HOSTED BY

ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

Review of Development Finance 8 (2018) 127–140

Review of DEVELOPMENT FINANCE

www.elsevier.com/locate/rdf

Bank competition and regional integration: Evidence from ASEAN nations

Alexia Ventouri

King's Business School, King's College London, UK

Available online 23 August 2018

Abstract

This study provides a characterization of the Association of the South East Asian Nations (ASEAN) banking system's competition under the new environment that the implementation of the Financial Integration Framework (AFIF) implies. We focus on the largest banking markets in the region, represented by the ASEAN-5. The period under study is 2007–2016, covering the preparation period of the ASEAN banks to fully implement the new Banking Integration Framework (ABIF) in 2020. Panzar and Rosse non-structural approach is utilised to measure the competition level. Following Goddard and Wilson's (2009) disequilibrium approach, the test for the dynamic competition measure is also conducted as a robustness check. We examine the evolution of the banking competition by observing the trend of the competition level using a rolling estimation with a 5-year window. This paper also investigates the factors that may influence the competitive conditions, specifically controlling for structural conditions and institutional characteristics. Our main findings confirm that banks operate under monopolistic competition, although there is still a high level of heterogeneity among the ASEAN countries' banking market and banking integration sure is a challenging objective for the region. Our results reveal a positive relationship between density of demand, concentration and competition.

JEL classifications: G21; L11; N20

Keywords: ASEAN banking market; Competition; Panzar and Rosse; Disequilibrium approach

1. Introduction

Assessing the effects of competition on financial stability is an important question for both policymakers and antitrust authorities alike. Prior to the global financial crisis, a number of studies have emphasized the role of competition in the banking industry (e.g. Bikker and Haaf, 2002; Claessens and Laeven, 2004; Beck et al., 2006). Those studies are focusing on investigating the relationship between competition and several different factors including the market structure, market contestability, banks' efficiency, banks' risk-taking behaviour and financial stability. Indeed, one would expect that when banks operate in a more competitive environment they may be more likely to engage in competitive policies achieving higher levels of performance and other efficiencies (Chortareas, et al., 2013, 2016). Increased competition is also expected to ease up access to financial services and external financing for wider population, improve the quality and innovation of the financial products, and overall lead to an improvement of the country's economic welfare.

On the other hand, competition may not necessarily lead to financial stability.[1] Competition has been blamed to trigger an increase in risk taking activities by banks, especially when they are forced to offer their services at more competitive prices (Schaeck et al., 2009; Allen et al., 2011). With the global financial crisis of 2008–09, the spill over effect of the crisis is even greater where the dangers of a high-risk culture in banking have generated a demand for the reassessment of the prudential rules currently in place (see e.g. G30, 2009; Acharya and Richardson, 2009; Chortareas et al., 2011). This in turns has important implications for financially integrated regions, with the latest development being the Association of the South East Asian Nation (ASEAN).[2] The aim of the ASEAN Bank-

E-mail address: alexia.ventouri@kcl.ac.uk

Peer review under responsibility of Africagrowth Institute.

[1] In this context, two views exist in the literature: the competition-fragility and the competition-stability (see Berger et al., 2009).

[2] One of the major backdrops triggering for such study is the financial integration as has been done by several regions in the world including European Single Market, North American Free Trade Agreement (NAFTA), Asia-Pacific Eco-

https://doi.org/10.1016/j.rdf.2018.08.002

ing Integration Framework (ABIF) is to promote competition, to achieve better financial inclusion and provision of financial services, stronger regional banking markets, and eventually stronger regional economic growth (Khan et al., 2016a, 2016b).

Yet, the existing empirical evidence on financial integration and stability is scant, especially considering the timeliness of the issue and the recent financial turmoil and bank insolvencies. This paper contributes to the existing literature in several aspects: first, it focus on the ASEAN banking market providing insights regarding the current banking market competition level and its country specific factors that have important policy implications for the region, especially in light of the coming implementation of ABIF. We expect the current competition level among the ASEAN-5 countries to vary given the differences in the nature of the banking industry of each country within the region.

Second, it uses recent data covering the global financial crisis of 2008–09 and the post crisis period. We also examine the evolution of the banking competition on ASEAN-5 level, representing the region's condition, for the period 2007–2016, by observing the trend of the competition level using a rolling estimation with a 5-year window. Our analysis also consider two sub-sample periods, with 2011 as the break point, to examine how the competition level of the ASEAN banking market is affected by the adoption of ASEAN Financial Integration Framework (AFIF), in which ABIF is one of the endorsed frameworks. Third, it focuses explicitly on the ASEAN-5 countries (e.g. Indonesia, Malaysia, Philippines, Singapore, and Thailand) where the literature on the topic is very limited. The choice to focus on ASEAN-5 countries is driven by the fact that ABIF will firstly be implemented to the ASEAN-5 countries before completely implemented to the whole ASEAN region.[3]

Fourth, it uses additional sensitivity analysis using the disequilibrium approach (Goddard and Wilson, 2009), to test for disequilibrium market conditions at each point in time during the observed period. Finally, it controls for several selected country specific characteristics to examine the factors determining the competition level in the ASEAN banking market.

The remaining of the paper is organized as follows: Section 2 reviews the existing literature on banking competition. Section 3 presents the methodology and data sources. Section 4 discussed the empirical findings. Section 5 concludes.

2. Literature review

The recent global economic and financial crisis puts the competition discussion on a new basis rendering the conflicting approaches that either view competition as a panacea or demonize. According to the "competition-fragility" view, competition triggers risk-taking behaviour of banks given their reduced franchise value due to eroded market power and competition. On the other hand, competition can create a level playing field, which can lead to improved bank efficiency and the overall country's economy. Competition can also improve a country's financial stability, as increased competition may reduce banks market power, and their ability to charge higher interest loan to customers that most likely will lead to an increase in non-performing loan (NPL), and hence riskiness of the banks' portfolio. This is known as "competition-stability" view.

Berger et al. (2009) argue that these two views are not contradicting each other. Their finding shows some support to the "competition-fragility" view where banks with higher market power tend to have less risk exposure. At the same time, the results also show some support to the opposing view that market power increases loan risk portfolio. This suggests that increased market power does not have to lead to an increase in overall risks. Banks may choose mitigating techniques (such as increase of capital, selective loan portfolio, etc.) to protect their franchise value, which also might be imposed through regulations set by regulator. Beck et al. (2012) and Fu et al. (2014) also emphasize the importance of the right regulatory reform in order to prevent the negative impact of competition on stability. They point out several factors in forming regulatory policies in the light of increased competition including the importance of entry and activity restriction, deposit insurance scheme, risk-taking incentives, and market structure. Overall, competition has been of a particular interest of academics and policymakers in a sense that if the right competition policies are in place, we might expect a competitive, efficient and also stable banking system. As suggested by Allen and Gale (2004), a complex and multi-faceted cause and effect relationship between regulation and competition as well as financial stability calls for a sound policy which take into consideration all factors that work both on theoretical and empirical level.

Aside from discussions on relationship between competition and stability, the vast majority of the literature on banking competition focuses on the relationship between bank competition and other factors such as market structure, efficiency, and contestability. Most of the literature study the developed markets, such as Europe especially in relation to the implementation of the Single Market initiative for the European Union (e.g. Bikker and Groeneveld, 1998; Chortareas et al., 2011). Other studies include Bain (1951) and Shaffer (1982) for the United States and Matthews et al. (2007) for the United Kingdom. International studies include Claessens and Laeven (2004) for a total of 50 developing and developed countries.

Molyneux et al. (1994) study the competitive conditions in major European Country for the period between 1986 and 1989 and find that banks in Germany, United Kingdom, France, and Spain operate under monopolistic condition, whereas in Italy banks operate under monopoly or collusive oligopoly. On another paper, Molyneux et al. (1996) find that the competitiveness in the Japanese commercial banks experience some changes between the period 1986 and 1988 where it was under monopoly conditions in 1986 and monopolistic conditions in 1988. A study

nomic Cooperation (APEC), and most recently ASEAN (Association of South East Asian Nation) with its ASEAN Economic Community (AEC).

