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Efficiency and Competition in Banking Industry: Case for ASEAN-5 Countries

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Abstract

This paper analyzes the level of the efficiency and competition (market structure) of ASEAN-5 banking industry from 2005 until 2016. Two methods were employed, i.e. Stochastic Frontier Analysis and Adjusted Lerner Index. The former is utilized to measure the bank efficiency in ASEAN-5 countries and the latter is applied to measure the bank competition (market structure) in ASEAN-5 banking industry. In order to connect the efficiency and competition level of ASEAN-5 banking industry, this study also utilizes quadrant analysis based on three different periods, namely the period before the global crisis (2005-2008), the period after global crisis (2009-2015), and the period after the establishment of ASEAN Economic Community –AEC- (2016). The results reveal that on average, the efficiency and the competition level of banks in ASEAN-5 countries are found to be relatively high. The competition in ASEAN-5 banking industry could be classified as monopolistic where each bank competes by diversifying their products or segments.

Keywords: bank; efficiency; competition; Adjusted Lerner Index; ASEAN.

JEL classification: D24; D40; G21.

1. INTRODUCTION

Bank efficiency can be reviewed from either micro or macro perspectives. From micro perspective, bank efficiency is defined as a condition for a bank that is always required to be able to optimize the use of inputs in maximizing outputs or minimizing costs. While in a macro perspective, bank efficiency is part of the key components in establishing a sound financial intermediation function that further contributes to the creation of financial system stability (Andersen and Tarp, 2003; Fungacova *et al.*, 2013; Khan *et al.*, 2017b). Analyzing the efficiency of banking industry and identifying its market structure are notably significant

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in supporting the scrutiny of banking sector contribution on country's economic development (Thi My Phan *et al.*, 2016; Wang *et al.*, 2013).

The positive performance of a country's banking is closely related to the development of banking performance in regional areas, such as ASEAN. There are two specific reasons for the rapid development of domestic banking industry in ASEAN (Wong and Deng, 2016). First, ASEAN is the fourth largest trading area in the world that has triggered the tight competition of the banking industry in the area to compete for market share. Thus, due to the condition, domestic banks are forced to grow efficiently and develop innovatively from time to time. Next, integrated banking industry and ASEAN Economic Community (AEC) become the second reason in the development of ASEAN banking industry. AEC has a purpose in creating a single market and production base characterized by free flow of goods, services, investments, skillful labors, and capitals. Endorsed by the ASEAN Central Bank Governors, ASEAN Banking Integration Framework (ABIF) is an integrated form of ASEAN finance sector implemented in ASEAN-5 countries including Indonesia, Singapore, Malaysia, Thailand, and Philippines. ABIF aims at increasing bank competition and efficiency as well as at attaining economy of scale by 2020.

Efficiency in private sector can be defined as how a company gains output as much as it can based on a particular numbers of input used (Casu and Girardone, 2009). The concept of efficiency in general can be led to a concept of achieving a maximum result by employing resources optimally. Efficiency in banking industry is a main aspect to create a sound and sustainable financial performance (Chan *et al.*, 2015; Khan *et al.*, 2017a). Banking efficiency can be measured by analyzing the cost structure and profit stability of a bank. Technically, they are managed by a bank through the activity of economic optimization, namely minimizing costs or maximizing profits in the relation of market price and the level of market competition (Schaeck and Čihák, 2008). Minimizing cost defined as minimizing the bank input costs, such as salary expenses, costs of funds, and costs of capitals in order to obtain a particular level of bank output, while maximizing profits described as how a bank gains profits as maximal as it can in a particular level of input (Rezvanian and Mehdian, 2002). To measure the level of efficiency in an economic entity, Saputra (2014) mentions that there are two specific approaches that can be used, namely the non-parametric approach (DEA –Data Envelopment Analysis-) and the parametric approach (SFA –Stochastic Frontier Analysis-).

