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Competition and Profitability of Commercial Banks in Thailand under The Financial Sector Master Plan Phase II-III

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Abstract The objective of the present study is to investigate the relationship between competition and bank profitability of 14 commercial banks in Thailand that operated under the Financial Sector Master Plan Phase II-III (2010-2020). Structural and non-structural approaches assessed competition in Thailand's banking industry. Econometric estimation was performed using the one-step GMM model. The findings reveal that the effects of competition on bank profitability varied depending on the approaches and indicators used. Under the structural approach, the concentration ratio (CR5) illustrated that increased competition positively affected bank profitability, as measured by ROA and ROE. The result was different when NIM was used to measure profitability, as reduced competition was found to enhance profitability. Nonetheless, the Herfindahl–Hirschman index exhibited no statistically significant relationship with profitability. Under the non-structural approach, when using the Lerner Index and Boone Index as competition measures, decreased competition was found to have a positive effect on bank profitability, as measured by ROA and ROE. The result differed when PRH was used to measure competition, as PRH indicated that increased competition enhanced bank profitability in terms of ROA and ROE. Lastly, profitability measured by NIM did not demonstrate any statistically significant relationship under this approach.

Keywords Profitability; Competition; Commercial bank; Financial sector master plan; Generalized method of moments

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Introduction

Significant transformations have marked Thailand's financial landscape since the 1997 Financial Crisis. This crisis laid bare the implementation vulnerabilities in Thailand's financial system, prompting concerted efforts from government authorities and private sector stakeholders to revamp the sector. Central to these efforts was implementing the Financial Sector Master Plan (FSMP), a medium-term development strategy spanning five to ten years. The FSMP was designed to rectify the economic downturn, rebuild investor confidence, and set the financial sector on a sustainable growth path.

The FSMP consisted of three distinct phases: FSMP I (2004-2008) aimed at streamlining the financial institution system to bolster stability and efficiency; FSMP II (2010-2014) focused on enhancing efficiency, competitiveness, financial access, and infrastructure, particularly risk management; and FSMP III (2016-2020) sought to establish a competitive financial institution system that could meet diverse needs at fair prices, facilitate regional trade and investment, while preserving macroeconomic and financial stability. An overarching objective across these phases was to foster competition among commercial banks.

Thailand's banking sector, especially the credit market, was characterized by low levels of competition before the FSMP implementation. This was primarily due to the dominance of a few key players in the industry. However, since the initiation of the FSMP, competition has been on the rise and is anticipated to continue its upward trajectory. However, a critical question arises: does increased competition benefit banks' lending activities, or does it bring challenges?

Research by Lerskullawat (2018) highlights that the heightened competition in the Thai banking industry during the third phase of the FSMP led to a weakening of banks' lending channels. This competition-induced challenge can manifest as a profitability crisis, rooted in credit deterioration due to banks' heightened risk tolerance.

Competition is pivotal in shaping the profitability of banks. Empirical studies spanning Europe, America, and Asia have extensively explored the intricate relationship between competition and bank profitability. Two predominant approaches have emerged in this research. The structural approach contends that banks operating in highly concentrated markets tend to exhibit lower levels of competition, resulting in enhanced bank profitability. Conversely, the non-structural approach posits that more efficient banks, characterized by lower production costs, are better positioned to capture larger market shares and demonstrate superior performance.

Before the financial crisis, foreign banks in Thailand exhibited higher profitability than local banks. However, this gap narrowed after the crisis, with local banks surpassing foreign banks in profitability following the implementation of the FSMP. This shift underscores the significant impact of policy measures on bank efficiency and profitability.

This study investigates the relationship between competition and bank profitability among banks in Thailand. The central question guiding our research is whether and how competition correlates with bank profitability in this context. To achieve this objective, we employ both structural and non-structural approaches. Key profitability metrics such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM) are utilized, in line with established practices in the field. Additionally, we incorporate bank-specific and economic factors as control variables, widely acknowledged as influential determinants of bank profitability.

The results of this study hold potential significance for both academic research and practical applications within the banking industry. Moreover, policymakers can leverage these findings to maintain economic stability in banking competition.

Competition and competitive metrics for banks in Thailand

Thailand's banking industry is characterized by low competition (Leenabanchong, 2012), especially following the financial crisis (Kubo, 2006). The credit market has few players and intermediate credit concentration (Srijampa & Vichittharmaros, 2022). The banking industry in Thailand is monopolized and has a declining trend in competition. Notably, competition in the industry in Thailand decreased after 2001- 2003 (Jearviriyaboonya & Sethapramote, 2019). However, competition will likely increase over time, indicating improved resource allocation efficiency in the banking industry (Prayoonrattana et al., 2020).

Measurement of competition in Thailand's banking industry has primarily relied on two approaches. The first is the structural approach, utilizing metrics such as concentration (CR) (Chaisongkram et al., 2020; Lerskullawat, 2018; Prayoonrattana et al., 2020; Srijampa & Vichittharmaros, 2022) and the Herfindahl-Hirschmann Index (HHI) (Chaisongkram et al., 2020; Prayoonrattana et al., 2020; Srijampa & Vichittharmaros, 2022). The second is the non-structural approach, including the Lerner Index for market power (Jearviriyaboonya & Sethapramote, 2019; Kubo, 2006; Lerskullawat, 2018; Prayoonrattana et al., 2020), the Panzar-Rosse H-statistic for elasticities of production factors (Leenabanchong, 2012; Prayoonrattana et al., 2020), and the Boone indicator for efficiency (Lerskullawat, 2018). However, market power (MP) was not found to have been used to measure competition among commercial banks in Thailand.

Empirical research on the banking industry in Thailand has widely attracted interest and explored various aspects, such as studies to explain competition among banks (Kubo, 2006; Leenabanchong, 2012; Prayoonrattana et al., 2020; Srijampa & Vichittharmaros, 2022), studies to explain the effects of competition on financial factors such as loan interest rates, deposit interest rates, and loan volume (Chaisongkram et al., 2020), and studies to explain the effects of competition on bank stability and lending channels (Jearviriyaboonya & Sethapramote, 2019; Lerskullawat, 2018). No studies on the effects of competition on the profitability of commercial banks in Thailand have been found.

