RESEARCH ARTICLE

Financial Development, Efficiency, and Competition of ASEAN Banking Market

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Abstract: Theoretically, the financial sector fosters economic development of a nation. Weak institutions, poor contract enforcement, and macroeconomic instability are negatively correlated with an underdeveloped financial sector. The global trends have revived the need for the ASEAN to continue to work for further integration among member countries. ASEAN banks serve as the important intermediaries in increasing the connectivity among ASEAN members and supporting the financial integration in the region. The strong growth of ASEAN financial institutions is driven by the development of business fundamental and the increasing competitiveness of financial institutions in this region. Therefore, this study aims to examine the nexus between financial development, competition, and efficiency of ASEAN banks over the period 2011 to 2016. Using dataset of 78 banks across ASEAN countries, data envelopment analysis (DEA) is used to measure efficiency, Herfindahl-Hirschman index to measure market concentration, and Lerner index to measure market power. The dynamic panel approach, namely the generalized method of moments (GMM), is employed to examine the nexus between financial development, competition, and efficiency of banks. The empirical results of nexus between financial development, competition, and efficiency indicate that competition is positively related to efficiency (technical efficiency and pure technical efficiency). However, competition is negatively related to scale efficiency. The results also show that financial development is negatively related to efficiency (pure technical efficiency) and competition. Nevertheless, GDP is positively related to competition. The results of this study imply that development in the financial sector makes banks inefficient and underutilized resources as banks improve their market power. The results of this study imply that competition in the banking sector must be encouraged to foster efficiency.

Keywords: ASEAN, banking, competition, efficiency, financial development

The banking sector serves as an important part of the Association of Southeast Asian Nations (ASEAN) economies as their performances influence the health of general economies at large. This can be seen during the outbreak of the 1997 Asian financial crisis. The crisis is considered contagious as the crisis from another country could hamper the economic stability of another country (Kim, Kose, & Plummer, 2001). In this period of crisis, the currencies constantly depreciate against the U.S. dollar, and the amount of unhedged foreign borrowings and the non-performing loans in the ASEAN countries mounted.

This caused most of the banks to get exposed to a high level of losses and bankruptcy. The financial crisis has severely mauled the ASEAN economies.

Most banking systems in ASEAN countries have implemented the process of recovery through restructuring and financial reforms. Some banks in their respective countries were taken over by the government, whereas others received government support. For instance, in Indonesia, the local government nationalized 13 banks and closed 70 banks (Hadad, Hall, Kenjegalieva, Santoso, & Simper, 2012); the central bank of the Philippines, Bangko Sentral ng Pilipinas, encouraged mergers as a way to reduce the number of bank failures (Gochoco-Bautista, 1999); and the Malaysian government issued a directive for all domestic banks to merge to create more robust banks.

ASEAN countries were also affected by the global financial crisis in 2008, which was caused by the chaos in the United States of America subprime mortgage market. However, few studies contended that the impact of the global financial crisis towards ASEAN countries was mild as they had learned their lessons from the past crisis in 1997. Das and Gosh (2006) highlighted several important lessons learned from the Asian financial crisis, particularly in the context of policy areas in banking and finance, prudential regulations, microeconomics, macroeconomics, and global financial architecture.

Following the globalization in the late 1990s and the global financial crisis in 2008, these trends have shown significant influences of banking markets on ASEAN. ASEAN countries are challenged with the efforts to hold a sustained recovery from the past crisis. In this vein, the global trends have revived the need for ASEAN to continue to work for further integration among its members. At the 19th ASEAN Banking Conference 2012, Kuala Lumpur, ASEAN banks aimed for regional economic integration, and ASEAN banks serve as the important intermediaries in increasing the connectivity among ASEAN members and supporting the financial integration in the region. The ASEAN Banking Integration Framework (ABIF) provides important guidelines for qualifying the banks and promoting financial stability in the ASEAN region (Bank for International Settlements, 2012).

Under the framework, the qualifying ASEAN banks that are well managed and have the capacity will be served as the standard-bearers in the region as well as accorded with more flexibility to access into the regional markets. Also, the framework assists the qualifying ASEAN banks in their regional expansion plans as they serve as financial intermediaries in the region. The issues of the banking reform and banking integration provide a unique feature of the ASEAN banking market for this study to embark upon the issue of ASEAN banking performance. In addition, ASEAN countries are moving toward strengthening their economic and financial ties.

Past crises have shed some light on the role of the banking market to foster economic advancement and country development. The failure of a financial regulatory to monitor and control risk associated with financial innovation creates instability in the financial system that failed to utilize capital and large inflows of volatile short-term foreign capital into weak and inefficient financial systems, which are the immediate catalysts of the crisis (Estrada, Park, & Ramayandi, 2010).

Financial development reflects the country's institutional characteristics and foster growth at the macroeconomic and microeconomic level. The efficiency of the banking sector in term of quality and innovation reflects the level of the competition. However, competition is correlated to efficiency, quality of the services, and product and innovation of the sector. With adequate prudential supervision, financial innovation can promote the soundness and efficiency of financial markets (Bongini, Iwanicz-Drozdowska, Smaga, & Witkowski , 2017). Lack of confidence in the macroeconomic stability may hamper financial intermediation and results in capital flight; hence, ASEAN has adopted market-oriented financial sector and expanded the funding sources (Claessens & Laeven, 2005; Cojocaru, Hoffman, & Miller, 2011).

Thus, the present study offers the insights into the banking performance by examining the efficiency performance of ASEAN banks over the study period of 2011–2016, as well as investigating the market structure of the banks and its competition. Next, the nexus between financial development, competition, and efficiency of ASEN banking sector is also tested in this study. The next section presents the review of past studies consist of theoretical studies and empirical studies, follows by data and methodology section. The subsequent section presents the empirical findings, the discussion of the results, and the final section concludes the study.