Competition is described as a situation where some parties are competing to obtain a particular thing. Generally there are two approaches in the theory of competition: structural approach and non-structural approach. The structural approach is a measurement of competition that is based on concentration level and the non-structural one is an approach focusing on information gathered from competition behavior as well as not depending on concentration level (Bikker and Haaf, 2002). Principally, competition among banks occurs due to a competition in acquiring productive resources that will be used for optimizing their profit. There are four factors influencing the competition of banking industry, *i.e.* regulation, fast-growing demand toward bank services, the technology development and innovation in finance markets (Maudos *et al.*, 2002).

Some studies have proven that bank competition is able to influence bank performance that is one of them is bringing positive impact on efficiency level (Casu and Girardone, 2006). In addition, Schaeck and Čihák (2008) argue that competition is able to stimulate banks to be more efficient by determining competitive price or deciding price that is equal to marginal cost in perfect competitive markets. The argument refers to the Efficient Structure

Hypothesis, which states that the higher the market shares, the higher the price than the marginal cost (Khan *et al.*, 2017b).

The negative correlation between competition and efficiency, meanwhile, is based on the Competition-Inefficiency Hypothesis. The banking industry with high competition will have the potential to reduce customer loyalty and disturb the stability of mutually beneficial relationships among banks and their customers in the short term (due to asymmetric information). The condition will force banks to make efforts to suppress the effect of asymmetric information through excessive expenditure on the cost of increasing customer loyalty activities, which in turn can have an impact on increasing inefficiency.

According to Casu and Girardone (2006), inefficiency of competitive banking industry describes that banks are in the situation of struggling with high competition or banks are exploited by market power. Next, another study investigating the relation between efficiency and competition is conducted by Arrawatia *et al.* (2015) finding out a positive relation between efficiency and competition in India banking industry. In the same line Alhassan and Ohene-Asare (2016) reveal that the efficiency and competition of Ghana banking industry are positively related. Pruteanu-Podpiera *et al.* (2008), however, state that efficiency in Czech banking industry is negative to competition.

This study could be distinguished from other previous studies in terms of, first, analyzing the level and interrelationship between efficiency and competition in the ASEAN-5 banking industry; second, inserting three different periods in clarifying the condition of the level of efficiency and competition in the ASEAN-5 banking sector, namely the pre and post periods of global financial crisis and the period of enactment of ASEAN Economic Community (AEC); third, utilizing Stochastic Frontier Analysis in measuring the bank efficiency, and Adjusted Lerner Index in measuring the competition level (market structure) of banking industry. In summary, the results show that the efficiency and competition level of ASEAN-5 banking industry tends to increase averagely and the market structure of the ASEAN-5 banking industry is found to be classified into the monopolistic market structure.

2. EMPIRICAL METHOD

This study includes five countries belonging to ASEAN-5 (Singapore, Malaysia, Indonesia, Thailand, and Philippines) and uses data gathered from the annual finance reports of each bank from 2005 until 2016. Due to the financial statements of each bank analyzed are generally stated in their local currency unit (i.e. bath for Thailand, Ringgit for Malaysia, Peso for Philippines, Singapore Dollar for Singapore and Rupiah for Indonesia), then this paper converts those figures in local currency unit into USD using the middle rate. Since utilizing USD in the analysis, the financial performance of each bank analyzed will be comparable.

Table no. 1 shows the list of the samples of banks used in this study. The samples are chosen based on the biggest total assets owned by banks in each country as well as the availability of data related to the variables of the study. The variables of the study consist of the variable of input, variable of output, profit, and marginal cost. The variable of input includes price of labor (ratio between personnel expenses on total assets), price of funds (ratio between net operating costs on fixed assets), and price of physical capital (ratio between total interest costs on total loan fund). The variable of output consists of total assets and total costs (namely total interest costs and total non-interest costs). Profit is described as bank annual net profit, and marginal cost is additional cost required to gain one unit of additional output.