Competition and profitability of banks

The empirical literature has mainly employed two approaches to investigate the relationship between competition and bank profitability (Tan, 2020; Tan & Folros, 2014) the structural and non-structural approaches.

The structural approach is based on two hypotheses, namely the Structure- Conduct-Performance (SCP) hypothesis, developed by Mason (1939) and Bain (1956), and the Efficient Structure (ES) hypothesis, developed by Demsetz (1973) and Peltzman (1977). The SCP hypothesis, supported by the New Empirical Industrial Organization (NEIO) approach of Bikker and Bos (2005), posits that collusion among banks may increase profitability in a more concentrated market through higher loan interest rates and lower deposit interest rates. So, high market concentration decreases competition.

The non-structural approach has an advantage over the structural approach, that is, the advantage of directly observing behavior to measure competition. This approach considers factors beyond market structure and concentration that may affect competition, such as market competitiveness, entry and exit barriers, and competitive constraints. It suggests efficient management can lead to better performance, reducing operating costs and increasing market share (Elfeituri, 2015). A bank with a higher market share has more market power and less competition, leading to greater profitability (Mirzaei et al., 2011).

Studies on the structural approach use different metrics of competition. For example, Lerskullawat (2021), Nguyen and Tran (2020) used the Herfindahl-Hirschman Index (HHI). Hsieh and Lee (2010), Lerskullawat (2021), Moudud et al. (2020), Tan and Floros (2014), Tan et al. (2017)

used concentration rate (CR). The results of these studies support the structural approach, indicating that a highly concentrated market has low competition and thus increased bank profitability. There have also been different results. Hu and Xie (2016), Yuanita (2019) found that low competition led to low profitability, using CR and HHI as measures of competition. Alhassan et al. (2016), Hsieh and Lee (2010), using HHI as a measure of competition, did not find any statistical significance between competition and profitability.

Likewise, studies on the non-structural approach have used different competition metrics. Lerskullawat (2021), Sarpong-Kumankoma et al. (2018) used market power (MP) to measure competition. Moudud et al. (2020), Nguyen (2018), Sarpong-Kumankoma et al. (2018), Shair et al. (2019), Tan and Floros (2014), Yuanita (2019) used the Lerner Index (LI). The results aligned with the non-structural notion, which posits that higher market share results in increased market power, reduced competition, and higher profits. Alhassan et al. (2016) had a different result, as no statistical significance was found, using MP as a measure of competition. Moreover, the Boone Efficiency Index was used to measure competition in the studies of Hu and Xie (2016), Lerskullawat (2021), Shair et al. (2019). The findings of the three studies above are consistent with the non-structural concept, which suggests that a bank's profitability is largely determined by its operational efficiency. When a bank operates efficiently, its operational costs are reduced, allowing it to increase its market share and generate more profits. Nevertheless, Tan (2020) found no significant correlation between profitability and competition, using Net Interest Margin (NIM) to measure competition. Similarly, Hsieh and Lee (2010), utilizing Price-Relative-to-Herfindahl (PRH) as a measure of competition, observed no statistical significance in the relationship between competition and profitability.

Data and Research methodology

Data

The present study utilized data from 14 commercial banks in Thailand, given their significance as a crucial funding source and a key driver of Thailand's economy (Subhanij, 2016). The sample comprised 154 bank-year observations from 2010 to 2020, when Thailand employed the Financial Sector Master Plan (FSMP) phases II and III to encourage competition among commercial banks. Bank-level data were sourced from each banks annual report by auditors (BARA), while macroeconomic information was obtained from the Bank of Thailand (BOT).

Variables and measurement

The dependent variable is bank profitability. The indicators are ROA, ROE, and NIM, all of which are common for studying bank profitability (Elekdag et al., 2020; Fernandes et al., 2021; Kanga et al., 2020; Kumar et al., 2021; Lu et al., 2022; Tan, 2020). The dependent variable is expressed in percentages.

- Return on assets (ROA) is calculated by dividing profit before tax by total assets (Djalilov & Piesse, 2016; Elekdag et al., 2020; Fernandes et al., 2021; Kanga et al., 2020; Kumar et al., 2021; Le & Ngo, 2020; Tan, 2020).

- Return on equity (ROE) is calculated by dividing profit before tax by total equity (Elekdag et al., 2020; Fernandes et al., 2021; Islam et al., 2017; Kanga et al., 2020; Kumar et al., 2021).

- Net interest margin (NIM) is calculated by dividing the total interest income minus total interest expense by average interest-earning assets (Kanga et al., 2020; Le & Ngo, 2020; Tan, 2020).

The independent variable is competition.

- Competition is the business operation of a bank to gain an advantage over and generate higher profits than its competitors. There are mainly two approaches to measure competition in the banking industry: the structural approach, which includes CR5 and HHI (Hsieh & Lee, 2010; Lerskullawat, 2021; Moudud et al., 2020; Nguyen & Tran, 2020; Tan & Floros, 2014; Tan et al., 2017), and the non-

structural approach, which includes MP, LI, PRH, and BI (Alhassan et al., 2016; Hsieh & Lee, 2010; Hu & Xie, 2016; Lerskullawat, 2021; Moudud et al., 2020; Nguyen, 2018; Sarpong-Kumankoma et al., 2018; Shair et al., 2019; Tan, 2020; Tan & Floros, 2014; Yuanita, 2019).

- The 5-bank concentration ratio (CR5) is the ratio of concentration, calculated from the ratio of the assets of the five biggest banks to the assets of the entire banking industry (Hsieh & Lee, 2010; Lerskullawat, 2021; Moudud et al., 2020; Tan & Floros, 2014; Tan et al., 2017). A higher concentration ratio means high concentration in the banking industry, indicating that the market structure is highly monopolized and has low competition. This also corresponds to higher bank profitability

- Herfindahl-Hirschman Index (HHI) is the concentration index, calculated by

$$HHI = \sum_{i=1}^{N} \left[\frac{S_i}{S}\right]^2$$

Where N is the number of banks, S_i the total assets of individual banks, S and the total assets of the commercial banking industry (Lerskullawat, 2021; Nguyen & Tran, 2020). High HHI shows higher monopolization and low competition, resulting in higher bank profitability.