Past Studies

The financial sector has become a tool to liberalize the economy further by providing the incentives and preferential tax treatments to improve financial sector performance, boost economic growth in many countries, and promote financial development (Balmaceda, Fischer, & Ramirez, 2014; Hamadi & Bassil, 2015; Huat, Lim, & Chen, 2004; Ito, 2006; Klein & Olivei, 2008; Lee, Lin, & Zeng, 2016) Fischer, & Ramirez, 2014; Hamadi & Bassil, 2015; Huat, Lim, & Chen, 2004; Ito, 2006; Klein & Olivei, 2008; Lee, Lin, & Zeng, 2016. The development of the financial sector depends on foreign capital investments and the development of new technologies and innovations (Hicks, 1969; Schaeck & Cihák, 2012). The revolution of financial development benefits the financial sector by mobilizing savings to the highest return, acquiring information, monitoring investment project, assisting the diversification, and management of risk (Huang, 2010; Sahay, Cihák, N'Diaye, & Barajas, 2015)"

Financial development also encourages risk-sharing while reducing financial constraints and enhancing the ability of firms and households to absorb shocks. As a result, financial development enhances greater consumption, boosts economic growth, and develops the demand for financial services, thereby reducing the poverty rate (Ranciere, Tornell, & Westermann, 2006; Robinson, 1952). Moreover, financial development enhances efficiency in the allocation of resources, and having a stronger financial system reduces the liquidity risk and enables the management of risk by both savers and investors (Sauvé, 1999). Financial development intensifies competition in the financial sector by the entry of new firms in the banking sector and triggers a competitive environment. Competition among the financial sectors creates the environment for the consumers to expect higher quality, better than the competitor's product offerings, and improved production methods or usage of new technologies (Kokkoris, 2014)

Banks in the market are interdependent, whereby one player has a significant impact on another player. Besides that, competition increases the banking sector's performance to an efficient point and contributes to the economic growth of countries. Ideally, efficient banks trigger the economics of a nation with better allocation of credit, create opportunities for accumulating wealth,

and invest in high social value projects, which will increase the living standards of people (Samargandi, Fidrmuc, & Ghosh, 2014). Competition among banks hampers waste and fraud, thus boosting efficient use of scarce resources and reducing the cost (Gimet & Lagoarde-Segot, 2011).

Competition enhances the role of banks in the economy to increase banking efficiency and foster the development of the financial sector (Eshete, Tesome, & Abebe, 2013). The financial institution with greater market power or higher concentration ratio will increase the banks' capacity to expand their activity across national boards, thus enhancing performances (Uddin & Suzuki, 2014). Competition allows financial deregulation and encourages banks to take more risks, which will lead to higher profit and reduce bank charter values (Klein & Olivei, 2008). A higher degree of competition reduces the monopoly power of banks, which eventually reduces the cost of the bank. Nevertheless, competition may lead to instability of the financial sector because competition tends to increase risk-taking incentives, leading to a higher probability of bank failure (Iskenderoglu & Tomak, 2013; Kokkoris, 2014).

In light of the above points, the fundamental idea of a financial institution in the early era of the establishment is a market-friendly set of incentives that can encourage the accumulation of capital and more efficient allocation of resources (Ahmed & Islam, 2009). With the same thought, the financial sector opens up for foreign investment from the point of view of creating and increasing a healthy financial market competition; reducing monopoly powers, particularly in the commercial banking sector; and most importantly raising the efficiency of investment. Besides that, financial markets provide more opportunities for foreign investors to invest, leading to spillover into savings and investment, which contributes to higher growth and development in the long run.

The structural-conduct-performance (SCP) paradigm is developed by Mason (1939) and Bain (1956) to explain the influences of the structural character of the market towards conduct and performances of firms. Structural and conduct determine the performances of the firms and the market. The SCP paradigm analyses the market and industries based on the behavior of the firms. Theoretically, the SCP paradigm suggests a concentrated market competition. As a result, firms

earn market power and acts as a monopoly; firms would increase the price and reap the high revenue. In the context of the banking sector, a highly concentrated banking market reduces competition by fostering collusive behavior among large banks.

Nevertheless, Demsetz (1973) claimed that market structure (SCP) has the potential to create an endogeneity problem. New ideas are developed based on SCP, namely the efficient-structural hypothesis (ESH). The idea of ESH is a positive relationship between rates of return and market concentration; as a result, performance leads the structural. The market power is not gained through concentration but rather by differentials in the efficiency of the banks. Efficient banks gain market power and market share through good management and low production cost with increased concentration, but less efficient banks lose their market power (Goldberg & Rai, 1996).

Fundamentally, the ESH has evolved into two major hypotheses: competition-efficiency and competition-inefficiency (Schaeck & Cihák, 2010). The competition efficiency suggests that an increase in competition leads to an increase in the efficiency of firms. Competition efficiency suggests that increase in competition by entry or more of local competitors increases the efficiency of the banks in terms of specialization, adopted lending technologies, reduced processing cost, lowered banks' credit risk, and better borrowers screening (Zarutskie, 2013). Otherwise, competition inefficiency hypothesis believes that competition reduces the banks' efficiency. Under this hypothesis, competition and efficiency have a negative relationship where an increase in competition makes banks less stable, increase the cost of amplified information asymmetric, screening, and borrowers monitoring (Boot & Schmeits, 2005; Weill, 2003).

As the structural reform targets banking efficiency, the stride towards competition is inevitable. A strong and resilient banking system should support economic efficiency and stability, where efficiency is closely related to the optimal competitive structure (Northcott, 2004). As far as this study is concerned, no known studies have investigated the relationship between competition and efficiency in the ASEAN banking market. With regard to structural reform in the Asian banking industry, it would be interesting to investigate efficiency, competition, and their relationship within the developing economies context.

