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The Effect of Market Power on Bank's Net Interest Margin: The Moderating Role of Financial Access

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ABSTRACT

The research focuses on determining the effect of commercial bank's market power on net interest margin and the moderating role of financial access. The study uses annual data of 33 commercial banks in Indonesia from 2012 to 2019 based on the category of State-Owned Commercial Banks and National Private Commercial Banks. The data is obtained from secondary data, using financial reports published by commercial banks. The data is analyzed using moderated regression analysis to estimate two models, basic model is used to estimate the effect of market power on net interest margin, while the interaction model is used to estimate the moderating effect of financial access. Market power was measured using the Lerner index of each bank. Financial access was measured by the number of branches and the availability of electronic banking channels such as mobile banking, internet banking, and digital branch. The results show that the increase in commercial bank's market power significantly increases net interest margin. Other results also show that branch and mobile banking & internet banking significantly moderate the effect of market power on the net interest margin, while the digital branch is not significantly moderating the relationship between market power and net interest margin.

Keywords: Digital Branch, Financial Access, Market Power, Mobile Banking, Net Interest Margin

JEL Classification Codes: D400, E580, G210, M21

INTRODUCTION

The interaction between bank's profitability and its market power has become a common topic discussed in the banking industry and has been explained in some of the previous studies. Previous studies explained that market power significantly affects a bank's profitability (Kunwar, 2018; Olmo, Saiz & Azofra, 2021; Turk Ariss, 2010). Some of the previous studies also include financial access as one of the variables that can affect bank profitability along with market power. Financial access is an indicator that measures the availability and access to financial services and can be reflected through access points or banking channels such as branches and ATMs (Espinosa-Vega, Shirono, Vilanova, Chhabra, Das, & Fan, 2020; Svirydzenka, 2016). The previous study found that the more branch that a bank has, the less interest spread will be earned (De Moraes, Galvis-Ciro & Gargalhone, 2021).

As the banking industry is growing and developing, there are new aspects that need to be considered as a factor that will be involved in the interaction between market power, bank's profitability, and financial access. Referring to Indonesian banking industry, there are new policies that regulate how commercial banks can distribute their banking products through banking channels or financial access. There are policy and guidelines regarding new banking channels that have been regulated by the Indonesia Financial Services Authority, such as Guidelines for Operation of Digital Branches by Commercial Banks and regulation concerning Implementation

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of Digital Banking Services by Commercial Banks. Referring to these policies, commercial banks in Indonesia can give services to customers not only through the physical channel but also through an electronic or digital banking channel.

The Structure Conduct Performance (SCP) hypothesis explain the relationship between market structure or market power and bank profitability. Based on the explanation of the hypothesis, the banking industry with a concentrated market structure or with a high market share by several major players will have an impact on the competition that emerge in the industry and the big players can influence the setting of interest rates (Berger, 1995; Berger, Klapper & Turk-Ariss, 2009). In previous research, it was found that the market structure of the banking industry in Indonesia can affect the Return on Assets (ROA), the lower the competition, the higher the profitability (Yuanita, 2019). Meanwhile, research on the banking market in other countries was conducted by (Giordano & Lopes, 2015) with his research on the Italian banking industry which found that the profitability of banking in Italy supports the Relative Market Power Hypothesis (RMP). In line with the development of research conducted on the aspects of competition and profitability, Yuanita (2019), Casu & Girardone (2006), and Repkova (2012) used the Lerner Index to generate the market power in research related to the interaction between bank's profitability and market power.

The interaction between bank's profitability, market power, and financial access also have been explained in the previous study. Financial access in the study used the number of ATMs and the number of bank branch as proxies that describe financial inclusion in the country. The results of this study indicate that the higher financial access a country has, the lower interest rate spread the bank will earned (De Moraes, Galvis-Ciro & Gargalhone, 2021). According to Saunders & Schumacher (2000), low number of banking branches in the system can impact on higher market power of banks, and increase the interest rate margin. Other studies found that higher financial access which reflected by higher number of branches can increase efficiency among financial intermediaries (Were & Wambua, 2014). Net interest margin can also affect savings option provided to the customer (Carbó Valverde & Rodríguez Fernández, 2007; Hawtrey & Liang, 2008; Maudos & Fernández de Guevara, 2004).