- Market Power (MP) is the market share of a bank, calculated by

$$MP_{i,t} = \frac{S_{i,t}}{S}$$

Where i refers to the individual bank and t the period, $S_{i,t}$ is the total assets of an individual bank, S is the total assets of the whole commercial banking industry (Lerskullawat, 2021; Sarpong-Kumankoma et al., 2018). A high index value indicates that a bank possesses greater market power due to its high market share. This leads to decreased competition and increased profitability.

- Lerner Index (LI) is the index of market power, calculated by

$$LI_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}}$$

Where $L_{i,t}$ denotes the market power of the bank i in a year t. $P_{i,t}$ is the average output price, calculated as total income to total assets, $MC_{i,t}$ and the marginal cost at the current output level. Marginal cost is determined by trans log cost function (Laowattanabhongse & Sukcharoensin, 2018; Moudud et al., 2020; Nguyen, 2018; Sarpong-Kumankoma et al., 2018; Shair et al., 2019; Tan & Floros, 2014; Yuanita, 2019). A high index value indicates that a bank possesses greater market power due to its high market share. This leads to decreased competition and increased profitability.

- The Panzar and Rosse (PRH) are the elasticities of production factors to overall revenue. PRH is calculated to find each production factor's elasticity value (β) obtained from the reduced revenue equation. The elasticity is calculated by

$$H = \frac{\beta_1 + \beta_2 + \beta_3}{1 - \beta_0}$$

The sum elasticity in the equation is the H statistic presented by Panzar and Rosse (1987), where each of β is the bank's total income elasticity concerning each price obtained from the reduced-form revenue equations (Hsieh & Lee, 2010; Prayoonrattana et al., 2019). A high PRH value indicates

reduced market power, resulting in more competition as banks cannot use market power to increase prices and consequently gain less profits.

- Boone Index (BI) is the elasticities of profits to the incremental cost, calculated by

$$lnII_{i,t} = \alpha_{i,t} + \beta lnMC_{i,t} + \varepsilon_{i,t}$$

Where the subscript i refers to a bank, subscript t refers to a sample year, $II_{i,t}$ denotes the profit, and $MC_{i,t}$ denotes the marginal cost, β refers to the Boone index (Hu & Xie, 2016; Lerskullawat, 2021; Shair et al., 2019). A bank with efficiency will have a decrease in marginal cost and an increase in profit, which will cause the profit elasticity to marginal cost to be negative. Banks with lower operating costs can gain a higher market share and increase profitability. Therefore, when this index becomes more favorable or less harmful, it means more monopoly, and less competition, resulting in increased profitability.

The control variables are: bank-specific factors, including credit risk, capital, bank size, and bank efficiency; and economic factors, including GDP and INF. Both groups of factors are well-known and widely used to study determinants of bank profitability (Kanga et al., 2020; Le & Ngo, 2020; Lerskullawat, 2021; Paukmongkol, 2023; Tan, 2020).

- Credit risk (AQ) is also often used to measure credit risk management. AQ is measured by calculating the ratio of the non-performing loans to total loans (Daq & Nguy, 2020; Elekdag et al., 2020; Islam et al., 2017; Le & Ngo, 2020; Malini, 2020; Tran & Vo, 2018). A bank with low credit quality shows that it has a high amount of non-performing debt compared to its consolidated loans. Poor asset quality leads to higher bank provisions, and the bank consequently loses its opportunities for credit expansion. Furthermore, deterioration in asset quality means loss of interest income from loans, and profitability of the bank will decrease accordingly.

- Capital (CA) is often used as a measure of credit risk management. CA is measured by calculating the ratio of capital adequacy to total risk assets (Daq & Nguy, 2020; Kanga et al., 2020; Kirakul et al., 2019; Kumar et al., 2021; Le & Ngo, 2020; Malini, 2020; Paukmongkol, 2022; Tan, 2020). Good capital adequacy indicates that a bank has good financial stability and low financing costs, resulting in profitability.

- Bank size (AS) is bank size with the natural log of the bank's total assets. There are mixed findings on the impact of bank size on bank profitability: Smirlock (1985) suggested that size has a positive impact, Tan and Floros (2012) that it has a negative impact, and Shehzad et al. (2013) that there is no relationship.

- Bank efficiency (OC) is often used to measure operating efficiency. OC is measured by calculating the ratio of operating expenses to total revenue (Daq & Nguy, 2020; Elekdag et al., 2020; Kumar et al., 2021). If efficiency in managing the bank's expenses is reduced, there will be a decrease in the bank's profitability.

- Gross domestic product (GDP) is measured by calculating the rate of gross domestic product growth (Kanga et al., 2020; Kumar et al., 2021; Le & Ngo, 2020; Tan, 2020). When economic growth is boosted, the economy and investment will expand. Consequently, the bank's credit will expand, and banks will gain more income, and profits. On the other hand, an economic downturn, indicated by a lower gross domestic product growth rate, will result in a decline in economic activity. Borrowers may also have lower repayment capacity, leading to lower bank income and profitability.

- Inflation (Inf) is measured by calculating the rate of change in the consumer price index (Kumar et al., 2021; Le & Ngo, 2020; Tan, 2020). Mild inflation promotes economic expansion. Banks will expand loans and adjust interest rates to gain more income, thus increasing. However, suppose the inflation rate is severe and causes production costs and living costs to rise. In that case, the bank's

debtors may not be able to comply with the conditions, resulting in more non-performing loans and a contraction in credit in the economy. Consequently, in this case, bank profitability decreases.

Table 1. Definition, notation, and expected effect of the variables.