Methods

Description of Data
This study covers 78 banks over the study period of 2011–2016. The largest number of banks covered by the study comes from Indonesia (22), followed by Cambodia (21), Thailand (15), Malaysia (7), Vietnam (6), the Philippines (3), Singapore (3), and Brunei (1). To maintain consistency across countries, the analysis included only commercial banks. The bank-level data used were taken from BankScope spreadsheets published by Bureau Van Dijk (1991), which publishes corporate information and business intelligence. All financial variables reported are in nominal values of U.S. dollar (million) to facilitate comparison over time. All the variables are deflated by the consumer price index to obtain real values, with 2011 as the base year.

Measuring Market Structure
The Herfindahl-Hirschman index (HHI) is employed to measure market structure:

$$HHI = \sum_{i=1}^{3} s_i^2 \qquad (1)$$

The HHI is calculated by summing the squared market shares of all banks in the industry. The HHI illustrates market concentration ratio. If HHI <1500, the degree of market concentration is competitive, but if HHI < 2500, the degree of market concentration is moderately concentrated, and if HHI > 2500, it shows a highly concentrated market.

Measuring Efficiency
Data envelopment analysis (DEA) is employed to measure the relative efficiency performance of firms by transforming inputs into outputs. On this note, DEA measurement allows multiple outputs and inputs to be reduced to single input (x_i) and output (y_i) by optimal weighs (Charnes et al., 1978). Due to the nature of banking market, the input-oriented DEA is utilized as commercial banks dwell well on the sources of input waste (Isik & Hassan, 2003). Additionally, the variable returns to scale is applied (Banker, Charnes,Cooperm 1984) as firms may experience economies or diseconomies of scale.

To measure the efficiency for each bank, the ratio of all inputs is computed, such as (u'yi/v'xi) where u is an M*1 vector of output weights and v is a K*1 vector of

input weights. To select optimal weights, the following mathematical programming problem is specified as:

$$\min (u'yi/v'xi), \quad u,vu'yi/v'xi \leq 1,$$
$$j= 1,2,3\ldots, N, u,v \geq 0 \tag{2}$$

The formulation has a problem of infinite solutions, and therefore, the constraint v'xi=1 is imposed, which leads to:

$$\min (\mu'yi), \mu,\varphi$$
$$\varphi'xi = 1 \tag{3}$$
$$\mu'yi-\varphi'xj \leq 0, \quad j=1,2,3\ldots, N, \mu, \varphi \geq 0$$

where the notations are changed from u and v to μ and φ to reflect the transformations. Using the duality in linear programming, an equivalent envelopment form of this problem can be derived:

$$\min \Theta,$$
$$\Theta, \lambda$$
$$yi+Y\lambda \geq 0 \tag{4}$$
$$\Theta xi-X\lambda \geq 0$$
$$\lambda \geq 0$$

where Θ is a scale representing the value of the efficiency, score for the *i*th bank which will be in the range between 0 and 1. λ is a vector of N*1 constants. The linear programming has to be solved N times, once for each bank in the sample. To calculate efficiency under the assumption of VRS, the convexity constraint (N1'λ=1) will be added to ensure that an inefficient bank is only compared against banks of a similar size, and provide the basis for measuring economies of scale within the DEA method.

The selected inputs for this study are deposits, fixed assets, personnel expenses and the outputs are loan and other earning assets based on previous studies by Ab-Rahim (2015); Wu et al. (2016). In general, the focus of this study is to examine the process of ASEAN commercial banks, which have similar products and services and examine the banks as an intermediation approach. The intermediation process is transforming the inputs (deposits, fixed assets, and

personnel expenses) to generate outputs (loans and other earning assets) and generate income. Basically, deposits represent the source of funds in the short term, whereas fixed assets include buildings and offices that can be used in the long term. Personnel expenses represent staff to produce intermediates and generate income (interest-based or non-interest-based income).

Measuring Competition

Lerner index is a non-structural indicator of the degree of market competition and it is an inverse measure of market power. The index has been employed in several studies such as Fernandez de Guevara, Maudos, and Perez (2005); and Maudos and Fernandez de Guevara (2007) and it can be expressed mathematically as:

$$Lerner_{it} = \frac{p_i - MC_{it}}{p_i} \tag{5}$$

where p_i the price of production output Q and is calculated as total revenue (interest plus non-interest income) divided by total assets. Lerner index is an inverse index of market power; hence, if the index equal to zero; it indicates firm has no market power but the firms are very competitive while index closer to 1 indicates relatively weak competition. Additionally, the marginal cost (*MC*) is obtained by taking the first derivative of the translog cost function as specified in Equation (10):

$$MC_{it} = \frac{TC_{it}}{Q_{it}}(\alpha_1+\alpha_2 \ln Q_{it}+\alpha_3 \ln Q_{it}+\alpha_{24} \ln Q_{it}+\varepsilon_{it}$$
$$\alpha_{24} \ln Q_{it}+\varepsilon_{it}) \tag{6}$$

It is assumed that the banks' flow of goods and services is proportional to its assets. The price of assets is computed as total interest income divided by total assets. To derivwe at marginal cost, a translog cost function is adopted as it does not require too many restrictive assumptions about the nature of the technology. The multiproduct cost function for a given bank *i* at time *t* follows Pruteanu-Podpiera, Weil, and Schobert (2008) as specified below:

$$\ln TC_{it} = \alpha_0 + \sum_{j=1}^{2}\alpha_j lny_{jit} + \frac{1}{2}\sum_{j=1}^{2}\sum_{k=1}^{2}\alpha_{jk} lny_{jit}lny_{kit} + \sum_{m=1}^{3}\beta_m lnwmit$$
$$+\frac{1}{2}\sum_{m=1}^{3}\sum_{n=1}^{3}\beta_{mn} lny_{mit}lnw_{nit} + \sum_{j=1}^{2}\sum_{m=1}^{3}\delta_{jm} lny_{jit}lnw_{mit} +v_{it}+u_{it} \tag{7}$$

