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Analysis of Market Power Hypothesis and Efficiency Hypothesis in ASEAN Banking

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Abstract

ASEAN banking free market will naturally make a high competition of banking industry in 2020. Therefore, the banks need to increase their efficiency in order to compete in banking industry. The main objective of this research is to detect the hypothesis of structure-conduct-performance (SCP) hypothesis and efficiency hypothesis in ASEAN banking industry. In addition, this research also determines the factors influencing profitability and also examines how efficiency is viewed from technical efficiency and the efficiency of the banking industry scale in ASEAN countries. The research object is commercial banks in ASEAN countries during 2009-2015. The sampling method is purposive sampling and this research uses two-step methods. The first method is Data Envelopment Analysis (DEA) to conduct the score of technical efficiency and scale efficiency. The outputs from the DEA are included as dependent variables in the second step, which is panel regression. The result of this research is SCP hypothesis is not applied in ASEAN-5 banking industry. This means there is no collusion in determining price. RMP hypothesis is closely applied to Indonesian and Thailand banking, this means the condition of Indonesian and Thailand banking are using market power in the term of product differentiation. Efficiency hypothesis is applied only to Thailand and Philippines banks, which means profitability in Thailand and Philippines banks are affected by management ability and scale efficiency.

***Key Words**: Structure-Conduct-Performance, Data Envelopment Analysis, Relative Market Power, banking, return on assets, x-efficiency, scale efficiency*
***JEL Classification:** G14, G21, L10*

1. Introduction

ASEAN Economic Community (AEC) will require the banking industry to be more efficient industrial performance in order to compete with other Southeast Asian banks. The matter of concern in the ASEAN banking free market in 2020 will naturally make competition in lending rates. Therefore, ASEAN banks need to be efficient in order to win the competition because people will prefer to borrow at low credit interest rates.

Deorukhkar and Xia (2015) reported on the ASEAN Banking Watch that credit growth decreased in 2012 to 2015 in most ASEAN countries. In Singapore banking industry, credit growth had risen from 13% (2012) to 17% (2013), however it declined again to 13% (2014) and 7% (2015). Meanwhile, Indonesia's industrial credit growth declined sharply from 24% (2012) to 20% (2013), then 11% (2014) declined again to 8% (2015). Thailand banking industry also experienced a decline in credit growth from 17% (2012) to 13% (2013), and then it declined again to 3% (2014 and 2015). Philippines banking industry experienced an increase in credit from 17% (2012) to 33% (2013), however its growth decreased to 23% (2014), and it had a sharp decline to 11% (2015). Malaysian banking industry tended to be stable between 10% and 15% from 2012 to 2015. It was also explained that the decline in credit was due to falling commodity prices, a slowdown in the Chinese economy, concerns over the impact of the expected increase in US interest rates, and structural constraints in the whole country. From a particular country perspective, the differences in the credit cycle throughout the region are largely determined by the quality of structural adjustments made by local authorities and the space available for monetary and fiscal accommodation.

Deorukhkar and Xia (2015) also explained that most of the operating costs in the ASEAN banking industry were still out of control due to the expansion carried out by large banks to enlarge their market share. This can be seen from the ASEAN banking's Cost to Income Ratio (CIR) which is still high. During 2013 to 2015, the banking industry in Indonesia, Malaysia, Thailand and Singapore had CIR between 40% and 50%. Meanwhile, Philippines banking industry has the highest CIR, which is around 59% -70% during 2012-2015. This shows that ASEAN banks are still not efficient in using operational costs. For the Philippines, prudent regulation with the elimination of 60% of foreign ownership by the end of 2014 has helped to increase consolidation efforts to encourage the participation of foreign banks in the Philippine banking sector. However, this sector needs to consolidate further to increase the efficiency ratio.

In terms of competition, it can be seen Singapore dominates market share and has a monopoly structure in its banking industry. This is clearly visible because there are only three large banks that control the Singapore banking industry, namely DBS Holding Group, CIMB, and UOB. Meanwhile

the monopoly system was followed by banks in Malaysia, the Philippines and Thailand because it had a concentration ratio above 60%. Indonesian banks have an oligopoly structure towards monopoly. This shows that there is a possibility that competition conditions in the ASEAN banking industry tend to be very controlling in the market to get profitability.