This paper proposes three stages for its empirical method. They can be described as the stage of efficiency measurement (First Stage), the stage of competition measurement (Second Stage), and the stage of quadrant analysis (Third Stage). In order to measure bank efficiency in the first stage, Stochastic Frontier Analysis (SFA) with 0-1 range score is used. Bank efficiency is getting higher when the score is close to 1. On the other hand, it is getting lower and even it has no efficiency when the value is close to 0. An equation applied in this study is presented below (Coelli *et al.*, 2005).

$$lnQ_i = \beta_0 + \sum_{j=1}^{3} lnW_{ji} + v_i - u_i \quad (1)$$

From the equation (1), *i* represents bank and *j* represents variable of input. Furthermore, *Q* is total assets, *W* is the vector of input variable (price of labor, price of funds, and price of physical capital), *v* represents standard statistical noise, and *u* captures inefficiency.

Table no. 1 – The sample list based on the biggest total assets (in each country)

Names of bank (country)	Types of bank	Total assets (US$ Billions)
Philippines		
BDO Unibank	Private Bank	48.7
Security Bank	Private Bank	16.2
Philippines National Bank	State Bank	14.9
Indonesia		
Mandiri	State Bank	66
BRI	State Bank	63.7
BNI	State Bank	43.1
Malaysia		
Maybank	State Bank	165
Public Bank Berhad	Private Bank	95.4
RHB Bank	State Bank	53.7
Singapore		
DBS Bank	State Bank	322.8
OCBC	State Bank	275.1
UOB	State Bank	222.8
Thailand		
Bangkok Bank	Private Bank	83.6
Siam Commercial Bank	Private Bank	81.4
Khrung Thai Bank	State Bank	81

In the second stage, competition is measured by applying Adjusted Lerner Index, which is the expanded version of Lerner Index and often used in any studies to analyze bank competition by referring bank market power. This method presents capacity of price power by measuring differences between price and marginal cost as a price percentage with 0-1 range score. To get marginal cost for a given bank *i* at the period of *t*, we adopt the method of translog cost function that also used by Kasman and Kasman (2015). It can be written as follows.

$$\ln TC_{it} = \alpha_0 + \beta_1 \ln Q_{it} + \sum_{j=1}^{3} \beta_j \ln W_{jit} + \frac{1}{2}\left[\alpha_{QQ} \left(\ln Q_{it}\right)^2 + \sum_{j=1}^{3}\sum_{m=1}^{3} \beta_j \ln W_{jit} \ln W_{mit} \right] + \sum_{j=1}^{3} \beta_{Qj} \ln Q_{it} \ln W_{jit} + v_{it} + u_{it} \quad (2)$$

In equation (2), *TC* is defined as total cost, *Q* is total assets, *W* is the vector of input variables (price of labor, price of funds, and price of physical capital), *v* captures statistical noise, and *u* represents inefficiency scale.

Total cost, price of labor and price of funds are scaled by price of physical capital to correct the heteroscedasticity and scale biases. The measurement of marginal cost is measured by the equation below (Turk-Ariss, 2010).

$$MC_{it} = \frac{\partial \ln TC_{it}}{\ln Q_{it}} = \frac{TC_{it}}{Q_{it}}\left[\beta_1 + \alpha_{QQ} \ln Q_{it} + \sum_{j=1}^{2} \beta_{Qj} \ln W_{jit} \right] \quad (3)$$

where *TC* in the equation (3) represents total cost, *Q* is total assets, and *W* is the vector of input variable. After marginal cost is computed, then bank competition is measured by applying the formula of Adjusted Lerner Index (ALI) as follows (Kasman and Kasman, 2015).

$$ALI_{it} = \frac{\pi_{it} + TC_{it} - MC_{it}.Q_{it}}{\pi_{it} + TC_{it}} \quad (4)$$

Equation (4) describes π as profit (net profit), *TC* as total cost, *MC* as marginal cost, and *Q* as total output. The value of Adjusted Lerner Index (ALI) ranges from 0 to 1. According to Kasman and Kasman (2015) and Noman *et al.* (2017) the competition market will be defined as perfect if the value of Adjusted Lerner Index is equal to 0 (=0) means that production price is equal to marginal cost. If Adjusted Lerner Index is equal to 1 (=1), meanwhile, it shows there is a structure of monopoly competition market indicating high market power where production price is above marginal cost. In addition, Wibowo (2016) explains that if Adjusted Lerner Index is between 0 and 1 (more than 0 and less than 1), it indicates that the market structure will be a monopolistic competition.