Bank costs (*TC*) are functioned to output or total loans (*y*), the input prices (*w*) which are P_L as the price of labor, P_K as the price of physical capital, P_D as the price of borrowed funds, and *α = 1, 2, ..., 9* are parameters to be estimated. v_{it} is a two-side error term to capture the effects of statistical noise, assumed to be independently, identically, and normally distributed with zero mean and variance σ_u^2 and independent of the u_{st}. Standard symmetry restrictions of linear homogeneity in input prices are imposed by normalizing total costs and input prices by one input price (P_D). The symmetry condition requires $\alpha_{ik} = \alpha_{ik} \; \forall i, k$ and $\beta_{jm} = \beta_{mj} \; \forall j, m$.

Finally, the Lerner index is averaged over time for each bank i for inclusion in the regression model, and it is the measure of competition that is computed at the bank level. The Lerner index elaborates the level of mark-up by the banks. Generally, the index is between 0 and 1. If the Lerner index is closer to 0 means that banks have no market power, and the market is perfectly competitive. Index closer to 1 means that banks monopolize the sector, and an increase in mark-up refer to high market power. In theory, the Lerner index value has a positive sign, where the price is slightly higher than the marginal cost in a competitive environment. For some cases, the index might have negative value and sign due to high competition—this cause banks to purposely reduce the price less than the marginal cost to compete with other banks (Hamza & Kachtouli, 2014; Maudos & Fernandez de Guevara, 2006).

Empirical Models

The study examines the impact of financial development, competition, and efficiency of the banking sector of the ASEAN countries. Based on the objectives of the study, there will be two main empirical models expanded to six in order to identify the impact of individual variables. The main two empirical models of this study are based on the following equations:

$$EFF = f(FD, LI, MS, GDP) \qquad (8)$$

$$LI = f(FD, EFF, MS, GDP) \qquad (9)$$

where EFF refers to the efficiency of the banking sector measured by the DEA method. LI stands for the competition index calculated by the Lerner index. FD represents the domestic credit provided by the

financial sector (percentage of GDP) as an indicator of financial development. This proxy represents financial deepening, the process of improvement in the financial sector, encourage people to access banking, and foster the process of investment and saving. MS is a subset for market structure, measured using HHI, whereas GDP represents the control variables, which consist of real GDP in a business cycle.

The main explanatory variables are examined and treated as exogenous or endogenous to ensure that causal reasoning remains critical (Boyd & Smith, 1996; Jin, Liu, Liu, & Yin, 2014). Bank-level variables have an endogeneity problem, which leads to bias estimation. To overcome the endogeneity problem, this study employed an econometric methodology, the generalized methods of moments (GMM) approach by Arellano and Bover (1995) and Blundell and Bond (1998). To measure the nexus between financial development, market power (competition), market structure, and GDP, GMM by Arellano and Bover (1995) is employed as:

$$Y_{it} = \alpha + \beta_0 X_{it} + \Upsilon_1 Y, it + \Upsilon_2 Y_2 it + \varepsilon it \qquad (10)$$

where:

Y_{it} = Competition or Efficiency
X_1 = Financial development
X_2 = Market structure
Y_1 = GDP

Y_{it} is the dependent variable (efficiency score and market power) where it shows the year and the respective country in this study. X_1 and X_2 are the independent variables, and Y1 is the control variables. This study examines the nexus between financial development, market power, market structure, and GDP. The variables for efficiency score of the banking sector are measured by the DEA method. The Lerner index, representing the competition level, calculates market power stand. Domestic credit provided by the financial sector (percentage of GDP) indicates financial development. Market structure is measured using HHI to determine the concentration ratio of the market, and GDP represents the control variables that consist of real GDP in a business cycle.

The standard panel data estimators, such as random effect and fixed effect estimator, are biased in the dynamic panel data model because the lagged

dependent variables are correlated with the error term (Baltagi, 1995). According to Arellano and Bond (1991) and Arellano and Bover (1995), the use of GMM is proposed as an estimator to solve the biased problem and take account the country-specific effects and control for endogeneity, measurement errors, and omitted variables in the OLS regression.

Although Arellano and Bover (1995) and Blundell and Bond (1998) found that difference GMM estimator suffered from a weak instrument's problem and solved the issue by developing a system GMM estimator. The assumption will be an appropriate instrument with the addition of the overall validity of the instrument test, auto correlated test, and unit root test. Sargan test is employed to test the overall validity of the instrument. However, the second autocorrelation test employed to test the error term shows a serial correlation. The system GMM estimator improves the precision of the estimates compared to difference GMM estimator, and it also reduces the infinite sample bias. Arellano and Bond (1991) also proposed one-step and two-step GMM estimators. The one- step estimator uses an individual specific weighting matrix, but the two-step estimator uses the error of heteroscedastic (Hamadi & Bassil, 2015).

Results

Descriptive Statistics

Table 1 presents the descriptive statistics of market structure, efficiency, competition, and the financial development for ASEAN banks over the period of 2011 to 2016. This study covers the commercial banks (local and foreign banks) and the datasets consists of Brunei (1 bank), Cambodia (21 banks), Indonesia (22 banks), Malaysia (7 banks), the Philippines (3 banks), Singapore (3 banks), Thailand (15 banks), and Vietnam (6 banks), with a total of 78 banks over the years between 2011 and 2016.