Table 1: Concentration Ratio of ASEAN Banking During 2009-2014

Year	Indonesia	Malaysia	Filipina	Thailand	Singapura
2009	46.02	67.12	36.45	69.63	79.45
2010	54.80	69.45	39.42	68.06	81.34
2011	44.11	70.43	40.37	58.92	80.45
2012	43.56	71.87	50.27	61.09	83.23
2013	42.65	74.32	59.89	61.64	86.73
2014	43.62	75.43	64.67	63.52	87.56

Source: *Annual Financial Report, Monethary Authority of Singapore, Asssociation of Bank in Malaysia, BSP, Bank of Thailand* (processed)

In addition, economists also argue that in industrial competition that requires efficiency will have an impact on profitability. In performance, profitability is often used as a measure of the extent to which an industry is successful in achieving its performance. Then profitability can be called the spearhead and can arise from market forces or efficiency. Under normal circumstances, profitability will be achieved by the industry if the industry is efficient in competing.

The theory that deals with profitability is caused by market forces or efficiency. The first theory is the hypothesis of structure conduct performance (SCP) which argues that market forces will give banks the power to determine prices so that they can raise lending rates and reduce deposit interest rates, with this condition profitability will increase (Van Hoose, 2010). The most famous research on the SCP hypothesis is Smirlock's (1985) research which examines the American banking industry, the results of his research suggest that concentration and profitability have insignificant relationships while market share and profitability have a positive and significant relationship. This shows the SCP hypothesis is not applied in United States banking industry. Meanwhile, research from Berger (1995) is the first research involving the scale of efficiency and x-efficiency to determine whether the efficiency affects profitability. The results of this study state the positive relationship between x-efficiency and profitability which indicates the existence of the RES hypothesis and the low existence of the SCP hypothesis.

Therefore, this study aims to determine whether profitability is influenced by market structure or because of efficiency. This is important for ASEAN banking industry that will face ASEAN Economics Community (AEC) in 2020 because efficiency will increase competition ability and profitability.

2. Literature Review

Structure Conduct Performance (SCP Theory) is initially a formal framework for variables that explained the market to describe the process that occurred in the market industry was developed by an economist named Edward S. Mason from Harvard University 1930 and further researched by economists afterwards. The framework was finally known as the structure-conduct-performance and became a tool for analyzing the industrial economy used by economists. In its development, several arguments emerged regarding the relationship between relations and influence on each variable that led to the emergence of a paradigm from this theoretical framework.

This theory assumes profitability will be influenced by market forces from market rulers because they are free in collusion. In the banking industry, some market authorities will cooperate in the form of collusion to reduce deposit rates and raise lending rates, this will make banks get greater profits (Van Hoose, 2010). If profitability is influenced by market forces from industrial authorities, then there is an indication of collusion from market authorities to gain profitability. Instead, if profitability is not affected by market forces, then the industry tends not to experience collusion.

The efficiency hypothesis was first suggested by Demzets (1973), he stated that there is a wrong relationship between concentration and profitability because of the factors that cause a company to gain market power and profit is efficiency. There are two efficiency hypotheses proposed by Berger (1995), namely the efficiency factor using the X-efficiency variable and the efficiency scale. Both of these variables have become determinants of profitability in addition to concentration and market share until the last twenty-first century study was conducted by Gajurel and Pradhan (2007) and Chortareas et al. (2011). There are two types of efficiency hypotheses that Berger (1995) introduced, namely relative efficiency hypothesis (RES) and scale efficiency hypothesis (SES). RES hypothesis assumes that the profits obtained by the company are due to cost pressures caused by management having superior capabilities and having robust technology for production. Whereas in the condition of the SES hypothesis, it is assumed that the company gets profit because there is a cost pressure with the cause of the company operating on an optimal scale.

The most well-known research on market structure is from Smirlock (1985) which states that the concentration has no relationship with profitability, however it has a significant and positive relationship with market share. The study also stated a significant positive relationship between market share and profitability as an indication of efficiency. However, Berger (1995) uses other efficiency indicators to determine the value of efficiency, namely using the efficiency scale and x-efficiency as a determinant of profitability. The results of Berger's research suggest that there is a

positive relationship between x-efficiency and profitability, this means that indicates the RES hypothesis.