Variables	Notation	Measure	Expected Sign	Source
Profitability				
Return on assets	ROA	Net operating profit to total assets		BARA
Return on equity	ROE	Net operation profit to equity		BARA
Net interest margin	NIM	Total interest income minus total interest expense and divided by average interest-earning assets		BARA
Competition				
Concentration Ratio	CR5	Total asset of the largest five banks to total assets of the whole commercial banking industry	+	Author
Herfindahl-Hirschman Index	HHI	$HHI = \sum_{i=1}^{N} \left[\frac{S_i}{S}\right]^2$ Where N is number of banks, S_i is total assets of individual bank, S is total assets of the whole commercial banking industry	+	Author
Market Power	MP	$MP_{i,t} = \frac{S_{i,t}}{S}$ Where i refer to individual bank and t refers to period, S_i is total assets of individual bank, S is total assets of the whole commercial banking industry	+	Author
Lerner Index	LI	$LI_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}}$ Where $LI_{i,t}$ denotes the market power of bank i in year t. $P_{i,t}$ is the average output price, calculated as total income to total assets, $MC_{i,t}$ is the marginal cost at the current output level.	+	Author
Panzar-Rosse H-Statistic	PRH	$H = \frac{\beta_1 + \beta_2 + \beta_3}{1 - \beta_0}$ The sum of elasticity is the H statistic, which was introduced by Panzar and Rosse ((1987, βis elasticity of the bank's total revenue with respect to each of its factor input prices.	-	Author
Boone Index	BI	$lnII_{i,t} = \alpha_{i,t} + \beta lnMC_{i,t} + \varepsilon_{i,t}$ Where the subscript i refers to a bank, subscript t refers to a sample year, $II_{i,t}$	+	Author

Variables	Notation	Measure	Expected Sign	Source
		denotes the profit, and MC_{it} denotes the marginal cost, β refers to Boone index.		
Control variables				
Credit risk	AQ	Non-performing loans to total loans		BARA
Capital	CA	Capital adequacy to total risk assets		BARA
Bank size	AS	Assets logarithm		BARA
Bank efficiency	OC	Operation expenses to total revenues		BARA
Gross Domestic Product	GDP	Gross domestic product growth		BOT
Inflation	INF	Change in the consumer price index		BOT

Note: BARA: Bank's Annual Report by Auditors, BOT: Bank of Thailand, Author: calculate by Author

Model specification

Based on the work developed by Tan (2020), the empirical equation is extended as follows:

$$II_{i,t} = C + \delta II_{i,t-1} + \sum_{j=1}^{j} \beta_j X_{i,t}^{j} + \sum_{l=1}^{l} \beta_l X_{i,t}^{l} + \sum_{m=1}^{m} \beta_m X_{i,t}^{m} + v_{i,t} + \mu_{i,t}$$

Where subscript i and t are the bank and time index, respectively. $II_{i,t}$ is bank profitability, $II_{i,t-1}$ is one proxy for the initial level of bank profitability, $X_{i,t}^{j}$ represents bank-specific determinants, including credit risk, capital, bank size, and bank efficiency. $X_{i,t}^{l}$ represents bank industry-specific determinants, including competition in the banking sector. And $X_{i,t}^{m}$ represents macroeconomic determinants, including inflation and Gross domestic product. $v_{i,t}$ is an unobserved time-invariant, bank-specific effect and $\mu_{i,t}$ is an observation-specific error term; and β_j, β_l, β_m are estimated coefficients.

In general, panel regression analyses are subject to endogeneity problems, including dynamic endogeneity, simultaneity, and time-invariant unobserved heterogeneity across banks. To mitigate the endogeneity problem in our banking dataset, we applied a generalized method of moments (GMM) estimation (Arellano & Bond, 1991). This is the method most commonly used to investigate the determinants of bank profitability (Dietrich & Wanzenried, 2011; Liu & Wilson, 2009) and is considered an appropriate estimation method to explore the dynamic nature of relationships (Flannery & Hankins, 2013).

To regress our selected model, we employed the system GMM estimator, this strategy enhance efficiency by reducing biases and solving the weak instrument problem in different GMMs (Blundell & Bond, 1998). The system GMM estimator uses lagged values of the dependent variables (in levels and differences) and lagged values of other regressors that potentially suffer from endogeneity as instruments.

Compared with one-step and two-step System GMM, we chose the one-step GMM estimator that Athanasoglou et al. (2008); Tan (2020) proposed. The model is used to conduct empirical analysis for bank profitability, especially the bank information, which is a dynamic panel dataset containing a small t (8 years) and a large N (14 banks).

The validity of instruments in GMM was assessed through the Sargan, Hansen, and Arellano-Bond tests. The Sargan and Hansen tests stated a null hypothesis that the instrument was strictly exogenous, and did not correlate with errors. The Arellano- Bond test was used to detect the autocorrelation of errors in the first difference. Thus, the test result of the first autocorrelation of errors, AR (1), was ignored. In contrast, the second autocorrelation of errors, AR (2), was tested on the first difference series of errors to detect the first autocorrelation of errors, AR (1).

Empirical results and discussion

Table 2 illustrates descriptive statistics for profitability, competition, and control variables of commercial banks in Thailand from 2010-2020.

The descriptive statistics in Table 2 provide each variable's mean, standard deviation, and minimum and maximum values. The dependent variables are profitability (ROA, ROE, and NIM). The independent variables are broadly classified as competition (CR5, HHI, MP, LI, PRH, and BI) and control variables (AQ, CA, AS, OC, GDP, and INF). For commercial banks in Thailand, the maximum value of ROA is 3.23%, and the minimum value is -0.43%, suggesting that each bank generated different profits from their asset investments with an average of 1.04%. On the other hand, ROE has a maximum value of 20.46% and a minimum value of -4.45%, indicating that each bank could yield different returns for their shareholders, with an average of 9.25%. Moreover, NIM has a maximum value of 6.24% and a minimum of 0.87%, signifying that the profitability of the net interest income difference varied across banks, with an average of 2.97%.

Table 2 Descriptive statistics of variables over the period 2010-2020

Variables	**Mean**	**SD.**	**Max**	**Min**
Profitability				
ROA	0.0104	0.0054	0.0323	-0.0043
ROE	0.0925	0.0472	0.2046	-0.0445
NIM	0.0297	0.0080	0.0624	0.0087
Industry-specific: Competition				
CR5	0.7655	0.0132	0.7817	0.7379
HHI	0.1310	0.0019	0.1356	0.1283
MP	0.0714	0.0654	0.1995	0.0065
LI	0.2603	0.0954	0.4975	0.0072
PRH	0.4120	0.1544	0.6764	0.1244
BI	-0.4909	1.5127	2.2051	-3.3838
Bank-specific				
AQ	0.0299	0.0124	0.0830	0.0000
CA	0.1764	0.0397	0.4369	0.1241
AS	1,073,543	1,019,949	3,384,960	62,363
OC	0.4870	0.0888	0.7298	0.2798
Macroeconomic				
GDP	0.0275	0.0348	0.0750	-0.0610
INF	0.0136	0.0153	0.03810	-0.0090

Note: Credit risk has a minimum value of 0.0000 for Standard Chartered Bank in 2019

Under the structural approach, CR5 has an average value of 0.7655, and the HHI has an average value of 0.1310. CR5 shows that Thailand's banking industry was nearly non-competitive, whereas the HHI shows moderate competition. Interestingly, despite the same approach, the results present the different tendencies of Thailand's banking competition. Under the non-structural approach, the MP has an average of 0.0714. This value is near 0, indicating low market power and high competition in Thailand's banking industry. The LI has an average of 0.2603. This value is close to zero, indicating high competition in Thailand's banking industry. The PRH has an average of 0.4120, suggesting monopolistic competition, while the BI has an average of -0.4909, suggesting more monopoly and less competition.