Based on Table 1, this part discusses the country level's statistic summary. The average concentration ratio of ASEAN banking sector is 3787.17. The Lerner index average of ASEAN banking sector is 0.44. In conclusion, ASEAN banking sector is a highly concentrated and competitive sector. The average values of technical efficiency, pure technical efficiency, and scale efficiency are 23.9, 57.5, and 57.1, respectively. ASEAN banking sector is more efficient under pure technical efficiency compared to technical efficiency and scale efficiency.

Empirical Results

Structurally speaking, a high value of HHI shows a concentrated banking market and a low level of competition. In the same vein, a high Lerner index implies high market power with low level of competition. The HHI has a crucial part in the enforcement process of antitrust laws in the banking sector. The concentration index plays an important role in determining the characteristic of the banking market, perceptions of the relative impact on large and smaller banks on competition in a market, and impact of the size distribution and number of banks. HHI reflects the entry or exit of a bank into the markets, measurement of

Table 1

Summary of Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Herfindahl-Hirschman Index	48	3,787	3,078.89	912.07	10000
Lerner Index	48	0.44	0.11	0.31	0.68
Technical Efficiency	48	23.92	6.24	13.00	38.42
Pure Technical Efficiency	48	57.54	28.16	16.49	95.72
Scale Efficiency	48	57.14	28.54	20.94	100
Financial Development	48	86.76	49.96	7.16	171.68
Gross Domestic Product	48	25.79	1.41	23.16	27.56

Note: DCFS is a proxy for financial development. LGDP is the logarithm of gross domestic product. Obs is the number of observation. Std. Dev. is standard deviation.

market behavior of banks, and determine the influence of the market changes. In other words, a big player in the market will influence or force the small player to act competitively or the other way around.

Table 2 presents the HHI of ASEAN banks over the period between 2011 and 2016. HHI can be categorized into three types: HHI up to 1500 is a remarkably competitive and concentrated market, HHI up to 2500 is commonly viewed as a moderately concentrated market, and HHI of more than 2500 reflects a highly concentrated market. The combination of the ASEAN banking sector shows a variance of concentration ratio over the period.

Overall, the concentration ratios for Brunei, the Philippines, and Singapore show that their banking sector to be a highly concentrated market. Meanwhile, Vietnam shows a moderately concentrated market. However, the remaining countries—Indonesia, Malaysia, and Thailand—show a competitive environment. Moreover, the concentration ratios of Indonesia, Malaysia, the Philippines, Thailand, and Vietnam show an upward trend over the years.

Nevertheless, the degrees of concentration of Cambodia, the Philippines, and Vietnam show significant changes in the overall market. In this case, Cambodia shows a drastic increase from 2011 to 2015 and decreases in the year 2016; this may be caused by the new banks' entry in the market, thus reducing the market concentration. All the same, the Philippines and Vietnam show a gain in market concentration over the period.

Table 3 presents the regression results of the nexus between financial development and efficiency performance and competition of ASEAN banking sector. Model 1 through Model 3 in Table 4 examines the impact of the financial development on efficiency of the banking sector.

Model 1 shows that the ASEAN banking market power has a negative relation to technical efficiency, whereas competition has a positive relation to technical efficiency. Increase in the market power reduces the technical efficiency. Hence, reduced competition is positively related to technical efficiency. The finding concludes that with less competition in the market, banks can focus on utilizing the resources. When the competition increases, the banks shift their focus to market survival. Besides that, previous technical efficiency is positively significant to the current performances.

The finding of Model 2 indicates that financial development and market structure (HHI) have a negative impact on pure technical efficiency. Increases in financial development and market concentration ratio reduce the pure technical efficiency of ASEAN banking sector. A 1% increase of financial development reduces pure technical efficiency of banking by 0.28%. The 1% increase in market concentration ratio reduces 0.06 of banks' pure technical efficiency. Thus, pure technical efficiency in the previous years have a positive impact on the current efficiency score.

Table 2

Herfindahl-Hirschman Index (HHI) of ASEAN Banks

Year	Countries							
	Brunei	**Cambodia**	**Indonesia**	**Malaysia**	**Philippines**	**Singapore**	**Thailand**	**Vietnam**
2011	10000	1,180.00	1,541.37	1,893.33	5,486.16	3,408.21	1,171.08	1,850.51
2012	10000	1,052.01	1,500.16	1,750.15	5,450.29	3,395.44	1,182.30	1,907.79
2013	10000	7,889.95	1,478.22	1,770.94	5,241.41	3,399.54	1,175.09	2,031.93
2014	10000	7,804.56	1,535.30	1,804.82	5,265.40	3,405.14	1,217.18	2,163.71
2015	10000	7,862.42	1,506.38	1,814.11	5,336.42	3,407.62	1,207.90	2,238.30
2016	10000	912.07	1,577.62	1,950.48	7,964.26	3,399.38	1,286.42	2,368.92
Mean	10000	4,450.17	1,523.18	1,830.64	5,790.66	3,402.56	1,206.66	2,093.53

Table 4

Summary of Generalized Method of Moments (GMM)

Model	Model 1	Model 2	Model 3
Technical Efficiency(t-1)	.923*** (5.12)		
Pure Technical Efficiency (t-1)		1.063*** (12.14)	
Scale Efficiency (t-1)			.2383 (0.39)
Lerner Index (t-1)			
Technical Efficiency			
Pure Technical Efficiency			
Scale Efficiency			
Lerner Index	-.505*** (-1.81)	-.045 (-0.08)	.105 (0.39)
Financial Development	.004 (0.04)	-.271* (-1.82)	-.056 (-0.99)
Herfindahl-Hirschman Index	-.016 (-0.55)	-.058*** (-2.66)	.016*** (3.82)
Gross Domestic Product	.488 (1.19)	.051 (0.99)	.071 (0.52)
Number of Instruments	18	18	18
Number of Observation	40	40	40
AR(1)	0.6890	0.5636	0.3416
AR(2)	0.7936	0.8516	0.4567
Sargan Test	0.9864	0.9999	0.9517

Note: The coefficient is significant at 1% ***, 5% **, and 10% * level.