[3] Since ASEAN-5 countries are the five largest economies in the ASEAN region (together they count for more than 87% of the region's total GDP since 2007–2016), the use of the five countries as sample should be sufficient to represent the condition of the whole region. Finally, the limited data availability of the remaining ASEAN-5 countries (Cambodia, Brunei Darussalam, Laos, Myanmar, and Vietnam) provides a constraint for us to perform a proper research on the overall ASEAN region.

with large samples by Bikker and Haaf (2002) investigate the competition across 23 industrialized countries including countries in Europe, US, Canada, and Japan. They provide evidence of monopolistic conditions in most of the countries and perfect competition in a few cases. Finally, Claessens and Laeven (2004) measure use a sample of 50 countries from both industrialised and developing countries for the period 1994–2001. The evidence broadly suggests monopolistic condition in all countries.

On the other hand, ASEAN, as a developing region has been playing an increasingly important role in the economy.[4] With an average growth rate of around 5% in the past 10 years, compared to the world's average GDP growth rate of around 3% for the same period, ASEAN is considered as a fast-growing emerging markets. However, although several studies have measured the level of competition in the different banking markets, the majority of these studies tend to cover large international cross-country data samples or developed economies, and only few exist for the ASEAN banking market. With ASEAN's notable economic growth, its ability to withstand the effect of the recent financial crisis, and most importantly, the coming implementation of ASEAN Banking Integration Framework (ABIF), it is not surprising that researchers are now turning their attention to this region.

In terms of banking integration, Hamid and Lean (2016) for Indonesian Capital Market Review, investigate the readiness of the ASEAN-5 countries for a banking integration by measuring the convergence level in price or return of assets with similar characteristics of the commercial banks in the ASEAN-5 countries. The results confirm that interest rates in the ASEAN-5 commercial banking sector are converging, which shows that it is ready for an integration. One of the studies considering the competition level in ASEAN is Claessens and Laeven (2004)'s who sample comprises of 50 countries (both industrialised and developing), including 3 of the ASEAN-5 countries (namely Indonesia, Malaysia, and the Philippines). They estimate the Panzar and Rosse *H-Statistic* on the basis of four models varying in terms of estimation techniques as well as in terms of dependent variables for robustness purpose. They results suggest that countries are operating under monopolistic competition for the observed period.

Liu et al. (2012) focus on four South East Asian commercial banking market, namely Indonesia, Malaysia, Philippines, and Vietnam, to examine how competition affects bank risk taking behaviour for a period between 1998 and 2008. Similarly, to the majority of banking competition literature, they also utilize the Panzar and Rosse *H-Statistic* and they use two dependent variables for robustness purposes. The results suggest that banks operate under monopolistic competition. Their study also show that competition does not increase bank risk-taking behaviour and that concentration is inversely related to bank risk, whereas regulatory restrictions positively influence bank risk-taking. Khan et al. (2016a), observe the role of competition in monetary policy transmission through the bank-lending channel. They use two structural (CR5 and HHI) and two non-structural (Lerner Index and Boone Indicator) indices as proxies for competition. They conclude, assuming all measures refer to the true competition level, is that the decreased level of competition in the banking industry weakens the monetary policy transmission. Khan et al. (2016b) examines the role of market structure for growth in 10 emerging Asian counties providing evidence in favour of bank competition suggesting that financially dependent industries grow more in industries characterized by more competition.

In one of the most recent studies, Khan et al. (2017b) examine the relationship between efficiency, growth and concentration in the ASEAN region. The results suggest that efficient banks are able to grow faster which in turn results in higher market concentration and power. On a more recent study, Khan et al. (2018) provide evidence supporting the S-C-P hypothesis for the ASEAN banking industry. Finally, Noman et al. (2017) examine the effect of competition on financial stability of the commercial banking market in ASEAN countries. They find that an increase in competition along with decrease in market power will encourage banks to hold more capital and take less credit risk, which in turn enhances banks' financial stability.

Nonetheless, the existing empirical evidence is inconclusive and scant, especially considering the timeliness of the issue following the implementation of the ASEAN BIF, and this is the task that we pursue in the following sections.

3. Data and methodology

3.1. Data sources

The dataset used in this study is composed of individual bank data sourced from unconsolidated statements of banks operating in the five ASEAN countries, as made available through the Orbis and Fitch Connect database.[5] Data for country specific characteristics are collected from the World Bank database, including the size of land area (in square kilometre), concentration ratio (CR3 and CR5), and the number of bank branches per 100,000 adults as a proxy for banks density. The chosen time span is 2007 to 2016. We focus on commercial banking, which comprises one of the largest segments of depository institutions in ASEAN. We have also scrutinized the data to avoid inconsistencies, reporting errors, and double counting of institutions. Implementing the aforementioned screening methods, results in an unbalanced panel of 1512 bank observations. Table 1 illustrates the number of banks included in the sample, per year and country.

[4] It has a combined gross domestic product (GDP) of USD 2554.70 billion and a total population of around 639 million as of end-2016, according to data from the World Bank.

[5] Specifically, for data on ASEAN banking market, Fitch Connect has a more complete database for each country sample especially in terms of period availability of bank level financial data. Hence, we primarily use data from Fitch Connect. We then manually screen to ensure there is no missing bank names, missing values, double entries, and other inconsistencies.

Table 1
Data distribution by country and year.

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand	Observation by year
2007	33	25	18	3	15	94
2008	42	31	18	5	18	114
2009	47	31	19	6	18	121
2010	53	34	19	6	19	131
2011	61	38	22	6	20	147
2012	74	38	21	6	20	159
2013	103	38	21	6	20	188
2014	110	39	21	5	21	196
2015	109	38	20	5	21	193
2016	107	28	13	3	18	169
Number of bank observations	739	340	192	51	190	1512

Source: Orbis and Fitch Connect.

Selected descriptive statistics for the dependent and independent variables are presented in Table 2. With respect to data availability, we experience very limited information for banks in Singapore. We note that out of the 128 commercial banks listed by Monetary Authority of Singapore (MAS),[6] there are less than 10 bank names listed in either Orbis or Fitch Connect. According to MAS, out of the 128 commercial banks, 5 are local banks and 123 are foreign banks, with only 29 of those foreign banks (one-fifth) offer full banking services. Given that data for foreign bank subsidiaries/branches/representative offices are not publicly available, the availability of data is very limited for the case of Singapore and the analysis is based on this sample size per year. Nevertheless, the banks included in the sample account for a largest proportion of the total assets of Singaporean banks, hence we treat this sample as a representative one.[7]

3.2. Measuring bank competition: the Panzar and Rosse model

To measure competition we use the Panzar and Rosse (1987) *H-statistic*. This statistic allows distinguishing among oligopolistic, competitive and monopolistically competitive markets. The *H-statistic* is a non-structural test, as it assesses the competitive behaviour of banks without using information on the structure of the banking market. It is calculated using the following reduced form revenue estimations (run on a panel data set) for each country:

$$\ln TR_{it} = \beta_1 \ln P_{1,it} + \beta_2 \ln P_{2,it} + \beta_3 \ln P_{3,it} + \gamma_1 \ln EQAST_{it} + \gamma_2 \ln AST_{it} + \gamma_3 \ln LOANAST_{it} + \gamma_4 \ln CASHDEP_{it} + \gamma_5 \ln OBSAST_{it} + \varepsilon_{it} \quad (1)$$

for $t = 1,...T$, where T is the number of periods observed and $i = 1,...I$, where I is the total number of banks. The dependent variable TR_{it} is the ratio of total revenue to total assets. We use three inputs (labour, capital and deposits) to describe the production process of banks: $\ln P_1$ is the average cost of labour (personnel expenses/total assets)[8]; $\ln P_2$is the average cost of deposits (interest expenses/customer and short term funding); and finally $\ln P_3$ is the average cost of capital (total capital expenses/total fixed assets).