For the last stage, Quadrant Analysis is conducted as a descriptive analysis to map the position of each bank owned by a specific country based on their efficiency and competition level. Quadrant Analysis is also implemented to find out the correlation between the efficiency and competition of ASEAN banking industry. Using Cartesian diagram, Quadrant Analysis has the x-axis (horizontal) and the y-axis (vertical). The x-axis represents competition level, and the y-axis represents efficiency level. The Cartesian diagram, furthermore, has four quadrants. Quadrant 1 (Q1) is the area of banks having high efficiency and high market power (or low competition). Next, Quadrant 2 (Q2) is placed banks with high efficiency and low market power (or high competition). The next quadrants, Quadrant 3 (Q3) is an area provided for banks with low efficiency as well as low market power (or high competition). The last Quadrant 4 (Q4) presents the area for banks having low efficiency but high market power (or low competition). The Quadrant Analysis in this study is grouped into three periods: the period before global crisis (2005-2008), the period after global crisis (2009-

2015), and the period after the establishment of ASEAN Economic Community -AEC (2016). Those periods were chosen because of the availability of data for each bank selected in each ASEAN-5 country. From the results of raw data compilation, it is obtained that the oldest data that is available in complete and can be accessed on-line for all selected samples is started from 2005. The most complete data that can be accessed and compiled is data that explains the conditions in the post-crisis periods (2009-2016). The data related to the period after the establishment of AEC was only available for 2016. When the study was conducting, the latest data after 2016 was not yet fully available for all samples used.

3. EMPIRICAL RESULTS AND DISCUSSION

3.1 The estimation results of efficiency

Table no. 2 describes that banks in Indonesia and Singapore achieve the highest efficiency level. It means that Indonesian and Singapore banking industries have relatively a better performance compared to their counterparts in the ASEAN area. The high efficiency level of bank in Indonesia attained by the state banks with a high rank of total assets ownership as well in the country. Wong and Deng (2016) reckon that state banks tend to increase efficiency more easily that the non-state banks do since state banks have more flexibility in getting resources and managed their specific segment through government policy. Singapore banking industry, meanwhile, has high efficiency because it has more capability in utilizing higher total input as well as creating higher output value.

Table no. 2 - The results of efficiency of ASEAN banking

Name of banks	2005-2008 (pre-crisis)	2009-2015 (post-crisis)	2016 (AEC period)
Philippines			
BDO Unibank	0.21	0.29	0.20
Security Bank	0.14	0.13	0.11
Philippines National Bank	0.12	0.11	0.07
Indonesia			
Mandiri	0.73	0.89	0.92
BRI	0.99	0.91	0.99
BNI	0.99	0.88	0.54
Malaysia			
Maybank	0.77	0.94	0.99
Public Bank Berhad	0.43	0.69	0.80
RHB Bank	0.35	0.46	0.56
Singapore			
DBS Bank	0.99	0.95	0.99
OCBC	0.55	0.66	0.80
UOB	0.92	0.77	0.84
Thailand			
Bangkok Bank	0.65	0.65	0.62
Siam Commercial Bank	0.46	0.61	0.53
Khrung Thai Bank	0.69	0.66	0.53
Average	**0.60**	**0.64**	**0.63**

Source: calculated, 2018

The efficiency of Malaysian and Thai banking industries are seen high enough even though banks in those countries have lower total input than banks in Indonesia and Singapore. On the contrary, Philippines banks have low efficiency scores due to the inability of gaining high output with their high total input. Regarding those finding, it can be concluded that banks with high total assets tend to have higher efficiency than those with low total assets. It is in line with a study conducted by Surifah (2011) finding out that larger banks will enjoy a better resources and lower transaction costs so that they will be better equipped to deal with problems in banking competition.