In German banking industry, Yu and Neus (2005) suggested the entry into force of the SCP and ES hypotheses but developed its profitability by increasing efficiency and consolidating. This condition is called *luck* from both because in addition to internal efficiency, they also have benefit from market forces. Wong, et al. (2007) followed the research of Berger (1995) which included the variable cost efficiency and scale efficiency in the regression. They use two dependent variables, which are ROA and IRS to show pricing the variable. This study presents the ineffectiveness of the SCP hypothesis because there is a negative and insignificant relationship between the concentration of IRS and ROA, however this study supports the hypothesis of X-efficiency hypothesis because there is a significant positive relationship between cost efficiency with the IRS, although it has a negative relationship to ROA. Clark, et al. (2018) show that competition contributes to financial stability in Commonwealth of Independent States (CIS) which verifies the competition-stability hypothesis. In addition, Denisman and Demirel (2018) suggest that higher market power in banking will decrease the risky behavior of banks, it confirms that the banking applied the competition-fragility view. Trinugroho, et al. (2018) found out that competition has an influence on Islamic bank margins, it is more applied in banks with the high profit-and-loss sharing (PLS) lending. The competition level and lower concentration increases the risk-taking behavior of the low capitalized banking (Saif-Alyousfi, et al., 2018).

Jian and Jing (2008) found that concentration also negatively and significantly correlated to ROA, meanwhile bank efficiency had a positive and significant relationship to ROA, however the effect of efficiency on market share and concentration was so small that the SCP hypothesis and efficiency could not be said to be valid in Chinese banking. Gajurel and Pradhan (2010) stated the existence of SCP and QL hypotheses in the Nepal banking industry and weak indications on the X-efficiency hypothesis. Ye et al. (2012) stated that the SCP and ES hypotheses did not apply in the Chinese banking industry, which indicated that profitability did not originate from collusive and efficiency. They stated that the advantages of the Chinese banking industry were derived from market forces in product differentiation capabilities. Ahmed (2012) stated the existence of the SCP hypothesis in the Bangladesh banking industry in the entire asset market, the deposit market, and the credit market which indicated Bangladesh banking was still collusive in all market channels. This is in line with the research of Bhatti (2010) which accepted the SCP hypothesis and it rejected the efficiency hypothesis in Pakistani banking industry.

In addition, Bitar, et al. (2018) shows that higher capital quality increases both bank efficiency and profitability. Peng, et al. (2017) also shows that efficiency and profitability are greatly

influenced by bancassurance which provides substantial benefits for banks for increasing shareholder value. Efficiency is also influenced by non-performing loans which supposed to have a negative impact in terms of technical efficiency (Partovi and Matousek, 2018).

3. Research Method

This research is an empirical study on conventional banks in ASEAN countries during 2009-2016. The data used in this study is secondary data. The dependent variable of this study is return on assets (ROA) as a proxy of profitability. Independent variables are the level of market concentration and individual market share, while the control variables are, LDR, CAR, NPL, GDP, and inflation.

This study uses Data Envelopment Analysis (DEA) model with input orientation and variable return to scale (VRS) method (Charnes, et al., 1978). ASEAN Economics Community will make banks compete to provide credit and other banking services. In addition, market competition will increase because MEA 2020 will make banks to gain a more limited market share. This keeps banks from allocating less credit and opportunities to get interest income and limited fee-based income. So to improve performance, it is assumed that banks will focus more on minimizing inputs. This study uses the approach of bank usability as an intermediary institution because the point of view of this research is to know the ability of banking management as financial intermediation from the surplus unit to the unit deficit.

$$ROAit = \alpha_o + \alpha_2 CR4_t + \alpha_3 MS_{it} + \alpha_4 XEFF_{it} + \alpha_5 SEFF_{it} + \propto_6 CAR_{it} + \alpha_7 LDR_{it} + \alpha_8 NPL_{it} + \alpha_9 GDPg_t + \alpha_{10} INF_t$$

ROA_{it} is the profitability of bank i at period, $CR4_t$ is the market power in period t which is represented by the concentration ratio of four biggest banks, MS_{it} is the market share of bank i at period t represented by market share, $XEFF_{it}$ is x -efficiency bank i in period t, $SEFF_{it}$ is scale efficiency of bank i in period t, the control variables are capital adequacy ratio (CAR), loan to deposits ratio (LDR), non-performing loan (NPL), GDP (GDPg) growth, and inflation (INF).