This model examines the effect of the change in factor input prices (i.e. independent variables) to the revenues (i.e. dependent variables) earned by banks. In other words, it captures the elasticity of bank's revenues to input prices. Essentially, all banks will experience an increase on their marginal cost given an increase in factor input prices. However, the reaction of each banks towards that change will be different depending on the type of market that those banks are belong in. In a perfect competition market, an increase in input prices, which raise the marginal costs, will force several firms to eventually exit the market, resulting in an increase of demand for the remaining firms which then leads to an increased in selling price and hence revenues by the same amount as the rise in costs. In a monopolistic market, the increase in costs will lead to an increase of revenues at a rate slower than the rate of increase in the costs. Meanwhile, in a monopoly market, the condition is explained by the theory that profit maximising firms operates on a price-elastic portion of market demand function (Goddard and Wilson, 2009). Hence, an increase in input prices will increase marginal costs, which leads to a decrease in the output, and consequently resulted in a decline in total revenues.

We use the intermediation approach to explain the production process of a bank given its main function as a financial intermediary to transfer funds from the party with excess of funds to parties in need of funds.[9] We use three inputs

[6] As of June 2017.

[7] Data available are mostly for the 5 local Singapore banks, namely DBS Bank Ltd., Oversea-Chinese Banking Corporation Ltd., United Overseas Bank Ltd., Far Eastern Bank Ltd., and Bank of Singapore Ltd., which are the 5 biggest banks in the country. Moreover, the first 3 banks are deemed as the 3 biggest banks in Southeast Asia (i.e. ASEAN region) in terms of asset.

[8] Due to lack of data on the number of employees for many banks in our sample, we use personnel expenses to total assets as an indicator of unit labour costs.

[9] Unlike the ordinary production approach where a bank's production process involves transforming inputs which include labour and capital into outputs/products which includes loans and deposits, intermediation approach considers deposits as one of the inputs and the loans as one of the outputs.

Table 2
Selected descriptive statistics per country: min, max, mean, and standard deviations for 2007–2016.[a]

Descriptive statistics of dataset per country for period 2007–2016	Indonesia				Malaysia				Philippines			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Dependent variable												
TR = total revenue/total asset	0.02	0.27	0.10	0.03	0.00	0.07	0.05	0.01	0.02	0.13	0.06	0.02
ROA* = 1 + return on asset	0.83	1.10	1.01	0.02	1.02	1.01	0.01	0.01	0.93	1.04	1.01	0.01
Independent variable												
P1 = personnel expenses/total assets	0.00	0.09	0.02	0.01	0.00	0.04	0.01	0.00	0.00	0.05	0.01	0.01
P2 = interest expenses/customer & short-term funding	0.00	0.40	0.05	0.02	0.00	0.08	0.02	0.01	0.00	0.19	0.02	0.02
P3 = total capital expenses/total fixed assets	0.03	26.83	2.35	2.95	0.09	94.85	6.95	11.67	0.28	18.93	2.27	2.75
Bank specific control variables												
EQAST = equity/total assets	0.00	0.86	0.14	0.08	0.03	0.96	0.13	0.11	0.01	0.65	0.13	0.07
AST = total assets	18.57	71,747.60	4,177.04	9,779.66	103.64	129,487.70	14,015.80	21,972.42	17.13	43,946.18	7387.85	8560.98
LOANAST = total loans/total assets	0.05	0.89	0.65	0.11	0.00	1.16	0.52	0.21	0.00	0.70	0.44	0.14
CASHDEP = cash and due from institutions/total deposits	0.00	0.69	0.09	0.06	0.00	4.14	0.29	0.36	0.01	0.44	0.13	0.11
OBSAST = OBS/total assets	0.00	3.21	0.13	0.17	0.00	13.52	0.78	1.50	0.00	3.00	0.20	0.41

Descriptive statistics of dataset per country for period 2007–2016	Singapore				Thailand			
	Min	Max	Mean	SD	Min	Max	Mean	SD
Dependent variable								
TRit = total revenue/total asset	0.01	0.06	0.03	0.01	0.01	0.10	0.05	0.02
ROA* = 1 + return on asset	1.00	1.02	1.01	0.00	0.93	1.03	1.01	0.01
Independent variable								
P1 = personnel expenses/total assets	0.00	0.02	0.01	0.00	0.00	0.03	0.01	0.00
P2 = interest expenses/customer & short-term funding	0.00	0.03	0.01	0.01	0.01	0.12	0.02	0.01
P3 = total capital expenses/total fixed assets	0.27	30.12	5.87	7.17	0.32	22.62	2.40	3.07
Bank specific control variables								
EQAST = equity/total assets	0.06	0.22	0.11	0.04	0.01	0.81	0.17	0.14
AST = total assets	617.70	292,364.65	103,256.50	89,302.09	167.77	82,733.67	19,551.20	23,518.26
LOANAST = total loans/total assets	0.10	0.73	0.48	0.16	0.20	0.91	0.67	0.13
CASHDEP = cash and due from institutions/total deposits	0.00	0.18	0.06	0.05	0.00	0.14	0.02	0.02
OBSAST = OBS/total assets	0.06	1.29	0.40	0.25	0.00	15.24	0.78	2.20

Sources: Fitch Connect and Author's calculation.
[a] All financial variables measured in USD millions.

(labour, capital and deposits) to describe the production process of banks: $\ln P_1$ is the average cost of labour (personnel expenses/total assets); $\ln P_2$ is the average cost of deposits (interest expenses/customer and short term funding); and finally $\ln P_3$ is the average cost of capital (total capital expenses/total fixed assets). The dependent variable TR_{it} is the ratio of total revenue to total assets. Unlike to other studies that only consider interest revenue, we also include both interest and non-interest revenue (i.e. other operating revenue). We view that the current banking market condition has forced banks to be more innovative in expanding their source of revenue including from fee- and commission-based products and off-balance sheet activities. According to this view, in a competitive environment banks are competing in both interest and non-interest income (Shaffer, 1982; Nathan and Neave, 1989; De Bandt and Davis, 2000). Hence, distinction between the two become less relevant.

Several bank-specific control variables are also included in the regression formula to control for potential differences in costs, size, risk, structure and product mix. Specifically, EQAST is the ratio of equity to total assets (to control differences in risk propensity); AST is the logarithm of total assets (to control for potential size effects); LOANAST is the ratio of total loans to total assets (to control for asset composition); CASHDEP is the ratio of cash and due from institutions to total deposits (to capture differences in the deposit mix). Finally, OBSAST is equal to off balance sheet activities over total assets (to control for differences in the business mix). Eq. (1) is estimated by running a panel data set with fixed effects, controlling for the bank-specific component to allow for heterogeneity across the banks. The *H-statistic* is calculated from the estimation of (1) as:

$$H = \sum_{j=1}^{3} \beta_j \tag{2}$$

If the *H-statistic* takes the value of zero or a negative value then the competitive structure is either a monopoly or a perfect colluding oligopoly. When the *H-statistic* is equal to 1, it indicates perfect competition whereas a value between zero and one indicates monopolistic competition. Therefore, the bigger the value of the *H-Statistic* indicates a stronger degree of competition in a market and that the changing patterns of *H-Statistic* over time represents changes in the degree of competition throughout the time. Vesala (1995) and Bikker and Haaf (2002) suggest that continuous interpretation of *H-Statistic* as well as comparison across countries or banking markets and time period is correct under stronger assumptions, more specifically the constant or identical price elasticity of demand for the various markets.