Table no. 3 - The results of marginal cost and adjusted lerner index

Name of Banks	Marginal Cost	Adj. Lerner Index
Philippines		
BDO Unibank	0.040	0.288
Security Bank	0.035	0.396
Philippines National Bank	0.045	0.287
Indonesia		
Mandiri	0.056	0.307
BRI	0.066	0.335
BNI	0.062	0.239
Malaysia		
Maybank	0.052	0.381
Public Bank Berhad	0.088	0.348
RHB Bank	0.033	0.250
Singapore		
DBS Bank	0.021	0.405
OCBC	0.018	0.433
UOB	0.023	0.457
Thailand		
Bangkok Bank	0.031	0.322
Siam Commercial Bank	0.032	0.378
Khrung Thai Bank	0.030	0.285
Average	***0.042***	***0.341***

Source: calculated, 2018

3.2 The estimation results of competition

To measure the competition of ASEAN banking industry, Adjusted Lerner Index is implemented by measuring differences between price and marginal cost as a price percentage with 0-1 range scales. The value of marginal cost is measured by using the method of translog cost function with Stochastic Frontier Model. Table no. 3 presents the results of the measurement of marginal cost and Adjusted Lerner Index of banks in 5 ASEAN countries. The average value of Adjusted Lerner Index in ASEAN banking industry ranges between 0.2 to 0.4. Those values indicate that the type of industry's competition is monopolistic. The low result of Adjusted Lerner Index, meanwhile, denotes that production price determined by the banks is close to its marginal cost. The low result of Adjusted Lerner Index also shows that bank competition in ASEAN is still relatively high (the value

of Adjusted Lerner Index is closer to 0 than 1). However, the Table also shows that the Singaporean banks tend to have a high market power in their banking market.

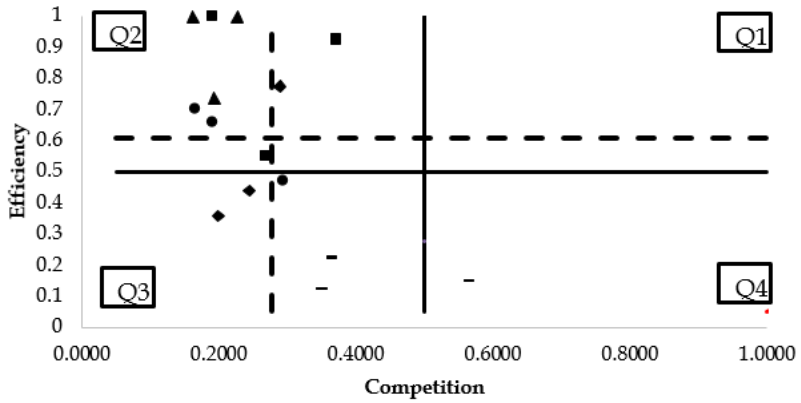
3.3 Quadrant analysis

As a descriptive analysis, Quadrant Analysis is implemented to map the efficiency and competition level of ASEAN banking industry that grouped into three periods, namely the period before global crisis (2005-2008), the period after global crisis (2009-2015), and the period after the establishment of ASEAN Economic Community –AEC (2016). In addition, the analysis also measures the correlation between the efficiency and competition level of ASEAN banking industry.

The mapping results of the efficiency and competition of ASEAN banking industry in the period of before global crisis (2005-2008) are showed by Figure no. 1. From Figure no. 1, we see that ASEAN banking industry in this period tends to have high competition proven by its low market power as well as to have high efficiency. ASEAN banks in 2005-2008 are positioned in Quadrant 2 (Q2) with a condition of high efficiency (the score moves away vertically from the horizon point) and high level of competition (the score moves closer horizontally to the horizon point). Quadrant 2 (Q2) is dominated by the banks of Singapore, Indonesia, and Thailand, while Quadrant 3 (Q3) is dominated by the banks of Malaysia and Philippines. Either Malaysian banks or Philippines' ones have low market power and efficiency, and it indicates that the banks are struggling due to the inability of facing competition with their competitors.