However, the output of equation 1 cannot be ascertained because the market power is estimated to be related to the efficiency variable. If efficiency is proven to affect market forces and profitability simultaneously, that means there will be an endogenity problem (Ye, et al., 2010). Then, additional testing is needed through the following models (Berger, 1995; Goldberg and Rai, 1996):

$$CR4_t = b_1 + b_2 XEFF_{it} + b_3 SEFF_{it}$$
$$MS_{it} = c_1 + c_2 XEFF_{it} + c_3 SEFF_{it}$$

Based on the formula, SCP Hypothesis is applied if $\alpha_1 > 0$, and at the same time b_2 and $b_3 = 0$. Meanwhile, RMP hypothesis is applied if $\alpha_1 > 0$, and at the same time c_2 and $c_3 = 0$. Meanwhile, RES hypothesis is applied when $\alpha 3 > 0$ || b2>0 (Eq. 2) || c2 > 0 and SES hypothesis is applied when $\alpha 4 > 0$ (Eq. 1) || b3> 0 (Eq. 2) || c3 > 0 (Eq. 3).

4. Result and Discussion

4.1 Efficiency Analysis

This study uses Data Envelopment Analysis (DEA) to measure efficiency. The orientation used in this study is input orientation by using variables returns to scale (VRS) for x-efficiency and CRS / VRS to determine scale efficiency. The first efficiency that is measured is the X-efficiency which describes the superior capabilities of management and advanced technology so that the bank can make cost emphasis (Chortareas et al. 2010). Based on table 4.2, we can see the x-efficiency value of all major banks in ASEAN during the period 2009 to 2016.

Overall, large banks in ASEAN have an average x-efficiency of 85.64%. This shows that to achieve efficiency, large banks in ASEAN must reduce input use by 14.36% (Sufian and Habibullah, 2010). This good x-efficiency score occurs because the sample of this study is the large banks of each ASEAN country, this result supports the research of Karim (2001) which states that large-scale banks will be more efficient than small banks. Another statement from Majid, et al. (2003) which suggested the size of banks influencing efficiency also supported the results of the study.

X-efficiency score of Singapore and Malaysia is the highest, namely 98.66% and 91.49%. The high value of large banks in both countries shows good capability in bank management and the technology they have to create efficiency. Meanwhile the x-efficiency value of the Philippines banks is the lowest, which is 74.2%. This study supports the review of Asian Banking Watch (2015) which shows the highest cost to income ratio data of banks in the Philippines in ASEAN, which is around 60%.

Table 2: X-efficiency and Scale Efficiency Scores

	ASEAN		Indonesia		Malaysia	
	X-Efficiency	Scale Efficiency	X-Efficiency	Scale Efficiency	X-Efficiency	Scale Efficiency
2009	89.90%	90.35%	93.60%	93.29%	90.80%	94.30%
2010	90.12%	90.89%	84.44%	94.80%	93.36%	98.60%
2011	89.32%	92.64%	84.44%	94.80%	93.36%	98.60%
2012	88.65%	93.77%	80.00%	93.28%	89.61%	98.22%
2013	87.11%	94.22%	84.64%	90.21%	93.60%	95.88%
2014	88.37%	94.17%	90.66%	90.30%	93.33%	96.52%
2015	85.32%	93.84%	94.53%	88.32%	90.08%	95.05%
2016	87.14%	93.81%	91.21%	85.84%	90.32%	95.39%

Average	85.64%	91.78%	87.95%	91.33%	91.49%	96.20%
	Thailand		**Singapore**		**Philippines**	
	X-Efficiency	**Scale Efficiency**	**X-Efficiency**	**Scale Efficiency**	**X-Efficiency**	**Scale Efficiency**
2009	80.47%	93.08%	99.46%	99.78%	70.81%	90.45%
2010	91.27%	89.82%	99.78%	99.95%	75.13%	91.34%
2011	91.27%	89.82%	99.78%	96.32%	75.13%	91.34%
2012	91.02%	89.22%	98.96%	96.11%	76.12%	92.72%
2013	93.59%	91.68%	98.79%	97.68%	72.44%	94.98%
2014	91.60%	88.01%	97.68%	96.28%	71.23%	92.05%
2015	90.63%	84.99%	94.84%	97.43%	75.58%	86.15%
2016	89.15%	85.76%	100.00%	97.92%	79.35%	85.00%
Average	88.88%	89.27%	98.66%	97.68%	74.22%	90.32%

ASEAN banks have 91.78% of efficiency, this indicates an inefficiency of 8.22% due to banks operating on the wrong scale, namely in most large banks operating in decreasing returns to scale or increasing return to scale (Tahir et al. 2009). However, the results show that the scale efficiency rate is higher than the x-efficiency value. This shows that large banks in ASEAN are more efficient in managing banks on a scale that is more appropriate than efficiency by relying on management and technology.

