	-.008	−2.16**	-.175	−6.66***	.743	0.50	.002	2.12**
_cons	-.894	−2.89***	1.169	2.31**	.677	8.54***	−12.146	−2.00**	.169	2.06**
AR1	-.0710 (0.9433)		−1.638 (0.2841)		−2.802 (0.0051)		−2.9508 (0.0032)		−1.4009 (0.1612)	
AR2	1.011 (0.3120)		−1.0532 (0.3128)		-.0854 (0.9319)		1.2226 (0.2215)		.8466 (0.3972)	
Hansen Test	.2357 (1.0000)		18.9691 (0.5238)		18.5868 (0.9853)		9.4959 (1.0000)		4.5965 (1.0000)	
F Test	13479.13 (0.0000)		42.95 (0.0000)		5521.01 (0.0000)		195.97 (0.0000)		42.58 (0.0000)	
No of Instruments	43		29		43		43		43	
Observations	90		27		225		126		99	

Notes: *CAR* = Capital adequacy ratio. *LI* = Lerner index. *LATA* = Liquid asset to total asset ratio. *EFF* = Cost to income ratio. *LTA* = Loan to total assets. *SIZE* = GDP growth. *INFL* = inflation rate. *** Significant at 1%, ** at 5%, * at 10%.

Study such as Amidu and Wolfe (2013) argue that the impact of competitiveness on capital holdings is inconclusive. Berger et al. (2009) posits that the level of bank capitalization is higher at banks with greater market power; this contrasts with Schaeck and Cihak (2010), who argue that competition offers banks an impetus to maintain a higher capital ratio.

The efficiency ratio has a significant and positive effect on the capital ratio at banks. This result suggests that an increase in the efficiency ratio leads to improvement in the bank capital ratio. Bank size and GDP growth have a significant and positive impact on the capital ratio at banks. These results mean that an increase in bank size and GDP growth lead to improvement in the bank capital ratio. However, the investment mix ratio and the inflation rate both have a significant and negative impact on the bank capital ratio, signifying that a decrease in the investment mix (loan to asset ratio) and the inflation rate increase the capital ratio at Malaysian banks.

The results for Singaporean banks indicate that competition has a positively significant impact on bank capitalization. One plausible reason is that a rise in market power leads to improvement in the capitalization of Singaporean banks. This finding is consistent with Berger et al. (2009). The efficiency ratio is found to have a positive and significant effect on the bank capital ratio, suggesting that an increase in operational efficiency results in improvement in the bank capital ratio. However, the investment mix, bank size, GDP growth, and the inflation rate are found to have a significant and negative impact on capital ratio.

The results for Indonesian banks show that the Lerner index is significantly positive for the capital ratio at banks. This result shows that an increase in market competition increases the bank capital ratio. However, the liquidity ratio has a significantly negative impact on the capital ratio of banks. The implication is that an increase in the liquidity ratio leads to a decline in the capital ratio. The efficiency ratio also has a significant and negative effect on the capital ratio at banks. This suggests that an increase in the efficiency ratio reduces the bank capital ratio. Similarly, the investment mix, bank size, the inflation rate, and GDP growth all have a significantly negative impact on the bank capital ratio. This implies that at Indonesian banks, an increase in the investment mix, bank size, the inflation rate, and GDP growth lead to a decrease in the bank capital ratio.

The results for Filipino banks (Model 9) indicate that the Lerner index has a negatively significant effect on the bank capital ratio. This suggest that a decrease in competition leads to an increase in the bank capital ratio. Generally, a low amount of capital is held by banks that offer high-quality loans and, as a result, do not require extra capital to cushion the bank against losses. Additionally, the investment mix has a significantly positive effect on the capital ratio. This suggests that an increase in the investment mix raises the bank capital ratio, but the bank size has a significant and negative impact on the capital ratio at Filipino banks. The implication is that an increase in bank size reduces the capital ratio at Filipino banks.

Additionally, the Lerner index has a positive and significant effect on the capital ratio of Thai banks. Schaeck and Cihak (2007) show that banks operating in an increasingly competitive market are more likely to hold higher capital ratios, whereas Berger et al. (2009) find the opposite result. Berger et al. (2009) asserts that greater market power at banks is

associated with an increase in non-performing assets, which confirms the "competition−stability hypothesis." But an increase in bank market power is also linked to a decline in insolvency risk at banks and thus supports the franchise-value hypothesis. In addition, the efficiency ratio, investment mix, and GDP growth have a negatively significant effect on the capital ratio at banks. However, the bank size and the inflation rate have a significant and positive effect on the bank capital ratio. This suggests that an increase in their economy of scale and rate of inflation improve the capital ratio of Thai banks.