Given that the PR model is only valid if the market is in equilibrium, we also undertake the tests on observations that are in long-run equilibrium. The equilibrium test is performed by recalculating Eq. (1) after replacing the dependent variable (total revenue over total assets) with the natural log of returns on assets (ROA). Thus, we estimate the following equation for each country:

$$\begin{aligned} \ln ROA_{it} &= \beta_1 \ln P_{1,it} + \beta_2 \ln P_{2,it} + \beta_3 \ln P_{3,it} \\ &+ \gamma_1 \ln EQAST_{it} + \gamma_2 \ln AST_{it} + \gamma_3 \ln LOANAST_{it} \\ &+ \gamma_4 \ln CASHDEP_{it} + \gamma_5 \ln OBSAST_{it} + \varepsilon_{it} \end{aligned} \tag{3}$$

Specifically, the dependent variable is computed as $ROA' = \ln(1 + ROA)$ in order to be adjusted for small and negative values due to banks' losses in any year. We define the equilibrium test as:

$$E = \sum_{j=1}^{3} \beta_j \tag{4}$$

E-statistic measures the sensitivity of profit with respect to the changes in input factor prices and is calculated as the sum of the factor input prices' coefficients. We then test whether E-statistic is statistically equal to zero using the F-test statistic.[10]

We further carry out a sensitivity analysis for robustness using to test for disequilibrium condition in the market. Especially for economies that are in transitional, the adjustment towards equilibrium might not happen instantly, leading to a market condition that is out of long-run equilibrium, which in turn can result in biased *H-Statistic*. Goddard and Wilson (2009) propose a dynamic version, as opposed to the normal static version, of the reduced revenue equation.[11] Thus, we re-estimate Eq. (1) as:

$$\begin{aligned} \ln TR_{it} &= \beta_0 TR_{i,t-1} + \beta_1 \ln P_{1,it} + \beta_2 \ln P_{2,it} \\ &+ \beta_3 \ln P_{3,it} + \gamma_1 \ln EQAST_{it} + \gamma_2 \ln AST_{it} \\ &+ \gamma_3 \ln LOANAST_{it} + \gamma_4 \ln CASHDEP_{it} \\ &+ \gamma_5 \ln OBSAST_{it} + \varepsilon_{it} \end{aligned} \tag{5}$$

This dynamic equation eliminates the requirement for long-run equilibrium assumptions because the coefficient estimates of the lagged dependent variable can be used to directly asses the speed of adjustment towards equilibrium. The unbiased *H-Statistic* calculation is as follows:

$$H = \frac{\sum_{j=1}^{3} \beta_j}{1 - \beta_0} \tag{6}$$

3.3. Determinant of competition

To identify factors that can explain differences in competitiveness across the ASEAS baking market, we use a two-step approach and we regress the *H-Statistic* (derived from Eq. (1)) on a number of country specific characteristics. Specifically, we develop a model where the competition measure is regressed to

[10] As Claessens and Laeven (2004) point out, in equilibrium ROA should not be related to input prices.

[11] One of the techniques to produce a dynamic panel estimator that they suggest is the one-step generalized method of moments (GMM) procedure by Arellano and Bond (1991), which introduce a lagged dependent variable on the right-hand side of the equation.

the following factors:

$$H_i = \alpha + \alpha_1 \ln DEPKM2 + \alpha_2 \ln INTERM + \alpha_3 BANKSPOP + \alpha_4 \ln CRk + \varepsilon_i \quad (7)$$

where, H_i is the estimated *H-Statistic* (derived from Eq. (1)) for country I; *DEPKM* 2 is a proxy for the density of demand (measured as total deposits over square km of land area); *INTERM* is the intermediation ratio (measured as loans over deposits); *BANKSPOP* is the number of bank branches per 100,000 adults; *CRk* is the concentration measure (measure by the CR ratio).

We expect a positive sign for the *DEPKM* 2 coefficient as an increase in density of demand would attract more firms and hence more competition. For the intermediation ratio *INTERM*, we expect a negative coefficient as the higher the loans to deposit ratio is the less deposit is required to produce loans, which indicates a low cost of intermediation and is a sign of low competition. BANKSPOP coefficient (a proxy for density of banks) is expected positive, as the higher the number of banks in the population is, the more competitive the market should be. Finally, if the traditional Structure-Conduct-Performance theory holds, the concentration ratio (CRk) variable is expected negative, suggesting that an increase in market concentration should restrict market's competitiveness.

4. Empirical results

4.1. The Panzar and Rosse H-Statistic measure

Before applying the Panzar and Rosse model to test for market competitiveness, we first run an equilibrium test to ensure the requirement for long-run equilibrium in the market. Table 3 presents the E-Statistic estimates for the whole sample period between 2007 and 2016 along with the result of the F-test with a null hypothesis of E = 0.

The results show that, on the ASEAN-5 level, the E-Statistic estimation is not significantly different from zero. This is also confirmed by the country level E-Statistic estimation values ranging from −0.006 to 0.008. This suggest that when the market is in equilibrium, the increase in input prices will have a minimum to no effect on banks' profitability. This is also confirmed by the F-test, which fails to reject the null hypothesis both at the ASEAN-5 and at a country level. The above results imply that the banking markets are in long-run equilibrium throughout the observed period.

To ensure the robustness of our result as well as to capture the evolution and the dynamic of ASEAN banking market condition, we also conducted the equilibrium test on a rolling basis following Matthews et al. (2007). The rolling estimation is conducted using a 5-year window and is done repeatedly for every 1 year gap. The result, as presented in Table 4. The F-test result fails to reject the null hypothesis of E = 0 which indicates that the ASEAN banking market is indeed in equilibrium throughout the observed period.[12]

Following the empirical literature on competition, we estimate the reduced form revenue specification in Eq. (1) a panel data framework. Table 5 reports the regression results. The estimated *H-Statistic* is 0.564 at the ASEAN level, thus indicating monopolistic competition in the ASEAN banking market. The variety of *H-Statistic* estimates for each country shows the difference in level of competition of each country, which is in line with our expectation. As mentioned in Section 3.2, we treat the *H-Statistic* as a continuous measure of competition, which is comparable across countries. Therefore, we can rank the countries' banking market from the most competitive one to the least one, i.e. Thailand (0.823) with the highest *H-Statistic* followed by Malaysia, Philippines, Indonesia, and finally Singapore (0.438). These results are in line with the result from previous studies done by Claessens and Laeven (2004) and Liu et al. (2012) for Indonesia, Malaysia, and Philippines for period 1994–2001 and 1998–2008, respectively.

Banking integration is expected not only to increase competition in the region, but also to lead to a convergence of the competition level in each country. Banks in countries with higher competition level may not be affected by the increased competition compared to the smaller ones. However, it may also be the case that the leading banks from the less competitive countries are the ones dominating the regional market. For example, Singapore has the lowest competition level, however its market is dominated by three large banks (namely DBS Bank Ltd., OCBC Ltd., and UOB Ltd.) with strong presence at the ASEAN region market. Another interesting point, is how countries with large number of banks result in lower *H-Statistic,* compared to countries with less number of banks. In Singapore and Indonesia cases, this can be explained by the fact that the biggest banks in the country (in terms of total asset) tend to dominate the domestic market in terms of customer base, market presence and franchise, benefited from market power. Furthermore, as before, we apply the rolling estimation to examine the trend of competition in each country's banking market. The results are presented in Table 6. In Appendix A (Graph A1), we also present the competition trend (*H-Statistic* rolling trend) per ASEAN-5 country throughout each period window. Analysing two windows period before and after the endorsement of ASEAN Financial Integration Framework (AFIF) and the creation of the Banking Integration Framework, we show variances in the change of each country's banking competition landscape. Although it is not necessarily enough to depict the actual changes in the market, one can argue that there is no clear sign of convergence of the competitiveness across the region.

Following the announcement of the banking integration framework, banks in the ASEAN region has taken different approached on responding to the coming changes. Countries like Malaysia and Singapore, take a more outward-looking approach

[12] Given these results, it is not necessary to perform the disequilibrium approach. However, for robustness purposes, we also carry out the disequilibrium approach using the one-step GMM dynamic panel estimator.

Table 3
Equilibrium test on ASEAN-5 and country level for 2007–2016.