Financial access as represented by access points or banking channel measures the availability and access to financial products for the customer. In the Indonesian banking industry, commercial banks can give their customers access to financial services through physical and electronic or digital banking channels. Some factors accelerate the migration to digital banking channels in Indonesia, such as strong digitization push by commercial banks, growth in e-commerce, and increasing adaptation of the internet and smartphones (Boarquin, de Gantes, Vinayak & Skhrikhande, 2019). Another previous study analyzed how the digital banking channel can affect the bank performance, and the results showed that the digital banking technology adaptation has a significant positive impact on intermediation efficiency perspective (Wirdiyanti, 2018). Study conducted in other countries, also explain that the implementation of digital banking can improve bank's performance and customer experience. In Malaysia, the implementation of digital banking services through mobile application can improve customer satisfaction (Kee, Binti Nor Hisam, Binti Abd Rashid, Binti Abdul Aziz, Binti Azlan & Binti Mahadi, 2021; Nair et al, 2020). In Kuwait, digital technologies also can give customer various option to acquire information and completion a certain transaction (Al-Hajri, Maria, AL-Mutairi & Al-Qenaei, 2019). These findings show the importance of electronic and digital banking channels as the new aspect that can be analyzed on the interaction between bank's profitability, market power, and financial access.

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Based on the explanation above, this study focuses on analyzing the impact of financial access on the interaction between bank's profitability and market power. Financial access in this study is represented by physical banking channels such as branch and also electronic & digital banking channel that emerge in the Indonesia banking industry such as mobile banking & internet banking and digital branch. The study contributed to the current understanding of how electronic and digital banking channels such as mobile banking, internet banking, and digital branch can have an impact on the interaction between bank's profitability and market power, as the relationship between bank's profitability, market power, and electronic or digital banking channel has not been discussed in the previous studies.

RESEARCH METHOD

The research was conducted using panel data because there are several bank samples (cross-section) and over several periods (time series). The study used annual data from the financial statement of each bank from 2012 to 2019. The sample in this study was 33 commercial banks which were selected by purposive sampling. the criteria of the selected banks are conventional commercial banks which were included in the category of State-Owned Commercial Banks and National Private Commercial Banks. The other bank categories were not included in the sample due to the limited scope of financial access that each category has. This research used secondary data, namely using annual reports published by commercial banks obtained from the website of the Indonesia Financial Services Authority. There are four types of variables that were used in the research, which are dependent, independent, moderator, and control. The following is the explanation of the research variables used in this research.

Table 1. Research Variables

Variable Category	Variable Name	Code	Details
Dependent	Net Interest Margin	NIM	Net Interest Revenue/Average of Productive Asset
Independent	Market Power	MP	Lerner Index
Moderator	Financial Access – Branch	B	Number of Branch
Moderator	Financial Access – Mobile Banking & Internet Banking	MBIB	Dummy Variable - Availability of Mobile Banking & Internet Banking
Moderator	Financial Access – Digital Branch	DB	Dummy Variable - Availability of Digital Branch
Control	Non-Performing Loan	NPL	Bad Debt/Total Loan
Control	Loan to Deposit Ratio	LDR	Total Loan/Total Third Party Fund
Control	BI Rate	BI	Bank of Indonesia Rate

This study used Moderated Regression Analysis to determine the effect of market power on bank's net interest margin and the moderating effect of financial access. The regression model was estimated using the EViews 11 software. Based on the scale level of the variables, Moderated Regression Analysis is a flexible method and can accommodate variables with a continuous or categorical scale (Helm & Mark, 2012).This analysis used two-equation models, the basic model, and the interaction model. The basic model estimated the effect of market power on bank's net interest margin, while the interaction model estimated the moderating effect of financial access to the interaction between bank's net interest margin and market power.