The average competition level of ASEAN banking industry before the global crisis is 0.227 and its average efficiency level is 0.6053. Eight banks from Singapore, Indonesia, and Thailand have efficiency above the average level, and it shows that the banks are able to manage their inputs optimally in order to gain expected outputs. Regarding competition level, meanwhile, there are six ASEAN banks reaching more level than the average competition level. Those banks are dominated by banks from Philippines meaning that Philippines banks seem to be exist in the industry with a higher market power. In this period, efficiency and competition have a negative correlation figure (r=-0.59).

Figure no. 2 presents the mapping results of the efficiency and competition level of ASEAN banking industry after the global crisis. In this period, ASEAN banking industry is likely to deal with the increasing of its market power and efficiency. Quadrant 1 (Q1) describes that there are three banks of Singapore that are able to increase their market power and become closer to monopoly condition. However, the increasing of their market power causes the decreasing of their efficiency although it is not so significant. This condition indicates that Singapore banking industry in the condition of struggling as a signal that the banks are being exploited by the increasing of market power. In Quadrant 2 (Q2), on the other hand, Indonesian and Thai banks as well as Malaysian banks start increasing their efficiency. Next, Philippines banking industry dominates in Quadrant 3 (Q3) and shows that they are in the condition of struggling since they are not able to face competition with their competitors.

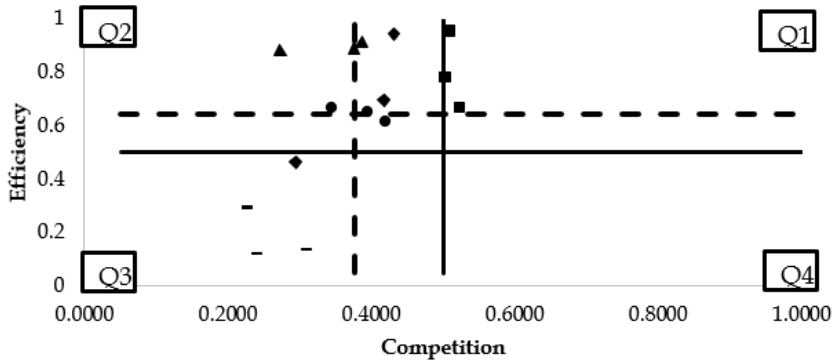


Notes: ■ *banks in Singapore;* ♦ *banks in Malaysia;* ▲ *banks in Indonesia;* ● *banks in Thailand;* ▬ *banks in Philippines; ---- the average value of the efficiency and competition of ASEAN banking industry*

Figure no. 1 - The quadrant of the efficiency and competition level of ASEAN Banking Industry (period before the global crisis, 2005-2008)

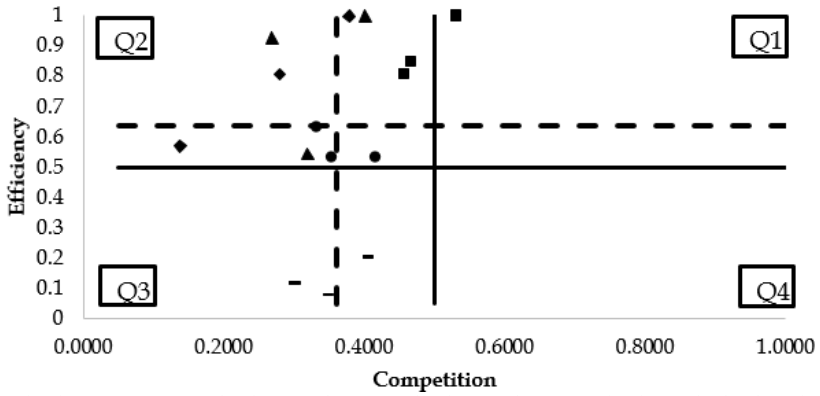
The average level of the efficiency and market power of ASEAN banking industry, even though it is not significant, increases. It happens since the performance of ASEAN banking industry improves. The average efficiency level of ASEAN banking industry is 0.6455, and the average competition level reaches 0.3944. The increasing of market power indicates that the competition of ASEAN banking industry decreases. Banking in Singapore, Malaysia, Indonesia, and Thailand tends to have efficiency above the average level, and it reveals that those countries' banks perform better so that they are able to gain outputs based on inputs they have. On the contrary, banking in Philippines found to have low efficiency score, *i.e.* below the average level. Regarding the correlation between the efficiency and competition level of ASEAN banking industry, we find a positive figure for both of them in the period after the global crisis (r=0.61).