Malaysian banks have the highest scale efficiency value compared to other banks during the observation period. This high rate is possible because the expansion of large banks in Malaysia cause an efficiency. Even though the expansion increases costs, however Malaysian banks are able to produce efficient output. This sequence is followed by Indonesia, the Philippines and Thailand. To achieve a perfect scale efficiency, these banks must improve their efficiency in an economical scale and not operate on the wrong scale (Tahir et al. 2009).

Overall, major ASEAN banks have greater scale efficiency score compared to x-efficiency score. This shows the efficiency that is done because the superior capabilities of management and technology have run better because it is shown by the x-efficiency value which is quite high and tends to rise. However, the X-efficiency for all ASEAN major banks and large banks per ASEAN country is still lower in scale efficiency as described in table 4.3. The scale efficiency value is much higher than x-efficiency indicating that the scale attribute is more successful in creating efficiency than the superior ability of management and technology development (Tahir et al. 2009).

4.2 Hypothesis Structure Conduct Performance Test

Based on table 3, it can be seen that there is no concentration variable (α_1) which has a significant and positive effect on profitability. This shows that the main criteria of the SCP hypothesis are not fulfilled in the major banks of ASEAN countries. In this case, there is actually no need for additional testing regarding the effect of efficiency on concentration because the SCP

hypothesis is automatically unacceptable. However, this research still provides the all result of SCP testing in table 3.

SCP hypothesis is not applied in ASEAN banks shows that banks are gaining profit not because of the concentration or collusion of prices of large banks (Van Hoose, 2010). In other words, large banks that control the market conduct collusive behavior to determine favorable prices for the banking sector have an impact on decreasing profits (Bektas, 2006). This is a good condition because if large banks implements low deposit rates and high credit interest rates will be very detrimental to consumers. This supports the research from Jumono (2016) which stated SCP hypothesis applied in Indonesian banking and Katib (2004) who has examined the existence of the SCP hypothesis in Malaysia

Table 3: Testing of Structure Conduct Performance Hypothesis

Symbol	Coefficient					
	ASEAN	**Indonesia**	**Malaysia**	**Thailand**	**Philippines**	**Singapore**
α_1 (CR4 on ROA)	-0.025**	-0.046**	-0.027*	-0.005	-0.012	-0.022
b_2 (XEFF on CR4)	**0.200**	**8.422**	**-1.095**	**-26.144****	**2.969**	1.084**
b_3 (SEFF on CR4)	**-6.722**	**-9.449**	**-2.875**	12.344*	**-3.619**	**-9.911**
SCP Testing (Ye et al. 2010) : SCP: $\alpha_1 > 0 \mid b_2 = 0 \mid b_3 = 0$ Close to SCP: $\alpha_1 > 0$						
The fulfilled criteria	Two	Two	Two	Two	Two	Two
SCP is applied/ SCP is not applied	SCP is not applied	SCP is not applied	SCP is not applied	SCP is not applied	SCP is not applied	SCP is not applied

* significant at 10%, ** significant at 5

The ineffectiveness of concentration on profitability occurs because the Central Bank of Malaysia prevents concentration by issuing periodic interest rate policies, however the discovery of the SCP hypothesis in these three countries it shows that government policies regarding prices do not have a strong influence on large banks. However, this result is not in line with the results from Riewsathirathorn, et al. (2011) which stated the concentration of ASEAN 5 banks with samples from 2008 to 2008 had a significant positive effect on profitability due to weak investor protection laws and the occurrence of major shareholders taking over minority shareholders.

4.3 Testing of Relative Market Power Hypothesis

Based on table 4, Indonesia and Thailand banks are close to RMP hypothesis because market share variables had a significant positive effect on profitability and x-efficiency had no effect on market share for Indonesia and scale efficiency had no effect on market share for Thailand. This

shows the lack of endogenous relationship between market share and profitability because pure profitability comes from market share (Ye et al, 2010). Profit gained by Indonesia's major banks comes from individual banks' market share due to product differentiation until banks can master prices and increase profits without collusion with market authorities. Then the significant negative effect of scale efficiency on market share in Indonesia's major banks is possible because that efficient banks cluster in niche markets and enter small market segments, these small market niches produce small asset growth in each bank to share individual markets decline (Gajurel and Pradhan, 2010).