Dependent variable: lnROA*	ASEAN5	Indonesia	Malaysia	Philippines	Singapore	Thailand
lnP1	−0.002	−0.004	−0.002	0.003	0.008*	0.007
	(0.317)	(0.291)	(0.171)	(0.440)	(0.091)	(0.250)
lnP2	0.000	−0.002	0.004**	−0.001	0.001	−0.003
	(0.697)	(0.421)	(0.013)	(0.381)	(0.328)	(0.278)
lnP3	0.001	0.002	0.000	−0.007**	−0.001	−0.005
	(0.634)	(0.285)	(0.711)	(0.048)	(0.192)	(0.190)
lnEQAST	0.001	−0.003	0.001	0.002	−0.001	0.009***
	(0.751)	(0.201)	(0.537)	(0.482)	(0.832)	(0.004)
lnAST	0.000	0.000	0.001	0.002	0.001	0.003
	(0.685)	(0.929)	(0.631)	(0.470)	(0.619)	(0.310)
lnLOANAST	0.002*	0.001	0.004***	−0.002	−0.002	0.002
	(0.087)	(0.921)	(0.000)	(0.145)	(0.491)	(0.784)
lnCASHDEP	−0.001*	−0.001*	0.000	−0.001	−0.001	−0.002*
	(0.057)	(0.052)	(0.422)	(0.282)	(0.479)	(0.055)
lnOBSAST	0.000	0.001	0.000	0.000	−0.001	−0.001
	(0.709)	(0.728)	(0.712)	(0.465)	(0.501)	(0.167)
CONS	−0.003	−0.020	0.013	0.002	0.044	0.020
	(0.823)	(0.404)	(0.350)	(0.940)	(0.187)	(0.210)
Estat (E)	−0.002	−0.004	0.002	−0.006	0.008	0.000
Ftest (E = 0)	0.52	0.60	2.47	0.92	2.05	0.00
Prob > F	0.471	0.440	0.124	0.348	0.212	0.953

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively. P-values are in parentheses.
Notes: lnROA* = 1 + Return on Asset; lnP1 = personnel expenses/total assets; lnP2 = interest expenses/customer and short term funding; lnP3 = total capital expenses/total fixed assets; lnEQAST = equity/total assets; lnAST = total asset; lnLOANAST = total loans/total assets; ln CASHDEP = cash and due from institutions/total deposits; lnOBSAST = off-balance-sheet activities/total assets.

Table 4
Rolling equilibrium test on ASEAN-5 Level for 2007–2016.

Dependent variable: lnROA*	2007–2011	2008–2012	2009–2013	2010–2014	2011–2015	2012–2016
lnP1	−0.002	−0.001	−0.002	−0.002	0.000	0.004
	(0.447)	(0.826)	(0.744)	(0.711)	(0.919)	(0.260)
lnP2	0.001	0.002	0.001	0.001	−0.002	−0.07**
	(0.393)	(0.334)	(0.508)	(0.526)	(0.371)	(0.037)
lnP3	−0.003	0.000	0.001	0.002**	0.001	0.001
	(0.147)	(0.945)	(0.470)	(0.020)	(0.579)	(0.696)
lnEQAST	0.008***	0.004*	0.002	0.000	0.000	−0.003
	(0.008)	(0.093)	(0.488)	(0.967)	(0.984)	(0.285)
lnAST	0.004**	0.005***	0.004*	0.002	0.003	0.004
	(0.034)	(0.008)	(0.100)	(0.502)	(0.369)	(0.276)
lnLOANAST	0.001	0.002	0.002	0.003**	0.002	0.001
	(0.518)	(0.544)	(0.218)	(0.036)	(0.234)	(0.611)
lnCASHDEP	0.000	0.000	0.000	−0.001	−0.001***	−0.001***
	(0.549)	(0.634)	(0.950)	(0.139)	(0.008)	(0.003)
lnOBSAST	0.001	0.001	0.001	−0.001	0.000	0.000
	(0.343)	(0.315)	(0.471)	(0.278)	(0.885)	(0.842)
CONS	−0.001	−0.010	−0.016	−0.008	−0.020	−0.036
	(0.962)	(0.694)	(0.517)	(0.631)	(0.436)	(0.307)
Estat (E)	−0.003	0.001	0.000	0.001	−0.002	−0.002
Ftest (E = 0)	1.17	0.06	0.01	0.17	0.23	0.20
Prob > F	0.2816	0.8078	0.9344	0.6801	0.6357	0.6522

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively. P-values are in parentheses.
Notes: lnROA* = 1 + Return on Asset; lnP1 = personnel expenses/total assets; lnP2 = interest expenses/customer and short term funding; lnP3 = total capital expenses/total fixed assets; lnEQAST = equity/total assets; lnAST = total asset; lnLOANAST = total loans/total assets; ln CASHDEP = cash and due from institutions/total deposits; lnOBSAST = off-balance-sheet activities/total assets.

focusing on strengthening their presence in regional market. Other countries, like Indonesia and Philippines, take a more inward-looking strategy in order to protect their own local banks' domestic presence. Using merger and acquisition activities, as well as increased restrictions on foreign ownership and activities, they aim to expand their domestic business capacity in order to survive from the incoming foreign competition. Meanwhile, banks from Thailand take a combination strategy of strengthen-

Table 5
Competition at the ASEAN-5 Level and at a country level for 2007–2016.

Dependent variable: lnTR	ASEAN5	Indonesia	Malaysia	Philippines	Singapore	Thailand
lnP1	0.260***	0.223***	0.270***	0.418***	0.114	0.424***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.350)	(0.000)
lnP2	0.289***	0.241***	0.401***	0.219***	0.336***	0.343***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
lnP3	0.015	−0.001	0.062*	−0.112	−0.012	0.056*
	(0.293)	(0.916)	(0.056)	(0.131)	(0.672)	(0.081)
lnEQAST	0.012	−0.046	0.094	−0.014	−0.149	0.008
	(0.634)	(0.126)	(0.149)	(0.760)	(0.160)	(0.884)
lnAST	−0.042	−0.054**	−0.026	−0.044	−0.199*	−0.002
	(0.107)	(0.018)	(0.658)	(0.607)	(0.070)	(0.968)
lnLOANAST	0.158***	0.215**	0.139***	0.127***	0.361**	0.227**
	(0.000)	(0.021)	(0.000)	(0.010)	(0.016)	(0.048)
lnCASHDEP	0.004	0.004	0.019	−0.026*	0.017	0.010
	(0.527)	(0.611)	(0.222)	(0.086)	(0.490)	(0.663)
lnOBSAST	0.000	0.007	−0.021	0.004	−0.002	0.014
	(0.964)	(0.389)	(0.126)	(0.677)	(0.916)	(0.206)
CONS	−0.057	−0.292*	0.298	0.432	0.917	0.548**
	(0.743)	(0.077)	(0.471)	(0.293)	(0.325)	(0.037)
Hstat (H)	0.564	0.463	0.733	0.525	0.438	0.823
Ftest (H = 0)	71.63***	57.83***	27.99***	10.19***	9.43**	103.69***
Prob > F	0.000	0.000	0.000	0.004	0.028	0.000
Ftest (H = 1)	42.77***	77.84***	3.73*	8.33***	15.50**	4.81**
Prob > F	0.000	0.000	0.061	0.009	0.011	0.040

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively. P-values are in parentheses.
Notes: TR = total revenue; lnP1 = personnel expenses/total assets; lnP2 = interest expenses/customer and short term funding; lnP3 = total capital expenses/total fixed assets; lnEQAST = equity/total assets; lnAST = total asset; lnLOANAST = total loans/total assets; ln CASHDEP = cash and due from institutions/total deposits; lnOBSAST = off-balance-sheet activities/total assets.

ing its domestic foundation while at the same time enhancing its regional presence. Overall, there is still a high level of heterogeneity among the ASEAN banking market and sure banking integration is a challenging objective for the region. Therefore, it remains critical for policymakers to create a playing level field in order to improve market environment though harmonisation of regulation and enhancement of competition in the region.

An analysis of the sign and significance of the regression coefficients (Tables 5 and 6) indicate that the price of funds is always positive and statistical significant for all countries. The price of labour is positive and statistical significant in most countries (with the exception of Singapore). The impact of the cost of capital seems to be minimal compared to the other input prices. These results are consistent with previous studies not only for the ASEAN banking market but also for other countries' and regions (Liu et al., 2012).

To validate our results we conduct the Goddard and Wilson's (2009) disequilibrium test for robustness purposes. The results from the one-step dynamic Generalized Method of Moments (GMM) estimation are presented in Table 7. Similar to Liu et al. (2012), we do not find a positive and statistically significant lagged-dependent variable in all observed countries. The varying sign and significance indicates the lack of necessity to include a partial adjustment mechanism to produce the dynamic revenue equation. Nonetheless, confirming the result obtained from fixed effect estimators (as laid out in Tables 5 and 6), the positive and statistically significant coefficient for the price of funds remain consistent for all countries and at the ASEAN-5 level. Furthermore, the results for the coefficient estimates of the other two input prices and the control variables are broadly in-line with the results derived from the fixed effect estimators. Table 8 presents the comparison between the result obtained from FE and GMM estimation.