The empirical results in Model 3 can conclude that market concentration significantly affects the scale efficiency and banking performance on a scale with a coefficient of 0.02. This finding concludes that when the banking sector becomes more concentrated, banks will perform at an optimal scale.

Models 4–6 in Table 5 examine the nexus between financial development, competition, and efficiency of the ASEAN banking sector. Under Model 4, financial development is positively related to market power and negatively related to competition. Financial development increases the market power of the banks while reducing the competition. Nevertheless, economic growth has a negative relation to market power (LI) and is positively related to competition. Besides that, the previous market power of the banking sector has a negative relationship to the current market power. Increase in the past year of market power boosts the competition in the current year.

The nexus between competition and efficiency has been explored. According to the empirical results under Model 5, pure technical efficiency is negatively related to market power (LI) and positively related to competition. Increase in pure technical efficiency boosts competition in the ASEAN banking sector. The result shows that competition is not significantly impacted by banking efficiency.

Based on Model 1 through Model 3, increase in market power (reduce competition) reduces the technical efficiency of the ASEAN banking sector. Financial development and market structure reduce pure technical efficiency. Finally, market structure increases the scale efficiency of the ASEAN banking sector.

Table 5

Summary of Generalized Method of Moments (GMM)

Model	Model 4	Model 5	Model 6
Technical Efficiency(t-1)			
Pure Technical Efficiency (t-1)			
Scale Efficiency (t-1)			
Lerner Index (t-1)	-.102 (-1.21)	-.297*** (-3.66)	-.220*** (-3.03)
Technical Efficiency	.0008 (0.02)		
Pure Technical Efficiency		-.178*** (-4.02)	
Scale Efficiency			.0576 (0.56)
Lerner Index			
Financial Development	.041** (1.92)	.100*** (4.88)	.084*** (2.63)
Herfindahl-Hirschman Index	.007 (0.17)	.006 (0.32)	.001 (0.09)
Gross Domestic Product	-.079*** (-4.44)	-.026** (-2.29)	-.053*** (-2.76)
Number of Instruments	14	14	14
Number of Observation	40	40	40
AR(1)	0.0604	0.2576	0.2757
AR(2)	0.4700	0.3922	0.3372
Sargan Test	0.9898	0.992	0.9985

Note: The coefficient is significant at ***: $p<0.01$; **:$p<0.05$; and *:$p<0.10$ level.

Model 4 through Model 6 examine the nexus between financial development and efficiency to the competition of ASEAN banking sector. The empirical results are that financial development encourages market power and reduces competition. Secondly, pure technical efficiency reduces market power and increases competition. However, economic growth in ASEAN countries reduces the market power of banks and encourages competition.

Discussion

The objective of the study is to investigate the nexus between financial development and performance of ASEAN banks (efficiency and competition). The empirical finding illustrates that financial development is positively significant to market power (negatively to competition) and negatively related to the efficiency of the banking sector (technical efficiency and pure technical efficiency). Besides that, technical efficiency is positively related to competition. The finding of this study concludes that financial development increases market power, which is in line with previous findings by Demirguc-Kunt, Laeven, & Levine (2003), Rioja and Valev (2004), Fathi (2010), Sufian and Habibullah (2012a), Ayadi, Arbak, Naceur, and De Groen (2015), and Schaeck and Cihák (2014).

Financial development is positively linked with market power, which is in line with the previous literature. The financial sector in developing countries is reasonably poor in capital pooling compared to the global standard, giving domestic banks a hard time to compete with foreign banks who can offer lower interest rates, mobilize funds from deposits, and gain more profits with their lower funding cost (Claessens, Demirgüç-Kunt, & Huizinga, 2001; Claessens & Lee,

2003; Demirguc-Kunt et al., 2003; Hübler, Menkhoff, & Suwanaporn, 2008; Micco, Panizza, & Yanez, 2007). According to Frieden (1991) and Haggard and Maxfield (1996), developing countries favor the abolition of restrictions on inflows of foreign capital with restriction of the ability of foreign banks to own and operate in domestic financial institutions. This concludes that the ASEAN banking sector uses financial development as a platform to boost their foreign capital inflow but hinder foreign banking from entering the domestic market to compete.

The nature of banks is closely relative to the development of financial system such as tighter entry requirement and restrictions on banks activities, reduced transaction and production costs, reduced banks efficiency, increased interest-rate margin and overhead expenditure, and increased fragility of banks to hinder competition and increased market power indirectly (Casu & Girardone, 2009; Claessens & Laeven, 2004; Demirguc-Kunt et al., 2003; Hauner & Peiris, 2005; Levine, 2002; Schaeck & Cihák, 2014).

The empirical result of financial development reduces competition and supports the "interest group" theory of financial development (Rajan & Zingales, 2003). Incumbents naturally exist in underdeveloped financial markets and operate a "relationship-based" system to ensure the power of monopoly by hindering the policies that promote the competition because competition reduces the pleasure of monopoly. Financial development is closely related to challenges in the political system (Pepinsky, 2012).