Table 4: Testing of Relative Market Power Hypothesis

Symbol	Coefficient					
	ASEAN	**Indonesia**	**Malaysia**	**Thailand**	**Philippines**	**Singapore**
α_2 (MS on ROA)	0.006	**0.118****	-0.005	**0.037****	-0.106**	0.001
c_2 (XEFF on MS)	2.022*	1.674	3.179	-4.129**	4.212*	8.029
c_3 (SEFF on MS)	-1.492	-5.554*	-11.592**	1.739	2.238	-4.050
Testing of RMP (Ye et al. 2010) : RMP: $\alpha_2 > 0$ | $c_2 = 0$ / $c_3 = 0$ Close to RMP criteria: $\alpha_2 > 0$						
The fulfilled criteria	One	**Two**	Two	**Two**	One	**Two**
RMP applied/ RMP is not applied	RMP is not applied	**Close to RMP**	RMP is not applied	**Close to RMP**	RMP is not applied	RMP is not applied

* significant at 10%, ** significant at 5%

The major banks of the Philippines have a negative market share coefficient on profit which causes the first criterion of the RMP hypothesis to be rejected. According to Mirzae et al. (2013) the negative coefficient of the market share variable occurs because the more banks have a large market share, then the size of the bank will also increase so as to cause high overhead costs so that it will have an impact on decreasing profitability. However, x-efficiency which has a significant positive effect on market share shows superior management capabilities and technology can make cost efficiency which will have an impact on profit increase (Berger and Hannan, 1998).

Market share variable of Malaysian banks does not have a significant influence on profitability, which shows that the major Malaysian banks do not accept the RMP hypothesis. This discovery contrasts with the theory of the RMP hypothesis that was coined by Shepherd (1982) where product differentiation increases the market share of these large banks so that they can determine prices cannot increase profitability. This could be because the products of these banks individually still cannot attract consumers to invest or borrow from these banks (Chortareas, 2010).

4.4 Efficiency Hypothesis Test

In table 5, it can be seen that only the major Philippine banks approach the efficiency hypothesis of the relative efficiency structure (RES) version by showing the x-efficiency coefficient which has a significant positive relationship to profitability and market share. Because the output of this study only shows that these banks meet two of the three criteria of the RES hypothesis, it can be said that the major banks of the Philippines approach the RES hypothesis (Ye et al. 2010).

A significant and positive relationship between efficiency and profitability and market share explains that management and technology capabilities of the bank will increase market share which will have an impact on increasing profitability. With this result, the big banks of the Philippines can improve management capabilities and technology to increase market share and profitability (Gajurel and Pradhan, 2007).

Thailand banks only fulfill one of the RES hypothesis criteria, however these results can show that bank management capabilities and technology owned by the banks are able to increase profitability even though it will reduce concentration and market share. This is very unique and large Thai banks are advised to improve their efficiency so that what is not sought for efficiency does not reduce market share.

There are no Indonesian and Malaysian banks that meet one of the RES hypothesis criteria because there is no x-efficiency that is significantly related to profitability, concentration, and market share. This indicates that the big banks of Indonesia and Malaysia are not efficient at minimizing their costs, maybe it could be because there is no management and technology action taken or management and the technology is still not successful in increasing profitability. In this case, the input allocation is very questionable (Bektas, 2006).

Thailand banks fulfill one criteria of scale efficiency hypothesis (SES), which is scale efficiency variable that has a significant effect on profitability, this occurs because large banks operating at an optimal scale can reduce costs to achieve large profitability (Berger, 1995) in other words, the more banks operate at an optimal scale will have implications for increasing profits.

Table 5: Testing of Efficiency Hypothesis

Testing of Relative Efficiency Structure (RES) Hypothesis						
Symbol	**Coefficient**					
	ASEAN	**Indonesia**	**Malaysia**	**Thailand**	**Philippines**	**Singapore**
α_3 (XEFF on ROA)	**0.495***	0.125	0.215	**0.912****	**2.902****	0.049
b_2 (XEFF on CR4)	0.200	8.422	-1.095	-26.144**	2.969	1.084**
c_2 (XEFF on MS)	**2.022***	1.674	3.179	-4.129**	**4.212***	8.029
Testing of RES (Ye et al. 2010) : RES: $\alpha_3 > 0$ | $b_2 > 0$ | $c_2 > 0$ Close to RES: $\alpha_3 > 0$ (main criteria), and there are two positive and significant relationships						
The fulfilled criteria	Two	None	None	One	Dua	One
RES applied/RES is not applied	Close to RES	RES is not applied	RES is not applied	Close to RES	Close to RES	RES is not applied