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RESULTS AND DISCUSSION

Market Power (Lerner Index) Estimation

The analysis will first be carried out by calculating the market power of each conventional commercial bank in Indonesia. The market power of this research is calculated using the Lerner Index. To get the Lerner Index value, two main components are needed, price (P_{it}) and marginal cost (MC_{it}). The following is the Lerner Index equation:

$$LI_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$$

The price will be obtained by dividing the total income from each bank by the total assets. Meanwhile, marginal cost is obtained from the derivative function of total cost or translog cost function. The following is the translog cost function equation for each bank:

$$\text{Ln } TC_{it} = \beta_0 + \beta_1 \text{Ln } Q_{it} + \frac{\beta_2}{2} \text{Ln } Q_{it}^2 + \sum_{k=1}^{3} \gamma_{kt} \text{Ln } W_{k,\ it} + \sum_{k=1}^{3} \Phi_k \text{Ln } Q_{it} \text{Ln } W_{k,\ it} + \sum_{k=1}^{3} \sum_{j=1}^{3} \text{Ln } W_{k,\ it} \text{Ln } W_{j,\ it} + \varepsilon_t$$

There are 5 components used to calculate the translog cost function, which are total cost, total output, labor cost, capital cost, and cost of fund. The following is an explanation of these components:

Table 2. Component of Translog Cost Function

Component	Code	Description
Total Cost	TC	Bank's Total Cost
Output	Q	Bank's Total Asset
Labor Cost	W_L	$\frac{\text{Labor Cost}}{\text{Total Asset}}$
Capital Cost	W_K	$\frac{\text{Total Cost-Interest Expense-Labor Cost-Impairment Loss}}{\text{Total Asset}}$
Cost of Fund	W_F	$\frac{\text{Interest Expense}}{\text{Total Third Party Fund}}$

The coefficients from the estimation output of translog cost function were used in the marginal cost equation. Here is the marginal cost equation :

$$MC_{it} = \frac{TC_{it}}{Q_{it}} \left[\beta_1 + \beta_2 \text{Ln } Q_{it} + \sum_{k=1}^{3} \Phi_k \text{Ln } W_{k,\ it} \right]$$

The results of the calculation of marginal costs obtained from the above equation will be used as input to the Lerner Index equation so that the Lerner Index value of each bank will be obtained which will describe the market power of each bank.

Descriptive Statistics

After estimating the Lerner Index to determine the market power of each bank, below are the descriptive statistics of each variable used in the analysis.

Table 3. Descriptive Statistics of Research Variables

Variable	Description	Code	Mean	Maximum	Minimum
Dependent	Net Interest Margin	NIM	5.2%	13.1%	1.1%

Independent	Market Power	MP	0.23	0.56	0.04
Moderator	Financial Access – Branch	B	732	10,649	1
Moderator	Financial Access – Mobile Banking & Internet Banking	MBIB	0.59	1.00	0.00
Moderator	Financial Access – Digital Branch	DB	0.10	1.00	0.00
Control	Non-Performing Loan	NPL	1.3%	6.4%	0.0%
Control	Loan to Deposit Ratio	LDR	94.2%	256.4%	43.5%
Control	BI Rate	BI	6.1%	7.8%	4.3%

Net interest margin is an indicator of bank profitability that can describe the net interest income earned on productive assets owned by the bank. The higher the net interest margin owned by a bank, it can indicate that the bank can set a higher loan interest rate to debtors and on the other hand can set a lower deposit interest rate to customers, so that the profit earned by the bank is higher. Based on the information in Table 3, it can be seen that the average net interest margin earned by conventional commercial banks in Indonesia based on the research sample is 5.2 percent, with minimum value is 1.1 percent and maximum value is 13.1 percent.