Overall, the GMM method produces higher *H-Statistic* estimated compared to the fixed effects procedure. This is in line with Goddard and Wilson (2009) and Liu et al. (2012) who suggest that the static *H-Statistics* produced by fixed effects has the tendency to underestimate the competition level. Moreover, in-line with the results from the fixed effects procedure, the GMM confirms that the ASEAN banking market operates under monopolistic competition throughout the observed period (2007–2016).

4.2. Determinants of competition

This section presents the results of the relationship of the independent variables with the competitiveness measure. Table 9 illustrates the results. The regression was run using two different proxies for concentration, CR3 and CR5, which gave us similar results and, for the purpose of this paper, we only report the estimation result based on the use of CR3 measure.[13]

Based on the estimation result above, it can be seen that the factors significantly affect the *H-Statistic* are the CR3 (proxy for market concentration) and DEPKM2 (proxy for density of

[13] The results for CR5 are not reported in the tables but are available upon request from the authors.

Table 6
Rolling analysis at a country level.

Country	Period	lnP1	lnP2	lnP3	H-Stat	H0: Hstat = 0	H0: Hstat = 1	Competition
ID	2007–2011	0.132***	0.181***	−0.030	0.283	F(1,65) = 11.33***	F(1,65) = 72.44***	MC
	2008–2012	0.199***	0.182***	−0.026	0.355	F(1,78) = 11.99***	F(1,78) = 39.48***	MC
	2009–2013	0.236***	0.181***	−0.018	0.398	F(1,107) = 16.69***	F(1,107) = 38.08***	MC
	2010–2014	0.239***	0.270***	0.000	0.509	F(1,112) = 66.65***	F(1,112) = 62.24***	MC
	2011–2015	0.196***	0.297***	−0.003	0.490	F(1,113) = 102.05***	F(1,113) = 110.33***	MC
	2012–2016	0.260***	0.335***	0.009	0.604	F(1,111) = 35.47***	F(1,111) = 15.23***	MC
MY	2007–2011	0.292***	0.570***	0.081**	0.942	F(1,38) = 234.40***	F(1,38) = 0.88	MC-PC
	2008–2012	0.431***	0.291**	0.088***	0.809	F(1,39) = 48.60***	F(1,39) = 2.69	MC-PC
	2009–2013	0.126	0.207***	0.015	0.348	F(1,39) = 10.59***	F(1,39) = 37.30***	MC
	2010–2014	0.155	0.176*	0.011	0.342	F(1,39) = 9.24***	F(1,39) = 34.12***	MC
	2011–2015	0.200	0.155*	0.074**	0.430	F(1,39) = 8.83***	F(1,39) = 15.57***	MC
	2012–2016	0.237**	0.234***	0.052	0.523	F(1,38) = 14.14***	F(1,38) = 11.77***	MC
PH	2007–2011	0.474***	0.217***	−0.051	0.640	F(1,22) = 19.77***	F(1,22) = 6.24**	MC
	2008–2012	0.529***	0.139*	0.071	0.739	F(1,22) = 45.80***	F(1,22) = 5.74**	MC
	2009–2013	0.426***	0.198**	0.058	0.682	F(1,22) = 18.25***	F(1,22) = 3.99*	MC
	2010–2014	0.477***	0.275***	0.208**	0.960	F(1,22) = 59.67***	F(1,22) = 0.10	MC-PC
	2011–2015	0.578***	0.253***	0.208**	1.038	F(1,22) = 95.21***	F(1,22) = 0.13	PC
	2012–2016	0.406***	0.208***	0.097	0.710	F(1,21) = 25.28***	F(1,21) = 4.21*	MC
SG	2007–2011	−0.068	0.348***	0.009	0.289	F(1,5) = 3.15	F(1,5) = 18.97***	M-MC
	2008–2012	0.032	0.431**	−0.022	0.440	F(1,5) = 1.77	F(1,5) = 2.85	M-PC
	2009–2013	0.543*	0.277**	−0.072**	0.749	F(1,5) = 22.05***	F(1,5) = 2.48	MC-PC
	2010–2014	0.707**	0.157	−0.038	0.825	F(1,5) = 56.63***	F(1,5) = 2.53	MC-PC
	2011–2015	0.751	0.084	0.050	0.885	F(1,5) = 7.68**	F(1,5) = 0.13	MC-PC
	2012–2016	0.603*	0.100**	−0.018	0.117	F(1,5) = 9.69**	F(1,5) = 2.05	MC-PC
TH	2007–2011	0.242	0.266***	0.083*	0.592	F(1,19) = 3.41*	F(1,19) = 11.62	MC-PC
	2008–2012	0.332*	0.316***	0.107***	0.755	F(1,19) = 16.33***	F(1,19) = 1.72	MC-PC
	2009–2013	0.411***	0.389***	0.061**	0.862	F(1,19) = 72.98***	F(1,19) = 1.86	MC-PC
	2010–2014	0.470***	0.277***	0.076**	0.823	F(1,20) = 228.10***	F(1,20) = 10.49***	MC
	2011–2015	0.500***	0.383***	0.052	0.935	F(1,20) = 162.88***	F(1,20) = 0.79	PC
	2012–2016	0.480***	0.356***	0.006	0.841	F(1,20) = 84.76***	F(1,20) = 3.03*	MC

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively.
Notes: ID = Indonesia; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand.
Competition type: MC = monopolistic competition; PC = perfect competition; M = Monopoly.
lnP = personnel expenses/total assets; lnP2 = interest expenses/customer and short term funding; lnP3 = total capital expenses/total fixed assets.

demand). The coefficient of the concentration measure, although it is significantly affect H-Statistic, but it affects the H-Statistic in a positive way, which means that the more concentrated banking systems are more competitive. This result differ from the previous literature, which indicates that an increase in concentration impairs competition (Bikker and Haaf, 2002; Khan et al., 2017a). Similar to our result, Claessens and Laeven (2004) find a positive and statistically significant relationship between concentration measure and H-Statistic. However, as the authors point out these differences in relationship between concentration measure and competition measure suggest that the degree of concentration may not be the proper indicator for level of a market's competitiveness. Hence, they cannot explain each other.

The positive and significant relationship between density of demand (DEPKM2) and competitive measure indicates that an increase in density of demand would also increase the competition level in a country. As expected, an increase in demand for banking products in one area may attract banks from another area to enter the market to pursue the increasing new business opportunity. Hence, the target area should face an increased competition level as a result. The INTERM variable, which proxies the intermediation ratio, is negatively related with the competition measure, although not statistically significant. Finally, the BANKSPOP variable (proxy for density of banks) is positively related with the competition measure, however again not statistically significant.

5. Conclusions

The endorsement of the ASEAN Financial Integration Framework (AFIF) in 2011, to support the creation of a globally competitive single market, has highlighted the importance of a banking integration in the ASEAN region, especially given that commercial banking is still the backbone of the region's financial system. As evident, an integrated banking market can increase competition, improve efficiency and the quality of financial services. Hence, we could expect strong and competitive regional banks that can compete not only against each other, but also against global banks.

Moving towards the full implementation of the ASEAN Banking Integration Framework (ABIF), this paper examines the

Table 7
One-step dynamic Generalized Method of Moments (GMM) estimation.