Testing of Scale Efficiency Hypothesis

Symbol	**Coefficient**					
	ASEAN	**Indonesia**	**Malaysia**	**Thailand**	**Philippines**	**Singapore**
α_4 (SEFF on ROA)	0.5833	-0.625	0.416	**1.824****	**3.505****	-0.112
b_3 (SEFF on CR4)	-6.722	-9.449	-2.875	**12.344***	-3.619	-9.911
c_3 (SEFF on MS)	-1.492	-5.554*	-11.592**	1.739	2.238	-4.050
Testing of SES (Ye et al. 2010) : SES: $\alpha_4 > 0$; $b_3 > 0$; $c_3 > 0$ Close to SES: $\alpha_4 > 0$ (main criteria), and there are two positive and significant relationships						
The fulfilled criteria	None	None	None	Two	One	None
SES applied/SES is not applied	SES is not applied	SES is not applied	SES is not applied	Close to SES	Close to SES	SES is not applied

* significant at 10%, ** significant at 5%

Meanwhile, the Philippines' major banks meet the two criteria of the SES hypothesis, namely scale efficiency has a positive and significant effect on profitability and market share. This shows that operating on an optimal scale in the major banks of the Philippines does not only increase its profitability but also its asset market share. This condition approaches the SES hypothesis because it meets two criteria, however because scale efficiency does not affect market share, the SES hypothesis is still rejected.

Then the big banks in Indonesia and Malaysia did not meet any of the criteria for the SES hypothesis because scale efficiency does not affect both profitability, concentration, and market share. This shows that large Indonesian and Malaysian banks that operate on an optimal scale still cannot increase profit, concentration and market share — this is supported by the DEA output on scale efficiency that there are still many inefficiencies on the scale of large banks and more efficiency depends on x-efficiency because of the greater x-efficiency value. This is very

ironic because the scale efficiency value in the previous DEA output shows that Singapore's big banks are efficient.

Table 6: Output Regression

ROA	ASEAN	Indonesia	Malaysia	Thailand	Philippines	Singapore
Constant	**1.633****	0.944	**2.009***	-1.802	-1.330	2.352
CR4	**-0.020****	**-0.046****	**-0.027***	-0.005	-0.012	-0.002
MS	0.012	**0.118****	-0.005	**0.037****	**-0.106****	0.001
XEFF	**0.854****	0.125	0.215	**0.912****	**2.902****	0.049
SEFF	-0.307	-0.625	0.416	**1.824****	**3.505****	-0.112
CAR	**0.062****	**0.056****	**0.081****	**0.059****	**0.121****	**0.052****
LDR	-0.011	0.003	0.003	**0.004****	**-0.027****	**-0.018****
NPL	**-0.049****	-0.053	-0.087	**-0.095****	**-0.019****	-0.111
GDP	0.019	**0.357****	-0.042	0.018	0.019	-0.007
INF	-0.007	-0.027	0.024	-0.062	-0.011	-0.115
Prob > chi / Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.308	0.696	0.497	0.597	0.178	0.692
Number of group	47	10	10	11	11	5

* significant at 10%, ** significant at 5

Table 6 shows that CR4 as a representative of market concentration has a negative and significant effect on profitability in ASEAN banks. The same conditions also occur in large banks in Indonesia and Malaysia. This shows the increasing market power, so that the big banks in Indonesia and Malaysia will increasingly be able to reduce deposit rates and raise lending rates (Van Hoose, 2010), however in this case the small deposit interest rate and high lending rates will cause a decrease in profit. In other words, the profit of Indonesian and Malaysian banks can decrease significantly due to collusion from the rulers of large banks. Khan, et al. (2018) also found that SCP hypothesis is valid in ASEAN banking which means concentration results anti-competitive conduct and it makes higher profitability. This output is in contrast with Maudos and Guevara's (2014) study where concentration has a positive and significant effect on profitability