5.1. Robustness checks

The study employs an ordinary least squares (OLS) and fixed-effects estimator (FEM) to enable comparison with the results of the GMM estimations in an attempt to offer further confirmation of the empirical results. The model that was used to analyze the aggregated data was revised using OLS and FEM to establish the robustness of prior estimations. The problems of autocorrelation, heteroskedasticity, and endogeneity were controlled for using the Discroy-Kraay standard error. The estimations also show the absence of multicollinearity among the variables.

The findings from the robustness analyses are not elaborated here but are available from the authors on request. The macroeconomic variables and bank-specific factors were also included to detect any changes in the effect of competition, proxied by the Lerner index, on bank stability and capitalization. Competition has a significant and positive influence on bank stability when the OLS model and FEM are used. This confirms the findings of the GMM estimations when the Z-score is used as a dependent variable. Product market competition has a positive and significant impact on the bank capital ratio when the OLS estimations and FEM are used.

Lastly, the estimation method was modified to determine the level of market power in the banking sector by taking into consideration different specifications of the inverse demand function. Hence, the study uses *OPL* (the ratio of operating expenses to total loans) as a replacement for bank *SIZE* in the demand function, because the pricing of bank loans can be affected by the monitoring cost of a bank. Lastly, the empirical results remain consistent with respect to the effect of market power on bank stability and capital ratios.

6. Conclusions and policy issues

This study investigates the effect of product market competition on stability and the capital ratio at Southeast Asian commercial banks. The study employs a panel of 63 banks in five ASEAN countries over the period 2009−2017, totaling 567 observations. The indicator used as a dependent variable to proxy for stability is the *Z*-score, which represents total bank risk and the capital adequacy ratio (ratio of total capital to risk-weighted assets) to calculate the bank capital ratio. In an attempt to address the problems of heteroskedasticity and endogeneity and to offer precise and consistent parameter estimations, we use GMM estimations.

To the best of our knowledge, there have been insufficient studies that seek to incorporate the bank capitalization into the competition−stability nexus of banks. Hence, this study extends and addresses the limitations of contemporary studies by examining the effect of product market competition on stability and the capital ratio of banks. At first, in contrast to prior studies that employ the market power index for individual banks in a single country, this study analyzes the effect of the market power index on a distinct bank stability and capital ratio in the context of Southeast Asian banks.

The study has several findings, first, finding a positively significant nexus between competition and bank stability. Notably, this positively significant nexus implies that product market competition enhances stability at banks in ASEAN, and a positive and significant nexus is found between competition and stability at Malaysian and Singaporean banks but a negatively significant nexus was found at Indonesian and Thai banks, and no significant relationship was found at Filipino banks.

Further results show that product market competition has a positively significant influence on the capital ratio at banks in Malaysia, Singapore, Indonesia, and Thailand, but the nexus between product market competition and the capital ratio is negatively significant at Filipino banks. Our results reveal that diversified banks in a competitive market are relatively more likely to maintain a higher capital ratio even though the empirical result is insignificant. By controlling for bank-specific variables, the capital stringency index, and macroeconomic factors, we find that market competition remains positively related to stability in most models.

In addition, our findings show how bank insolvency risk is affected by competition in emerging and developed markets. The findings are consistent with the "competition−stability" view and with previous findings, reinforcing that the operations of banks in a less competitive market make them susceptible to creating riskier loans, which can be harmful to bank stability. In conclusion, the empirical results offer more evidence regarding the recent debate as to whether market competition improves the stability of banks. This study offers valuable analysis for policy makers, bank supervisors, and market investors and has vital policy implications with respect to the nexus between competition, stability, and the capital ratio at banks.

Funding Acknowledgement:

There is no funding available for this research.

Conflicting Interests:

The authors declare that they have no conflicting interests

References

Adams, C. (2008). *Emerging East Asian banking system: Ten years after the 1997/98 crisis*. ADB Working Paper Series on Regional Economic Integration. No. 16.

Allen, F., & Gale, D. (2004). Competition and financial stability. *Journal of Money, Credit, and Banking, 36*, 453−480.

Amidu, M., & Wolfe, S. (2013). Does bank competition and diversification lead to greater stability? Evidence from emerging markets. *Review of Development Finance, 3*(3), 152−166.

Anbar, A., & Alper, D. (2011). Bank specific and macroeconomic determinants of commercial bank profitability: Empirical evidence from Turkey. *Business and Economics Research Journal, 2*(2), 139−152.

Beck, T., Demirguc-Kunt, A., & Maksimovic, V. (2004). Bank competition and access to finance: International evidence. *Journal of Money, Credit, and Banking, 36*, 627−648.

Beck, T., Dermirguc-Kunt, A., & Levine, R. (2006). Bank concentration, competition and crises: First results. *Journal of Banking & Finance, 30*, 1581−1603.

Berger, A. N., & Hannan, T. H. (1989). The price−concentration relationship in banking. *The Review of Economics and Statistics, 71*, 291−299.

Berger, A. N., Klapper, L. F., & Ariss, R. T. (2009). Bank competition and financial stability. *Journal of Financial Services Research, 35*, 99−118.