Highly concentrated and high market power enable banks to reduce the competition and increase their price which may lead to inefficient banking market. (De Nicoló, Jalal, & Boyd, 2006; Mirzaei, Moore, & Liu, 2013). High market power allows banks to access cheap sources of finance, exploit the price of the product and services, and excessively expand their scope of activities, which lead to moral hazards, excessive risk-taking, and drive institution and competition policy to privatizations and mergers and acquisitions to monopolize the market (Ariss, 2010). Fathi (2010) argued that financial reformation fails to enhance competition when the institutions are weak. Countries with poor law enforcement have a high impact in terms of financial performance and banking efficiency. Weak institution and inefficient allocation of financial sources will reduce financial development (Achy, 2005; Ayadi et al., 2015).

The results of bank distress are inefficiency in the allocation and underutilizing the resources, subsequently sabotaging the economic and bank growth (Sufian & Habibullah, 2012b). Some of the banks in the ASEAN region have a higher proportion of riskier loan and tend to be inefficient in their intermediation function. The findings of this study are in opposition to the idea of Hauner (2005), where high market power and a large bank are able to access input (source of funds) at lower price and operate at increasing return to scale through efficient and better functioning financial system, thus gaining more profit by specializing the market with resources. Precisely, the result indicates that ASEAN banks have poor performance due to poor management, poor managerial practice, misallocation or under-utilized resources, and lack of good governance (Ayadi et al., 2015; Hasan & Marton, 2003; Kosmidou, 2008; Pasiouras & Kosmidou, 2007; Sufian & Habibullah, 2012b).

ASEAN countries have high market power, with their main incomes from non-traditional activities. Increase in competition allows banks to gain interest-based earning. A competitive environment allows banks to hold more capital (Allen, 2011; Schaeck & Cihák, 2012). Boone (2008) believed that a highly competitive environment among banks causes banks to become fragile when investing in high-risk loans.

The negative impact of financial development and inefficiency of the banking sector can be explained by two possibilities: (1) excessive credit growth, which leads to high economic volatility and financial crisis, and (2) high credit, which leads to potential misallocation, thus reducing the banking efficiency (Arcand, Panizza, & Berkes, 2012). The Asian financial crisis 1997–1998 and global financial crisis 2007–2008 caused financial repression in the banking sector due to lack of good governance and inability to select growth-enhancing projects (Ayadi et al., 2015). Poor regulation and supervision constrain the good allocation of credit. Achy (2005) found that financial development has negative impacts on financial investment regression, resulting in financial repression, weak institutions, and ineffective allocation of financial resources.

On the other hand, previous studies argued that the decline in the efficiency of banks is caused by advances in technology and operational improvements made by regulatory reform. Banks with advanced technologies dominate the sector with lower cost and higher profit. Banks with advanced technology will

form a new efficient frontier. In the same manner, banks with less developed technologies cannot catch up with the changes that the leading banks have made. This causes the poor performing banks with lack of technology to be inefficient and being left behind from the new efficiency frontier, eventually driving inefficient banks out of business in an orderly manner (Gardener, Molyneux, & Nguyen-Linh, 2011; Schaeck & Cihák, 2014).

However, market structure is positively significant to scale efficiency in the banking sector. According to the findings of this study, a highly concentrated market will operate towards an optimal scale. This finding is in line with previous findings by Nguyen and Nghiem (2015), Demirguc-Kunt et al. (2003); and Fathi (2010). Increase in market structure boosts the concentration ratio of the banking sector and it will reduce competition, leading to an increase in market power. Banks can diversify the product to gain more profit. Besides that, a highly concentrated market reduces competition, at the same time, allowing banks to adopt advanced technology to facilitate new services.

Large banks have the ability to explore new business while achieving the economies of scale and scope of growth with better manager or management (DeYoung & Nolle, 1996). High competitiveness among banks will limit the bank's scope and scale activities, thus drawing far from operating optimal efficiency. Demirguc-Kunt et al. (2003) and Schaeck and Cihák (2014) found that concentration ratio in less developed financial systems and subordinate economic development has positive effects on banking efficiency because the institutions have low-quality and weak regulation, which will encourage large banks to merger and acquisitions. A highly concentrated market will improve the efficiency of banks by widening and diversifying the range of products (Amel, Barnes, Panetta, & Salleo, 2004).

The finding states that an increase in market power will reduce competition, thus increasing scale efficiency of the banking sector because banks with superior managerial skills or the best policy practices overcome cross-board disadvantage and can operate abroad efficiently. Besides that, highly concentrated market and efficiency in banks have the advantages of accessing new technology and able to explore innovation in the market to generate profit by providing international services and gain positive spillover effects

from the efficient banks (Berger, DeYoung, Genay, & Udell, 2000; Pasiouras, Liadaki, & Zopounidis, 2008).

The macroeconomic variable of GDP has a negative relationship with market power but increases the competition in the ASEAN banking sector. High economic growth will require high external financial support and growth from more financially dependent sectors. High economic growth attracts a high volume of foreign direct investment to spur domestic investment. The growth of financially dependent sector increases the level of freedom and competition. To meet the demand for financial support, ASEAN banks must reduce the entry cost and motivate new entry in the banking sector to increase competition among the banks. More competitions will reduce market power and cost, which will increase external financing. Increase in competition may affect the role of the financial sector in fostering growth (Claessens & Laeven, 2004). Competition reduces the loan rate, decreases the probability of loan rate, and reduces loan risks, leading to improved health for banks. A competitive environment is a motivator for banks to hold more capital, practice efficient operations, and stability (Allen, 2011; Schaeck & Cihák, 2012, 2014).

Demand for financial services in developing countries is overflowing because developing countries are in the race to catch up with developed countries in boosting economic growth. Banks in developing countries are still underdeveloped and have a lower level of efficiency because of poor governance and poor management, leading to the misallocation of resources. Although the ASEAN banking sector has an underdeveloped system, the demand for financial services is high because of the large population. The main contributions to the Asian crisis are bank inefficiencies, excess foreign borrowing, low-quality credits, and sub-standard regulations (Corsetti, Pesenti, & Roubini, 1999; Radelet, Sachs, Cooper, & Bosworth, 1998).