Meanwhile, market share has a significant positive effect on profitability only for in Indonesia and Malaysia. This shows that banks in both countries have been able to differentiate deposit and credit products so that they can reach individual market forces, this is what will cause these banks to determine prices and lead to rising profits (Chortareas, 2010). This research is in accordance with Ye, et al (2010) in Chinese banking. However, the market share has a negative and significant effect on the big banks of the Philippines. This shows that market forces in determining prices derived from product differentiation will cause a decrease in profit. This must be a concern so that the big banks of the Philippines do not elevate banking products, namely by not raising lending rates and not reducing deposit rates. Then the market share does not have a significant effect on profitability in other countries, this is because these large banks

are still unable to issue differentiated products to attract consumers to borrow or invest (Chortareas, 2010). This research is in accordance with the research from Wong, et al (2007) which stated market share has no effect on profitability in Hong Kong banking industry

X-efficiency has a significant effect on profitability in Thailand and the Philippines banking. This shows that Thailand and Philippines banks have superior management capabilities and sophisticated technology that can reduce costs so that they will increase profits (Berger, 1995). This is consistent with the research from Gajurel and Pradhan (2010), Ye, et al (2010) and Wong, et al (2007) which stated x-efficiency has a significant and positive effect on profitability.

Scale efficiency has a positive and significant effect on profitability in the major banks of the Philippines, and Thailand. This shows that banks in those countries that operate at an optimal scale will be able to lower costs so that they will generate greater profits (Tahir, et al. 2009). This finding is in accordance with the research of Yu and Neus (2006) which stated scale efficiency has a significant effect on profitability.

Capital adequacy as measured by the capital adequacy ratio (CAR) in the major banks of Indonesia, Malaysia, Thailand and the Philippines has a significant positive effect on profitability which means that the greater the capital adequacy of banks in these countries, the profit will increase because the existence of trust from the public and also indicates management efficiency in the capital structure so that profitability can be improved as well as good capitalization and borrowing with a small amount to finance bank operations.

Bank liquidity which is measured by loan to deposit ratio (LDR) has a positive and significant impact on Thai banks. This shows that the greater the credit distributed from the deposit to the consumer will make a profit increase. This condition indicates the ability of credit managers in distributing credit. However, liquidity has a significant negative effect on the major banks of the Philippines. This is possible because the larger the loan distributed will have a greater risk of risk than returns, the bank must be more careful in distributing loans.

Meanwhile the quality of assets measured through non-performing loans (NPLs) has a significant negative effect on profitability in all major banks of Thailand, and the Philippines. This is very reasonable because the reduced quality of bad loans will reduce the risk of loss of lending and can increase operating income which will have an impact on increasing bank profitability (Mala, et al. 2017). NPL does not have a significant effect on profitability. This is possible because of allowance for earning assets can still cover the problem of bad credit. GDP growth has a significant positive effect on the profitability of Indonesia's major banks. This condition shows that GDP growth in Indonesia has an influence on the increase in deposits and an increase in credit which causes rising profitability. A good economy will cause a higher level of financial transactions and a good bank management will increase profit from loans and

securities sales (Sufian and Habibullah, 2010). However, the relationship between GDP growth and profitability is not significant in other ASEAN major banks. This happens because when economic growth increases, there is a consumer's optimism in choosing to save excess funds and take out loans.

There is no inflation rate in the ASEAN region that has a significant effect on profitability in each ASEAN country. This shows that the rate of price increase has absolutely no effect on profitability because the determinants of profitability are more on internal factors, however this shows that bank management cannot utilize the situation in rising inflation to increase profitability. This is consistent with the result from Sheefeni's (2015) which stated inflation does not affect profitability.

5. Conclusion

The level of efficiency in large banks in ASEAN-5 countries on average has a high value both in x-efficiency and scale efficiency. However, profitability which is represented by return on assets (ROA) is not affected by the two efficiencies. The SCP hypothesis that does not apply to large banks of the five ASEAN-5 countries shows that there is no collusion for pricing the ASEAN-5 banking region. The RMP hypothesis only approaches to apply to large banks in Indonesia and Thailand. Although it does not fulfill the full RMP hypothesis, the results show the strength of product differentiation will lead to market forces that can determine prices so that it affects profitability.

The efficiency hypothesis that is divided into RES and SES hypotheses is largely not applicable to all ASEAN's five major banks. This shows the efficiency of management capabilities, technology, and economies of scale cannot improve profitability. As an early warning system, this is a concern for ASEAN-5 major banks. Efficiency still cannot influence the market both in terms of technical and scale, even though efficiency is one of the keys to winning the competition in AEC 2020 in the banking industry. If ASEAN banking still relies on market forces such as market concentration, then competition will be unhealthy especially in collusion problems in pricing. In this case, ASEAN banks must improve their efficiency to win banking competition and to not harm consumers.

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