Boot, A., & Thakor, A. (2000). Can relationship lending survive competition? *The Journal of Finance, 55*, 679−713.

Boyd, J. H., & De Nicolo, G. (2005). The theory of bank risk taking and competition revisited. *The Journal of Finance, 60*, 1329−1343.

Boyd, J. H., De Nicolo, G., & Jalal, A. (2009). *Bank risk taking and competition revisited: New theory and evidence. IMF Working paper WP/09/143*.

Boyd, J. H., De Nicolo, G., & Smith, B. D. (2004). Crisis in competitive versus monopolistic banking systems. *Journal of Money, Credit, and Banking, 36*, 487−506.

Brana, S., & Lahet, D. (2009). Capital requirement and financial crisis: The case of Japan and the 1997 asian crisis. *Japan and the World Economy, 21*, 97−104.

Carletti, E. (2008). Competition and regulation in banking. *Handbook of financial intermediation and banking, 126*(5), 449−482.

Claessens, S., & Laeven, L. (2004). What drives bank competition? Some international evidence. *Journal of Money, Credit, and Banking, 36*, 563−583.

Claessens, S., & Laeven, L. (2005). Financial dependence, banking sector competition and economic growth. *Journal of the European Economic Association, 3*, 179−207.

De Guevara, J. F., Maudos, J., & Pérez, F. (2005). Market power in European banking sectors. *Journal of Financial Services Research, 27*(2), 109−137.

De Nicolo, G., Bartholomew, P., Zaman, J., & Zephirim, M. (2004). Bank consolidation internationalization and conglomeration: Trends and implications for financial risk. *Financial Markets, Institutions & Instruments, 13*, 173−217.

De Nicolo, G., & Loukoianova, E. (2006). *Bank ownership, market structure and risk, working paper No. 143*. Washington, DC: International Monetary Fund.

Demirguc-Kunt, A., & Huizinga, H. P. (2010). Bank activity, and funding strategies: The impact on risk and return. *Journal of Financial Economics, 98*, 626−650.

Fu, X. M., Lin, Y. R., & Molyneux, P. (2014). Bank competition and financial stability in Asia Pacific. *Journal of Banking & Finance, 38*, 64−77.

Keeley, M. C. (1990). Deposit insurance, risk and market power in banking. *The American Economic Review, 80*, 1183−1200.

Matutes, C., & Vives, X. (2000). Imperfect competition, risk taking and regulation in banking. *European Economic Review, 44*, 1−34.

Mishkin, F. S. (1999). Financial consolidation: Dangers and opportunities. *Journal of Banking & Finance, 23*, 675−691.

Moshirian, F. (2008). Financial services in an increasingly integrated global financial market. *Journal of Banking & Finance, 32*(11), 2288−2292.

Oduor, J., Ngoka, K., & Odongo, M. (2017). Capital requirement, bank competition and stability in Africa. *Review of Development Finance, 7*(1), 1−7.

Organization for Economic Cooperation and Development. (2010). *Competition, concentration and stability in the banking sector. OECD policy roundtables*. DAF/Comp.

Park, Y. C. (2006). *Economic liberalization and integration in east Asia: A post-crisis paradigm*. Oxford: Oxford University Press, ISBN 978 0 199 21521 8.

Sachs, J. D., & Woo, W. T. (2000). *Understanding the Asian financial crisis. The Asian financial crisis: Lessons for a resilient Asia* (pp. 13−43).

Schaeck, K., & Cihak, M. (2007). *Banking competition and capital ratios. Working paper series, 07/216*. Washington, DC: International Monetary Fund.

Schaeck, K., & Čihák, M. (2010). *Competition, efficiency, and soundness in banking: An industrial organization perspective*. European Banking Center Discussion Paper, 2010-20S.

Schaeck, K., Cihak, M., & Wolfe, S. (2009). Are competitive banking systems more stable? *Journal of Money, Credit, and Banking, 41*(4), 711−734.

Soedarmono, W., Machrouh, F., & Tarazi, A. (2013). Bank competition, crisis and risk taking: Evidence from emerging markets in Asia. *Journal of International Financial Markets, Institutions and Money, 23*, 196−221.

Uhde, A., & Heimeshoff, U. (2009). Consolidation in banking and financial stability in Europe: Empirical evidence. *Journal of Banking & Finance, 33*, 1299−1311.

Van Leuvensteijn, M., Kok Sorensen, C., Bikker, J. A., & van Rixtel, A. A. R. J. M. (2008). *Impact of bank competition on the interest rate pass-through in the euro area*. European Central Bank. Working Paper Series 885.

Vives, X. (2011). Competition and stability in Banking, in monetary policy under financial turbulence. In *Proceedings of the annual conference of the central bank of Chile* (pp. 455−502).

Wagner, W. (2010). Loan market competition and bank risk-taking. *Journal of Financial Services Research, 37*(1), 71−81.