Dependent variable: lnTR	ASEAN5	INDO	MALAY	PHIL	SING	THAI
lntrL1.	0.234***	0.319***	0.090	0.234**	0.102	−0.062
	(0.000)	(0.001)	(0.154)	(0.044)	(0.541)	(0.300)
lnP1	0.196***	0.054	0.221**	0.408	0.527***	0.401***
	(0.005)	(0.582)	(0.015)	(0.252)	(0.009)	(0.002)
lnP2	0.296***	0.395***	0.255***	0.192**	0.168**	0.356***
	(0.000)	(0.000)	(0.000)	(0.015)	(0.031)	(0.001)
lnP3	0.085**	0.018	0.032	0.185	0.017	0.008
	(0.042)	(0.740)	(0.606)	(0.196)	(0.799)	(0.849)
LnEQAST	0.052*	0.016	0.064	0.100	0.019	0.009
	(0.064)	(0.754)	(0.332)	(0.319)	(0.809)	(0.828)
lnAST	−0.089***	−0.096**	−0.137***	−0.158	−0.112	−0.125
	(0.002)	(0.025)	(0.000)	(0.406)	(0.372)	(0.114)
lnLOANAST	0.173***	0.315***	0.203***	−0.003	−0.019	0.164***
	(0.000)	(0.004)	(0.000)	(0.976)	(0.893)	(0.009)
lnCASHDEP	−0.003	−0.009*	0.004	−0.019	0.044	−0.035
	(0.569)	(0.078)	(0.780)	(0.144)	(0.295)	(0.215)
lnOBSAST	−0.004	−0.001	−0.027	0.007	0.037	0.007
	(0.523)	(0.908)	(0.101)	(0.666)	(0.164)	(0.472)
Hstat	0.753	0.685	0.559	1.024	0.792	0.721
Hansen p	0.421	0.383	0.152	0.687	1.000	0.607
AR(2)	0.558	0.110	0.470	0.820	0.695	0.329
No. of instruments	37	33	37	21	15	17
No. of groups	201	112	40	23	6	20
No. of observation	1062	488	253	135	38	148

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively.
Notes: lnTRL1 = lagged dependent variable; lnP1 = personnel expenses/total assets; lnP2 = interest expenses/customer and short term funding; lnP3 = total capital expenses/total fixed assets; lnEQAST = equity/total assets; lnAST = total asset; lnLOANAST = total loans/total assets; ln CASHDEP = cash and due from institutions/total deposits; lnOBSAST = off-balance-sheet activities/total assets.

Table 8
Comparison of static FE and dynamic GMM.

Dependent variable: lnTR & LnTRL1	ASEAN5		Indonesia		Malaysia	
	FE	GMM	FE	GMM	FE	GMM
lnP1	0.260***	0.196***	0.223***	0.054	0.270***	0.221**
lnP2	0.289***	0.296***	0.241***	0.395***	0.401***	0.255***
lnP3	0.015	0.085**	−0.001	0.018	0.062*	0.032
lnEQAST	0.012	0.052*	−0.046	0.016	0.094	0.064
LnAST	−0.042	−0.089***	−0.054**	−0.096**	−0.026	−0.137***
lnLOANAST	0.158***	0.173***	0.215**	0.315***	0.139***	0.203***
lnCASHDEP	0.004	−0.003	0.004	−0.009*	0.019	0.004
lnOBSAST	0.000	−0.004	0.007	−0.001	−0.021	−0.027
Hstat	0.564	0.753	0.463	0.685	0.733	0.559

Dependent variable: lnTR * LnTRL1	Philippines		Singapore		Thailand	
	FE	GMM	FE	GMM	FE	GMM
lnP1	0.418***	0.408	0.114	0.527***	0.424***	0.401***
lnP2	0.219***	0.192**	0.336***	0.168**	0.343***	0.356***
lnP3	−0.112	0.185	−0.012	0.017	0.056*	0.008
lnEQAST	−0.014	0.100	−0.149	0.019	0.008	0.009
lnAST	−0.044	−0.158	−0.199*	−0.112	−0.002	−0.125
lnLOANAST	0.127***	−0.003	0.361**	−0.019	0.227**	0.164***
lnCASHDEP	−0.026*	−0.019	0.017	0.044	0.010	−0.035
lnOBSAST	0.004	0.007	−0.002	0.037	0.014	0.007
Hstat	0.525	1.024	0.438	0.792	0.823	0.721

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively.
Notes: lnTRL1 = lagged dependent variable; TR = total revenue; lnP1 = personnel expenses/total assets; lnP2 = interest expenses/customer and short term funding; lnP3 = total capital expenses/total fixed assets; lnEQAST = equity/total assets; lnAST = total asset; lnLOANAST = total loans/total assets; ln CASHDEP = cash and due from institutions/total deposits; lnOBSAST = off-balance-sheet activities/total assets.

Table 9
Determinants of H-Statistic.

Variable	Coefficient	Standard Error	t	P > |t|
CR3	1.116***	0.092	12.070	0.000
DEPKM2	0.433**	0.110	3.940	0.017
INTERM	−0.666	0.775	−0.860	0.439
BANKSPOP	0.246	0.121	2.040	0.111
Cons	−4.772***	0.219	−21.750	0.000

*, **, *** denote significance at 10%, 5%, and 1% levels, respectively.
Notes: CR3 is the concentration ratio (proxy for market structure); DEPKM2 is total deposit over size of land area (proxy for density of demand); INTERM is total loans over total deposits (proxy for intermediation function); BANKSPOP is bank branches per 100,000 adults (proxy for density of banks).

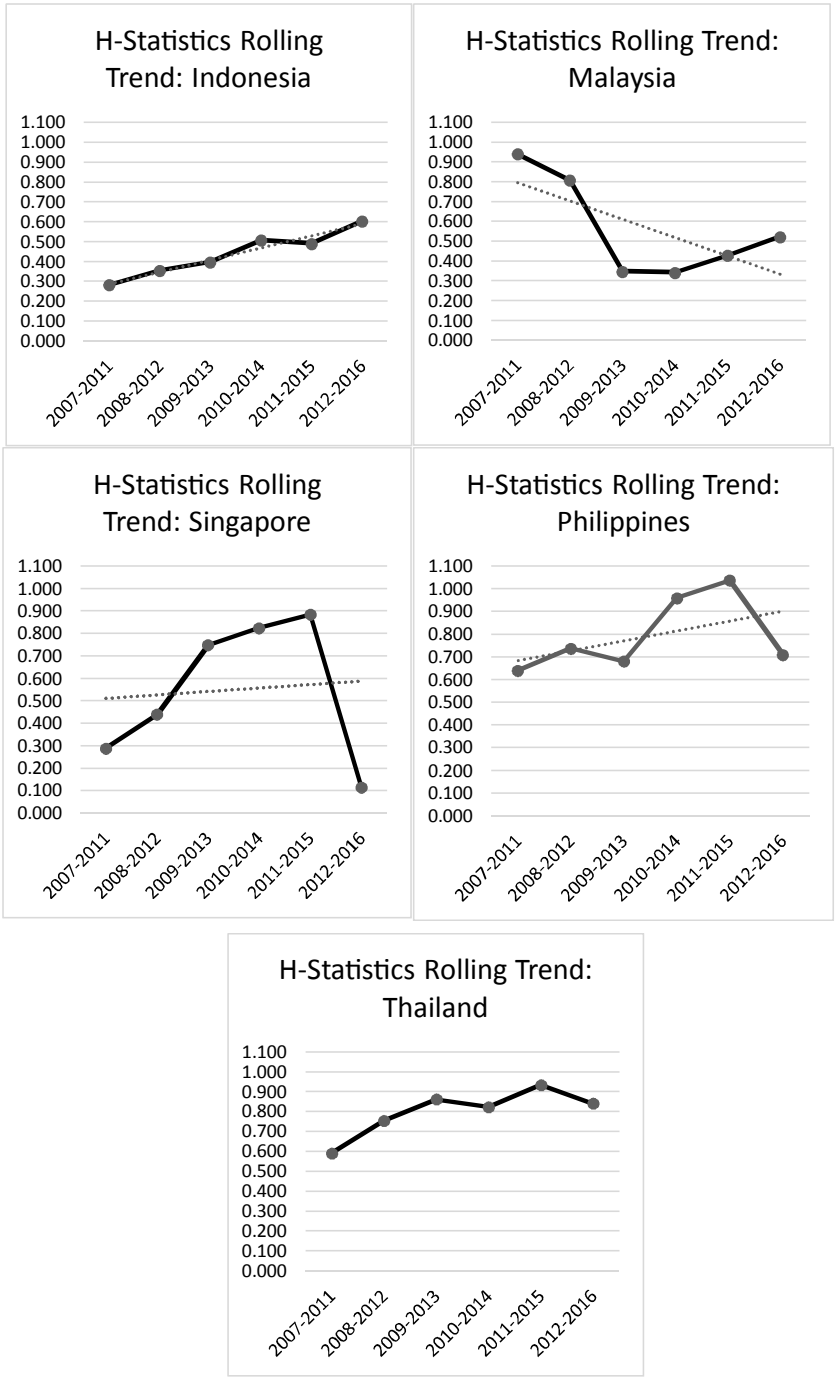
characteristic of the ASEAN banking markets' competition for the period 2007–2016. The competition level is measured using the Panzar and Rosse (1987) statistic. The trend and evolution of the ASEAN countries' banking markets are then examined using a rolling estimation with 5-year window. Furthermore, as a robustness check, we also test our results using the generalized method of moments (GMM) dynamic panel estimation, as suggested by Goddard and Wilson (2009). Both the fixed effects and the GMM estimation results indicate monopolistic competition in the ASEAN banking market, a result in line with previous studies (e.g. Claessens and Laeven, 2004; Liu et al., 2012). This result is also confirmed by each country's' H-Statistic which are all between 0 and 1, although varies across counties (Indonesia: 0.463; Malaysia: 0.733; Philippines: 0.525; Singapore: 0.438; and Thailand: 0.823). The varying *H-Statistic* explains the different nature of each the ASEAN banking markets, especially in terms of development stage and their ability to maintain the sovereignty of its banking sector.