Other variables are also included. Asset quality ranges from 0% to 8.30%, indicating different banks' different asset quality. The average asset quality is 2.99%, suggesting that banks in Thailand had good quality assets and a small portion of non-performing debts compared to the overall credits. The value of capital adequacy ranges from 12.41% to 43.69%, indicating that each bank had a different ability to absorb risk from assets. The average capital adequacy is 17.64%, suggesting that Thai banks had a higher ability to absorb damage that might occur to risky assets than the standard set by the Bank of Thailand (8.5%). Operating costs range from 27.98% to 72.98%, suggesting that Thai banks had varying efficiency in cost management. The average operating cost is 48.70%, suggesting that banks in Thailand had high operating costs. In addition, bank size also varies, with the largest bank having assets of 3,384,960 million baht, the smallest having 62,363 million baht, and most having medium to high asset sizes, averaging 1,073,543 million baht.

The test model designation must not contain multicollinearity. The analysis revealed that most variables in the model did not pose such a problem, except for the MP variable, which had a multicollinearity value of Pearson Correlation with LOGAS, GDP, and INF higher than 0.8. Therefore, MP was excluded from the model to prevent biased analytical results. Alternatively, LI, commonly used to study banking competition under the non-structural approach, can replace MP (Lerskullawat, 2021; Nguyen, 2018; Shair et al., 2019; Tan & Floros, 2014; Yuanita, 2019).

The analysis of the relationship between competition and the profitability of banks in Thailand is divided into two tables based on the measures of competition. Table 3 illustrates competition under the structural approach (CR5, HHI). Table 4 illustrates competition under the non-structural approach (LI, PHR, BI).

Tables 3 and 4 show that the Hansen test found no over-identified restrictions. The results further indicate that the first-order autocorrelation was rejected, which affirms the consistency of the results.

Table 3 illustrates the relationship between competition and profitability under the structural approach. The results are different across the models. The ROA and ROE models show that CR5 and HHI are negatively correlate with profitability, while the NIM model shows that CR5 positively correlates with profitability. CR5 is significantly correlated across all models, differing from HHI, which is not statistically significant. The results of the three different models (ROA, ROE, NIM) may be due to different profitability metrics. ROA and ROE indicators are based on net profit, whereas the profitability measurement of the NIM model, which yields a different result, considers net interest,

The results through the CR5 indicator in the ROA and ROE models show that high concentration and low competition result in lower profitability of banks. This study differs from the structural approach, which posits that a highly concentrated banking structure or many large banks in a market gives banks more monopoly power and greater profitability (Lerskullawat, 2021; Nguyen & Tran, 2020). Higher CR5 leads to lower profitability, which is consistent with Yuanita's (2019) study. A high CR5 means that the Big Five banks increase market power by expanding the market. The expansions result in increased costs and some market expansions, such as new product launches, may

need to be more profitable for banks. New services and expansions have high overhead costs but need to be better received by customers, resulting in low profitability. CR5 in the NIM model shows high concentration and low competition, which leads to higher bank profitability. This aligns with the structural approach and Tan et al. (2017) and Moudud et al. (2020) findings. In the credit market, collusion can create a monopoly, such as high pricing, which allows large banks to exercise pricing power over their customers and consequently increase risk and profits.

Table 3 Competition under the structural approach (2010-2020)

Profitability	**ROA**	**ROE**	**NIM**	**ROA**	**ROE**	**NIM**
$Profitability_{t-1}$	-0.2928***	-0.2562***	0.0257**	-0.2842***	-0.2352***	0.0220*
AQ	-0.1075***	-0.9892***	-0.0261	-0.1155***	-1.0656***	-0.0125
CA	0.0422***	-0.0332	-3.7105	0.0390***	-0.0718	0.0068
AS	-0.0038	0.0075	-0.0078***	-0.0041*	0.0011	-0.0066**
OC	-0.0385***	-0.2835***	-0.0188***	-0.0387***	-0.2863***	-0.0183***
CR5	-0.0869*	-0.8901**	0.1586***	-	-	-
HHI	-	-	-	-0.2886	-1.9252	0.3439
GDP	0.0172**	0.1173*	-0.0136	0.0131	0.0902	-0.0088
INF	0.0446	0.4407*	0.1125***	0.0806***	0.7980***	0.0488
No. of Obs.	126	126	126	126	126	126
AR1 (p-value)	0.3102	0.5710	0.2469	0.3734	0.4950	0.1285
AR2 (p-value)	0.9781	0.1801	0.0294	0.6835	0.3613	0.0443
Hansen (prob.)	0.1622	0.6005	0.9377	0.1826	0.7434	0.8262

Note: The table contains the results estimated using the GMM system estimator, Profitability is ROA, ROE, and NIM. The competition is CR5. *, **, *** Significant at 10, 5, and 1 percent levels.

The results through the HHI indicator are not statistically significant with profitability in all models (ROA, ROE, NIM), consistent with studies by Alhassan et al. (2016) and Hsieh, and Lee (2010). The regression results with HHI as a measure of market structure do not show a significant coefficient either. This result suggests that HHI is not a significant factor in bank profitability. The HHI movement is affected by all banks' market shares. An increase in small bank shares will increase HHI.