In Figure no. 3 the mapping results of the efficiency and competition of ASEAN banking industry after the establishment of ASEAN Economic Community (AEC) are described. Both bank efficiency and competition level looks increase in ASEAN when AEC is established. The highest market power in this period is positioned in Quadrant 1 (Q1). That position is occupied by DBS, a bank from Singapore that also attains the highest score for the efficiency level in the considered period. In Quadrant 2 (Q2), meanwhile, banks from Indonesia, Thailand, and Malaysia dominate the area. Those banks are considered to be able to compete with their competitors so that it brings effects toward their own productivity and efficiency. Next, Philippines banking still positions in Quadrant 3 (Q3) since AEC and ABIF have not given significant impact on Philippines banking yet. In this period, banks in Philippines tend to have a decrease efficiency level.



Notes: ■ *banks in Singapore;* ♦ *banks in Malaysia;* ▲ *banks in Indonesia;* ● *banks in Thailand;* ▬ *banks in Philippines; ---- the average value of the efficiency and competition of ASEAN banking industry*

Figure no. 2 – The quadrant of the efficiency and competition level of ASEAN Banking Industry (period after the global crisis, 2009-2015)



Notes: ■ *banks in Singapore;* ♦ *banks in Malaysia;* ▲ *banks in Indonesia;* ● *banks in Thailand;* ▬ *banks in Philippines; ---- the average value of the efficiency and competition of ASEAN banking industry*

Figure no. 3 – The quadrant of the efficiency and competition level of ASEAN Banking Industry (period after the establishment of AEC, 2016)

The establishment of AEC aiming at integrating economy brings an effect toward ASEAN banking industry, which is the decreasing of the average level of market power in ASEAN in the level of 0.3602. Although the decreasing is not significant, it is known that AEC is able to trigger banks in ASEAN to increase their competition, and it is in line with one of AEC's purposes: omitting barrier to entry so that banks in ASEAN can expand and establish new branches inside ASEAN. In this period, efficiency and competition level in ASEAN shows a positive correlation (r=0.23); however, the correlation gets weaker since competition increases due to integration on ASEAN finance sector.

4. CONCLUSION

The aim of this study is to analyze the level of the efficiency and competition (market structure) of ASEAN-5 banking industry from 2005 until 2016. From the results, we find that on average, ASEAN-5 banking industry has high efficiency level, even though Philippines banks still show low efficiency scores. For ASEAN-5 banking industry's competition, the competition is categorized as monopolistic where each bank competes by diversifying their products or segments. After doing a period grouping, this paper discovers that efficiency and competition levels in ASEAN-5 tend to increase since ASEAN finance sector is integrated.

In order to increase their performances in the era of ASEAN Economic Community (AEC), ASEAN-5 banking industry should do some improvements, especially in developing the inclusiveness of financial sector in economy through the utilization of technology expansion in financial activities. Based on the results found, the Singaporean banks could be positioned as the benchmark for other ASEAN-5 countries' banks not only for the issues of efficiency improvement but also financial inclusion promotion via the increased utilization of technology in banking industry, such as the development of financial technology and the banking human capital skill.

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