This heterogeneity is also observed in the trend/evolution of each country's banking market competition throughout the observed period, where in general shows that the markets have a tendency to move towards either monopolistic or perfect competition. There are also differences in the change of competition level among ASEAN-5 countries prior to (2007–2011) and after (2012–2016) the implementation of AFIF. Although these results alone are not necessarily enough to depict the actual condition on how each national react towards the implementation of AFIF, but it is safe to say that countries with different competition level may react differently towards an increased competition. Therefore, the creation of a level playing field by ASEAN competition policymakers is crucial to ensure harmonization and conduciveness of the ASEAN banking market after the implementation of ABIF, which eventually shall boost the competition level evenly across the region.

Our findings on the relationship between competition and several country characteristics suggests a significant and positive relationship between market concentration and competition. The results also suggest that a higher density of demand makes the ASEAN banking market more competitive. With ASEAN's large population and still huge pool of untapped businesses, especially in less developed areas and areas where the middle income population is rising such as Indonesia, an increase in demand for banking products can be expected and hence the increase in competition. These results seem to indicate that the heterogeneity is the main characteristic of the ASEAN banking markets, which poses a challenge for the ASEAN policymakers in the implementation of the ABIF because each nation may react differently to the changes (i.e. more liberalization and increased competition) in the banking market. Nonetheless, the increased competition shall not threatened the region's financial stability as long as the right regulations are in place.

Overall, our findings suggest important policy implications regarding anti-trust policies and financial stability, especially after the global financial crisis of 2008-09, which prompted policy makers to search for new regulatory and supervisory tools. An important policy implication of this evidence is that policy makers need to consider whether the implementation of the ABIF indeed increase the level of competition in ASEAN and whether there is an impact of increased competition on the region's overall financial stability.

Appendix A.



Graph A1. H-Statistic rolling trend for each country.

References

Acharya, V., Richardson, M., 2009. Restoring Financial Stability: How to Repair a Failed System? John Wiley and Sons, New York.

Allen, F., Gale, D., 2004. Competition and financial stability. J. Money Credit Bank. 36 (3), 453–480.

Allen, F., Carletti, E., Marquez, R., 2011. Credit market competition and capital regulation. Rev. Financ. Studies 24 (4), 983–1018.

Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Rev. Econ. Studies 58 (2), 277–297.

Bain, J.S., 1951. Relation of profit rate to industry concentration: American manufacturing, 1936–1940. Q. J. Econ. 65 (3), 293–324.

Beck, Thorsten, Demirgüç-Kunt, Asli, Levine, Ross, 2006. Bank concentration, competition, and crises: first results. J. Bank. Finance 30 (5), 1581–1603.

Beck, T.H., De Jonghe, O., Schepens, G., 2012. Bank Competition and Stability. Manuscript, Tilburg University.

Berger, A.N., Klapper, L.F., Turk-Ariss, R., 2009. Bank competition and financial stability. J. Financ. Serv. Res. 35 (2), 99–118.

Bikker, J.A., Groeneveld, J.M., 1998. Competition and Concentration in the EU Banking Industry, vol. 8. De Nederlandsche Bank NV.

Bikker, J.A., Haaf, K., 2002. Competition, concentration and their relationship: an empirical analysis of the banking industry. J. Bank. Finance 26 (11), 2191–2214.

Chortareas, G., Girardone, C., Ventouri, A., 2011. Financial frictions, bank efficiency and risk: evidence from the Eurozone. J. Bus. Finance Acc. 38, 259–287.

Chortareas, G., Girardone, C., Ventouri, A., 2013. Financial freedom and bank efficiency: evidence from the European Union. J. Bank. Finance 37 (4), 1223–1231.

Chortareas, G., Kapetanios, G., Ventouri, A., 2016. Credit market freedom and cost efficiency in US state banking. J. Empir. Finance 37, 173–185.

Claessens, S., Laeven, L., 2004. What drives bank competition? Some international evidence. J. Money Credit Bank. 36 (3), 563–583.

De Bandt, O., Davis, E.P., 2000. Competition, contestability and market structure in European banking sectors on the eve of EMU. J. Bank. Finance 24 (6), 1045–1066.

Fu, X.M., Lin, Y.R., Molyneux, P., 2014. Bank competition and financial stability in Asia Pacific. J. Bank. Finance 38, 64–77.

G30, 2009. Financial Reform: A Framework for Financial Stability Group of 30, Washington DC.

Goddard, J., Wilson, J.O., 2009. Competition in banking: a disequilibrium approach. J. Bank. Finance 33 (12), 2282–2292.

Hamid, F.S., Lean, H.H., 2016. Is ASEAN ready for banking integration? Evidence from interest rate convergence. Indones. Capital Market Rev. 8 (2016), 72–82.

Khan, H.H., Ahmad, R.B., Gee, C.S., 2016a. Bank competition and monetary policy transmission through the bank lending channel: evidence from ASEAN. Int. Rev. Econ. Finance 44, 19–39.

Khan, H.H., Ahmad, R.B., Gee, C.S., 2016b. Market structure, financial dependence and industrial growth: evidence from the banking industry in emerging Asian economies. PLoS One 11 (8).

Khan, H.H., Kutan, A.M., Ahmad, R.B., Gee, C.S., 2017a. Does higher bank concentration reduce the level of competition in the banking industry? Evidence from South East Asian countries. Int. Rev. Econ. Finance 52, 91–106.

Khan, H.H., Kutan, A.M., Naz, I., Qureshi, F., 2017b. Efficiency, growth and market power in the banking industry: new approach to efficient structure hypothesis. N. Am. J. Econ. Finance 42, 531–545.

Khan, H.H., Ahmad, R.B., Chan, S.G., 2018. Market structure, bank conduct and bank performance: evidence from ASEAN. J. Policy Modell. (In press, corrected proof).

Liu, H., Molyneux, P., Nguyen, L.H., 2012. Competition and risk in South East Asian commercial banking. Appl. Econ. 44 (28), 3627–3644.

Matthews, K., Murinde, V., Zhao, T., 2007. Competitive conditions among the major British banks. J. Bank. Finance 31 (7), 2025–2042.

Molyneux, P., Lloyd-Williams, D.M., Thornton, J., 1994. Competitive conditions in European banking. J. Bank. Finance 18 (3), 445–459.

Molyneux, P., Thornton, J., Llyod-Williams, D.M., 1996. Competition and market contestability in Japanese commercial banking. J. Econ. Bus. 48 (1), 33–45.

Nathan, A., Neave, E.H., 1989. Competition and contestability in Canada's financial system: empirical results. Can. J. Econ., 576–594.

Noman, A.H.M., Gee, C.S., Isa, C.R., 2017. Does competition improve financial stability of the banking sector in ASEAN countries? An empirical analysis. PLoS One 12 (5), e0176546.

Panzar, J.C., Rosse, J.N., 1987. Testing for monopoly equilibrium. J. Ind. Econ., 443–456.

Schaeck, K., Cihak, M., Wolfe, S., 2009. Are competitive banking systems more stable? J. Money Credit Bank. 41 (4), 711–734.

Shaffer, S., 1982. A non-structural test for competition in financial markets. In: Proceedings of a conference on bank structure and competition, Federal Reserve Bank of Chicago, April, 225, 243.

Vesala, J., 1995. Testing for Competition in Banking: Behavioural Evidence from Finland.