Table 4 Competition under the non-structural approach (2010-2020)

Profitability	**ROA**	**ROE**	**NIM**	**ROA**	**ROE**	**NIM**	**ROA**	**ROE**	**NIM**
$Profitability_{t-1}$	-0.3162***	-0.2444***	0.0244**	-0.2969***	-0.2626***	0.0244**	-0.2711***	-0.2243***	0.0253**
AQ	-0.1034**	-1.0165***	-0.0069	-0.1107***	-1.0262***	-0.0129	-0.1162***	-1.0656***	-0.0119
CA	0.0402***	-0.0714	0.0077	0.0384***	-0.0724	0.0073	0.0358***	-0.0887	0.0067
AS	-0.0039	-0.0006	-0.0050*	-0.0047*	-0.0011	-0.0056*	-0.0061***	-0.0100	-0.0057*
OC	-0.0263***	-0.2355***	-0.0136	-0.0408***	-0.3059***	-0.0181***	-0.0374***	-0.2812***	-0.0183***
LI	0.0148**	0.0616	0.0060	-	-	-	-	-	-
PRH	-	-	-	0.0055**	0.0532***	-0.0010	-	-	-
BI	-	-	-	-	-	-	0.0011***	0.0051*	0.0002
GDP	0.0187**	0.1255**	-0.0122	0.0304***	0.2445***	-0.0159	0.0217***	0.1370**	-0.0121
INF	0.0846***	0.8062***	0.0562*	0.0893***	0.8915***	0.0507	0.0271	0.5594**	0.0418
No. of Obs.	126	126	126	126	126	126	126	126	126
AR1 (p-value)	0.4268	0.4054	0.7107	0.3700	0.6063	0.7204	0.4759	0.4995	0.7271
AR2 (p-value)	0.4771	0.4439	0.0675	0.9073	0.1588	0.0920	0.4721	0.0445	0.1027
Hansen (prob.)	0.1817	0.6816	0.6600	0.1785	0.5924	0.6016	0.1435	0.5991	0.5757

Note: The table contains the results estimated using the system GMM estimator, Profitability is ROA, ROE, and NIM, Competition is LI. *, **, *** Significant at 10, 5 and 1 percent levels, respectively.

Table 4 illustrates the relationship between competition and profitability under the non-structural approach. The results are different across the ROA, ROE, and NIM models. The ROA model shows that LI, PRH, and BI correlate significantly positively with profitability. On the other hand, the NIM model shows that LI, PRH, and BI are not statistically significant in profitability.

The LI measure in the ROA model exhibits that higher market power and lower competition increases bank profitability. This outcome aligns with the non-structural perspective, which suggests that banks can raise prices beyond marginal costs, indicating an upsurge in their market power or level of competition. This enables banks to gain a competitive edge by offering diverse products and improving their range of services compared to their rivals, leading to higher profitability. This result is consistent with the findings of Lerskullawat (2021), Nguyen (2018), Shair et al. (2019), and Tan (2018). However, LI does not exhibit any statistical significance with profitability in the ROE and NIM models. The contradictory outcome of both regressions in the ROA model suggests that the definition of profitability influences the regression results.

The PRH measure in the ROA and ROE models demonstrates that increased competition, resulting from greater PRH, leads to higher profitability. The result contradicts the expected hypothesis that profitability should be lower when the market becomes more competitive, and PRH increases. The results of this study reveal collusion to set prices of commercial banks in Thailand to increase revenue and profit. In the NIM model, PRH is not statistically significant with profitability. Overall, these tests highlight a weak or insignificant impact from the degree of PRH on bank profitability, which is consistent with the findings of Hsieh and Lee (2010).

The BI measure in the ROA and ROE models indicates that higher BI corresponds to better operational efficiencies. This leads to lower operating costs, higher market share, and thus more profitability. The finding aligns with the hypothesis and is consistent with the results of Hu and Xie (2016), Lerskullawat (2021), Shair et al. (2019), and Tan (2020). The NIM model does not find statistical significance between BI and bank profitability, similar to the result of Tan (2020). The three regressions' contradictory outcome suggests that the profitability definition influences the regression results.

Tables 3 and 4 also provide an analysis of bank-specific factors. An increase in OC was found to decrease bank profitability in all models, which aligns with the findings of Daq and Nguy (2020), Elekdag et al. (2020), and Kumar et al. (2021), confirming the reliability of this result. Increased AQ results in a decline in profitability across all models and exhibits statistical significance in the ROA model. This outcome is consistent with Chantapong (2005), Jiraporn et al. (2019), Kirakul et al. (2019), Kumar et al. (2021), Leon (2020) and Malini (2020). However, no significant correlation is found in the NIM model, similar to Kanga et al. (2020). The impact of CA varies across the models. Increasing CA results in a significant increase in profitability only in the ROA model, which is consistent with Kirakul et al. (2019) and Kumar et al. (2021). CA does not exhibit statistical significance in the ROE and NIM models, similar to Kanga et al. (2020). The results of AS could be more consistent across the models. An increase in AS leads to a significant decrease in profitability in the NIM model, consistent with Daq and Nguy (2020), Fernandes et al. (2021), and Tan (2020). However, AS was not found to be a significant factor in profitability when switching to different profitability indicators (Kanga et al., 2020; Kumar et al., 2021).

The analysis of economic factors reveals that an increase in GDP and INF results in higher profitability, which aligns with the findings of Kumar et al. (2021), Leon (2020), and Tan (2020). This relationship is observed in all models, except the NIM model, which shows a negative correlation between GDP and profitability, similar to the study of Kirakul et al. (2019). The inconsistency in results may stem from using different measures for each model.

The analysis of profitability is considered a one-period delay. The results are statistically significant in all models. Profitabilityt-1 exhibits a negative correlation with profitability in the current

year in the ROA and ROE models. This finding contrasts with the study conducted by Le and Ngo (2020), which found a positive correlation in the ROA and NIM models. The NIM Profitabilityt-1 model positively correlates with the current year's profitability. The coefficient δ represents the speed at which profits adjust to the long-run equilibrium (Athanasoglou et al., 2008). The result suggests that δ is close to 0, indicating a high speed of adjustment and implying a highly competitive banking industry in Thailand.

Conclusion and recommendation

This research aims to examine the relationship between competition and profitability of commercial banks in Thailand from 2010 to 2020, specifically during the Financial Sector Master Plan (FSMP) phases II and III, using both structural and non-structural approaches. The competition level in the Thai banking industry was measured, and profitability was assessed through ROA, ROE, and NIM metrics. Additionally, comprehensive bank-specific and macroeconomic determinants were controlled for analyzing banks' profitability and competition. Econometric estimation was conducted using the one-step GMM model with the collapse command.