During the economic boom period, the demand for financial services increase, and societies are turning wealthier. The banks loosen up on their credit standards, which encouraged them to lend more. Developing countries like the ASEAN countries mostly depend on the liberalization of the domestic banking sector (Molyneux, Nguyen, & Xie, 2013). Increase in competition reduces accessibility to credit. This will allow the banks to restructure the focus. Small and

young banks may focus on channeling their funds and loans based on soft information, but large banks focus on various borrowers and diversified loan portfolio (Petersen & Rajan, 1995; Zarutskie, 2013).

Conclusion

In general, the results of the causality test suggest a negative link between cost efficiency and banking competition. The negative relationship between efficiency and competition corroborates the efficient-structure (Demsetz, 1973; Peltzman, 1977; Smirlock, 1985) and the quiet-life hypotheses (Hicks, 1935). The efficient-structure hypothesis postulates that banks with superior management strategies, better technologies, and highly skilled personnel harnessed those attributes to maximize profit. Efficient banks increased their market share at the expense of inefficient banks. Similarly, efficient banks also benefit from economies of scale due to increased bank size. As the market becomes concentrated, banks can exploit their market power with a resultant trade-off between efficiency and competition. The non-competitive market permits bank managers to enjoy a "quiet life," where costs are not kept under control. This results in decreased competition.

Overall, this study presents important evidence on the link between banking competition and banking efficiency in developing countries, particularly in five ASEAN banking markets. Theoretically, intense competition compels firms to put more effort in improving their efficiency. With little or no competition, firms tend to enjoy the quiet life by taking customers for granted and making no effort to enhance their efficiency and productivity. By ensuring that only the most competitive and innovative firms stay in the market, competition improves consumer welfare. Competition benefits customers by making firms more efficient and inducing them to compete on price, improve the quality of their services, and innovate more. Nevertheless, the impact of competition depends on many factors, such as the nature and structure of the industry. Additionally, this study offers evidence that the impact of competition on banking efficiency varies by type of bank efficiency at work in the banking industry.

Over the past few decades, numerous empirical studies have intensively examined the relationship between financial development, competition, and efficiency of the banking sector. However, the results of the previous studies were ambiguous, which motivates this study to investigate the nexus between financial development, competition, and efficiency of the ASEAN banking sector. This study explores the nexus between financial development, competition, and efficiency of eight ASEAN countries namely, Brunei (1 bank), Cambodia (21 banks), Indonesia (22 banks), Malaysia (7 banks), Philippines (3 banks), Singapore (3 banks), Thailand (15 banks), and Vietnam (6 banks) over the 2011 to 2016 period.

The study employed several methodologies to examine the relationship. The main objectives of this study are (1) to determine to competition and efficiency of ASEAN banking sector, (2) to examine the impact of financial development and competition towards the efficiency of the banking sector, and (3) to investigate the impact of financial development and efficiency to banking competitiveness. To determine the competition of ASEAN banking sector, this study employed HHI (structural measurement) and Lerner index (non-structural measurement). The structural measure represents market concentration ratio and non-structural measure that elaborate market power of the banking sector. To investigate the efficiency of ASEAN banking sector, this study employed DEA. The findings of DEA are grouped into three parts: technical efficiency, pure technical efficiency, and scale efficiency. Each group represents an individual explanation and justification. However, to examine the nexus between financial development, competition, and efficiency of the banking sector, GMM was employed.

The empirical results of this study are categorized based on the objectives. The first empirical finding is the competition of the ASEAN banking sector. Concentration ratio based on HHI found that Brunei, the Philippines and Singapore's banking sector are highly concentrated markets. Vietnam showed a moderately concentrated market. On the other hand, Indonesia, Malaysia, and Thailand have competitive markets. In other word, highly concentrated markets are monopoly markets that reduce competition. High HHI refers to high concentration ratio, and most of the banks focus on generating more income and exploit the market compared to fully utilizing the resources. Highly concentration market is less efficient compared to a less concentrated market because of the competition.

To shed some light of the market power of banks, the Lerner index shows that the market power of the banking sector to set the price over the cost of production. A value closer to 1 explain less competition and have a large market power to determine the price and vice-versa. The empirical result of this study found that Malaysia has the highest market power in determining price, followed by Singapore, Brunei, Thailand, Indonesia, Vietnam, the Philippines, and Cambodia. Generally, the ASEAN banking sector is a competitive market (excluding Malaysia). The ASEAN banking sector is providing almost similar products, whereby banks do not have much power to control the market and pricing. Besides that, the ASEAN banking sector is competitive due to the tight regulation of ASEAN countries in order to achieve target Banking Integration Framework (BIF) by 2020 and also to stabilize the financial sector to avoid a financial crisis.

Next, this study further explored the performance of the ASEAN banking sector using DEA approach. The empirical findings are grouped into three: firstly, Thailand and Malaysia are the most technically efficient countries, followed by Singapore, Cambodia, Brunei, Indonesia, Vietnam, and the Philippines. Secondly, under pure technical efficiency, Singapore is the most efficient, followed by Vietnam, Indonesia, Malaysia, Thailand, Cambodia, the Philippines, and Brunei. Lastly, under scale efficiency, Brunei is the most efficient, followed by Cambodia, the Philippines, Thailand, Malaysia, Singapore, Indonesia, and Vietnam. The empirical findings can be concluding as ASEAN banks are not utilizing their resources fully to generate more income. ASEAN banks can adopt the best practice of developed countries' financial sector in order to reduce the underutilize resources and increase efficiency.

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Declaration of ownership

This report is our original work.

Conflict of Interest

None

Ethical Clearance

This study was approved by the institution.

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