Regarding the level of competition in the commercial banking industry in Thailand during the FSMP phases II and III, the study reveals varying results across indicators. Under the structural approach, CR5 indicates high concentration and low competition, whereas HHI shows low concentration and moderate competition. Under the non-structural approach, MP and LI indicate low market power and a high level of competition, while PRH and BI suggest a low level of competition.

Regarding the relationship between competition and the profitability of commercial banks in Thailand, the findings indicate that competition affects profitability differently depending on the approaches and indicators employed. Under the structural approach, based on the CR5 indicator, concentration does not benefit banks' profitability when measuring it with ROA and ROE. However, using NIM as the indicator does have a positive effect on profitability when. According to the HHI indicator, the concentration index does not significantly impact a bank's profitability across all profitability indicators (ROA, ROE, NIM). Under the non-structural approach, based on the LI indicator, an increased market power index and decreased competition favorably affect profitability when measuring it with ROA, However, the effect is insignificant when using ROE and NIM as indicators. The PRH indicator reveals that an increased input price elasticity to income indicates reduced monopoly and increased competition, but only when measuring profitability with ROA and ROE, not with NIM. As for the BI indicator, an increased marginal cost elasticity indicates greater monopoly, less competition, and higher profitability when using ROA and ROE as profitability indicators. However, this effect is insignificant when NIM is used as the indicator.

Regarding theoretical and practical implications, the findings of all three models (ROA, ROE, NIM) confirm that the concentration of the five largest banks (CR5) is significantly correlated with profitability, with increased concentration positively impacting profitability when measured by net interest income (NIM). This suggests that commercial banks in Thailand utilized market power to collude, leading to higher lending rates and lower deposit interest rates, resulting in improved profits. However, when measuring profitability based on net profit (ROA, ROE), increased concentration was found to have a negative effect. This implies that commercial banks in Thailand leverage their market power for market expansion, such as launching new products, services, and expansions. While market expansion incurs costs and may need to be better received by customers, it leads to lower profits. Therefore, bank managers should carefully consider market expansion strategies that align with the specific area and customer segments to achieve successful outcomes. Moreover, the study results varied across indicators, illustrating that utilizing multiple indicators can better explain the impact of competition on the profitability of commercial banks in Thailand. Policymakers and bank executives can benefit from these findings to enhance monitoring and policy formulation.

There are two limitations of this study. There are two limitations to this study. Firstly, the sample could have been more representative, as it excluded specialized banks with distinct business natures, asset sizes, and credit volumes significant to the Thai banking industry. Secondly, limitations in data access and frequency were encountered. Specifically, the limited data availability prevented the analysis of pre and post- implementation of the FSMP. Additionally, the low data frequency (annual) could have helped analysis based on bank size and revenue. Therefore, future research should study specialized banks and foreign banks operating in Thailand to cover all types of banks operating in Thailand, as well as use data with longer intervals and higher frequency, such as quarterly, monthly, etc.

References

Alhassan, A., Tetteh, M., & Brobbey, F. (2016). Market power, efficiency and bank profitability: evidence from Ghana. *Economic Change and Restructuring, 49*(1), 71-93.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies, 58*, 277-297.

Athanasoglou P. P., Brissimis S.N., Delis M.D. (2008). Bank-specific, industry-specific and macroeconomic determinants of Bank profitability. *Journal International Finance Market Institutions and Money, 18*(2), 121-136.

Bain, J. (1965). *Barriers to new competition*. Cambridge, MA: Harvard University Press.

Bikker, J. A., & Bos, J. W. (2005). Competition and efficiency in banking: International comparisons. *Economic & Financial Modelling, 12*(3), 103-148.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115-143.

Chaisongkram, K., Wongkhrua, C., Ariya, A., Kamrach, C., & Yongpaknam, P. (2020). The analysis of the relationship between financial factors and industrial concentration of commercial banks in Thailand. *Journal of Accountancy and Management, 12*(2), 54-70.

Chantapong S. (2005). Comparative study of domestic and foreign bank performance in Thailand: The regression analysis. *Economic Change and Restructuring, 38*(1), 63-83.

Daq, B. T. T., & Nguy, D. P. (2020). Determinants of profitability in commercial bank in Vietnam, Malaysia and Thailand. *Journal of Asian Finance, Economic and Business, 7*(4), 133-143.

Demsetz, H. (1973). Industry structure, market rivalry and public policy. *The Journal of Law & Economics, 16*(1), 1-19.

Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money, 21*(3), 307-327.

Elekdag, S., Malik, S., & dan Mitra, S. (2020). Breaking the bank? A probabilistic assessment of Euro area bank profitability. *Journal of Banking and Finance, 120*(4), 1-16.

Elfeituri, H. (2015). An empirical investigation of market structure, determinants of profitability, competitiveness and productivity in MENA economies banking sector. Retrieved from: https://researchportal.port.ac.uk.

Fernandes, G., Mendes, L., & Leite, R. (2021). Cash holdings and profitability of banks in developed and emerging markets. *International Review of Economics and Finance, 71*, 880-895.

Flannery, M. J., & Hankins, K. W. (2013). Estimating dynamic panel models in corporate finance. *Journal of Corporate Finance, 19*, 1-19.

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th eds.). Boston, MA: McGraw Hill.

Hu, T., & Xie, C. (2016). Competition, innovation, risk-taking, and profitability in the Chinese banking sector: An empirical analysis based on structural equation modeling. *Discrete*

Dynamics in Nature and Society, Article ID 3695379, https://doi.org/10.1155/2016/36953791-10.

Hsieh, M., & Lee, C. (2010). The Puzzle between banking competition and profitability can be solved: International evidence from bank-level data. *Journal of Financial Services Research, 38*(2), 135-157.

Islam, Md. A., Sarker, Md. N. I., Rahman M., Sultana A., & Prodhan, AZM. S. (2017). Determinants of profitability of commercial banks in Bangladesh. *International Journal of Banking and Financial Law, 1*(1), 1-11.

Jearviriyaboonya, J., & Sethapramote. Y. (2019). Competition and bank lending channels: Evidence from bank-level data in Thailand. *Journal of Economics and Management Strategy, 6*(2), 105-121.

Jiraporn, P., Jumreornvogn, S., Jung, C. S., & Preechaborisutkul, P. (2019). The impact of ownership structure on bank performance and risk: Evidence from ASEAN. *Thammasat Business Journal, 42*(163), 1-22.

Kanga, D., Murinde, V., & Soumare, I. (2020). Capital, risk and profitability of WAEMU banks: Does bank ownership Matter? *Journal of Banking & Finance, 114*, 105814.

Kirakul S., Chunhachinda, P., & Padungsaksawasd, C. (2019). Determinants of bank performance in Thailand: Foreign vs. Domestic banks. *Kasem Bundit Journal, 20,* 51-71.

Kubo, K. (2006). The degree of competition in the Thai banking industry before and after the East Asian crisis. *ASEAN Economic Bulletin, 23*(3), 325-340.

Kumar, V., Thrikawala, S., & Acharya, S. (2021). Financial inclusion and bank profitability: Evidence from a developed market. *Global Finance Journal, 53*, 100609.

Laowattanabhongse, S., & Sukcharoensin, S. (2018). Bank competition and economic growth: a cross-country investigation. *Southeast Asian Journal of Economics, 6*(1), 1-21.

Leenabanchong, C. (2012). Bank's competition. *Thammasat Economic Journal, 30*(3), 102-131.

Le, T. D., & Ngo, T. (2020). The determinants of bank profitability: A cross-country analysis. *Central Bank Review, 20*(2), 65-73.

Leon, M. V. (2020). The impact of credit risk and macroeconomic factors on profitability: The case of the ASEAN bank. *Banks and Bank Systems, 15*(1), 21-29.

Lerskullawat, A. (2018). Banking competition, banking stability and the lending channel of monetary policy: the case of Thailand. *Southeast Asian Journal of Economics, 6*(2), 41-60.

Lerskullawat, A. (2021). Bank competition and profitability: Evidence from Southeast Asian countries. *Journal of Business Administration, 44*(171), 22-50.

Liu, H., & Wilson, J. (2009). The profitability of banks in Japan. *Applied Financial Economic, 20*(24), 1851-1866.

Malini, H. (2020). Profitability condition with stylized fact of banking industries in Indonesia, Malaysia and Thailand. *AFEBI Management and Business Review, 5*(2), 15-30.

Mason, E. (1939). Price and production policies of large-scale enterprise. *American Economic Review, 29*(1), 61-74.

Mirzaei, A., Liu, G., & Moore, T. (2011). Does market structure matter on bank's profitability and stability emerging versus advanced economies. *Journal of Banking & Finance, 37*(8), 2920-2937.

Moudud-UI-Hug, S., Halim, M., & Biswas, T. (2020). Competition and profitability of banks: Empirical evidence from the Middle East & North African (MENA) countries. *Journal of Business Administration Research, 3*(2), 26-37.

Nguyen, H. (2018). Profitability of Vietnamese banks under competitive pressure. *Emerging Market Finance and Trade, 55*(9), 2004-2021.

Nguyen, T. T., & Tran, H. G. (2020). Competition, risk and profitability in banking system evidence from Vietnam. *The Singapore Economic Review, 65*(6), 1491-1505.

Panzar, J., & Rosse, J. (1987). Testing for monopoly equilibrium. *The Journal of Industrial Economics, 35*(4), 443-456.

Paukmongkol, W. (2022). Comparison profitability, asset quality, capital adequacy classified of commercial banks in Thailand. *Journal of Accountancy and Management, 14*(4), 99-119.

Paukmongkol, W. (2023). Bank specific factor, economic factor and profitability of commercial banks with different asset sizes. *Economics and Business Administration Journal Thaksin University, 15*(1), 73-90.

Peltzman, S. (1977). The gains and losses from industrial concentration. *The Journal of Law and Economics, 20*(3), 229-263

Pessarossi, P., Thevenon, J. L., & Weil, L. (2020). Does high profitability improve stability for European banks? *Research in International Business and Finance, 53*, 101220.

Prayoonrattana, J., Laosuthi, T., & Chaivichayachat, B. (2020). Empirical measurement of competition in the Thai banking industry. *Economies, 8*(44), 1-20.

Sarpong-Kumankoma, E., Abor, J., Aboagye, A., & Amidu, M. (2018). Freedom, competition and bank profitability in Sub-Saharan Africa. *Journal of Financial Regulation and Compliance, 26*(4), 462-481.

Shair, F., Sun, N., Shaorong, S., Atta, F., & Hussain, M. (2019). Impacts of risk and competition on the profitability of banks: Empirical evidence from Pakistan. *PLoS ONE, 14*(11), 1-27.

Shehzad, C. T., De Haan, J., & Scholtens, B. (2013). The relationship between size, growth and profitability of commercial banks. *Applied Economics, 45*(13), 1751-1765.

Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking. *Journal of Money, Credit and Banking, 17*(1), 69-83.

Srijampa, P., & Vichittharmaros, P. (2022). Market concentration on credit of commercial bank that enroll in SET. *Phuket Rajabhat University Academic Journal*, *18*(1), 20-40.

Subhanij, T. (2016). *Commercial bank innovations in small and medium-size enterprise finance: Global models and implications for Thailand. ADBI Working Paper Series, No.583*. Retrieved from https//www.adb.org

Tan, Y. (2020). Competition and profitability in the Chinese banking industry: new evidence from different ownership types. *Journal of Industry, Competition and Trade*, *20*(3), 503-526.

Tan, Y., & Floros, C. (2012). Bank profitability and GDP growth in China: A note. *Journal of Chinese Economic and Business Studies, 10*(3), 267-273.

Tan, Y., & Floros, C. (2014). Risk, profitability, and competition: Evidence from the Chinese banking industry. *The Journal of Developing Areas, 48*(3), 303-319.

Tan, Y., Floros, C., & Anchor, J. (2017). The profitability of Chinese banks: Impacts of risk, competition and efficiency. *Review of Accounting and Finance, 16*(1), 86-105.

Tran, D. B., & Vo, D. H. (2018). Should bankers be concerned with Intellectual capital? A study of the Thai banking sector. *Journal of Intellectual Capital, 19*(5), 897-914.

Yuanita, N. (2019). Competition and bank profitability. *Journal of Economic Structures, 8*(31), 2-15.