Market power in this study is measured by using the Lerner Index. The Lerner Index will measure how much the bank's ability to regulate the prices given to customers compared to the marginal cost needed to increase the output produced. In this case, the price will be reflected from the bank's total income compared to the total assets owned by the bank, while the marginal cost is obtained from the calculation of the translog cost function which will be explained further in the regression analysis section. The Lerner Index has a value between 0 and 1. If the Lerner Index's value is close to 0, then it indicates that the market power of the bank tends to be low, because the increase in marginal costs cannot be accommodated by the increase in prices given to customers. Meanwhile, if the Lerner Index's value is close to 1, then it indicates that the Market Power owned by the bank tends to be high, because the bank can increase the prices given to customers without experiencing a significant increase in marginal costs. Based on the information in Table 3, it can be seen that the average Lerner Index owned by conventional commercial banks in Indonesia is 0.23, with minimum value is 0.04, and maximum value is 0.56.

The branch is the first indicator of financial access used in this study to describe the physical distribution network owned by the bank in reaching and distributing its products to customers. Based on the information in Table 3, it can be seen that the average number of branches owned by conventional commercial banks in Indonesia is 732 branches, with minimum value of 1, and maximum value of 10,649. Mobile Banking and Internet Banking are the second indicator of financial access used in this study to describe the distribution network of electronic channels provided by banks in reaching and distributing their products to customers. Mobile Banking and Internet Banking in this study are used to see how electronic channels, which are commonly used by banks in Indonesia, can affect the performance of these banks. Digital branch is the third indicator of financial access used in this study to describe the distribution network of electronic channels provided by banks in reaching and distributing their products to customers. Digital branch in this study is used to see how the relatively new electronic channel launched in recent years by banks in Indonesia, can affect the performance of the bank. In accordance with the description described in OJK regulations regarding the Implementation of digital branch, the aspect that distinguishes digital branch from other banking channels is the feature for customers to be able to open accounts directly through self-service banking.

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Non-performing loan is one of the control variables used in the study. Non-performing loan describes the bank's internal conditions that reflect the quality of loans given to debtors or often referred to as bad loans. The lower the non-performing loan value in a bank, the better the credit quality, because the potential risk of default on bad loans tends to be low. Referring to several previous studies, the results obtained that non-performing loan is one of the determinants of the movement of net interest margin. Based on the information in Table 3, it can be seen that the average non-performing loan owned by conventional commercial banks in Indonesia is 1.3 percent, with minimum value is 0 percent and maximum value is 6.4 percent. Loan to deposit ratio is one of the control variables used in this study.

Loan to deposit ratio describes the internal condition of the bank that reflects the amount of credit extended to debtors compared to the amount of third-party funds obtained from customers. The higher the loan to deposit ratio value describes the condition of the bank being aggressive in extending credit to debtors and potentially increasing interest income, but on the other hand there is a trade-off with the liquidity of the bank. The higher the loan to deposit ratio indicates the risk of liquidity in the bank's internal will be higher, because the higher the funds disbursed for loans or credit, the less funds are available for funding customers if at any time there is a need to withdraw funds from these customers. Referring to several previous studies, the results found that loan to deposit ratio is one of the determinants of the movement of net interest margin. Based on the information in Table 3, it can be seen that the average loan to deposit ratio owned by conventional commercial banks in Indonesia is 94.2 percent, with minimum value is 4.3 percent, and maximum value is 7.8 percent.

The interest rate of Bank Indonesia (BI) is one of the control variables used in the study. The BI interest rate reflects external conditions and in this case is one of the macroeconomic indicators that can influence the movement of the NIM. The movement of the BI interest rate set by Bank Indonesia will be a reference for Indonesian banks to determine the interest rate for loans and deposits owned by each bank. The determination of the interest rate will potentially affect the net interest income earned by the bank.

Regression Model Selection

Panel data regression analysis will begin with the selection of a model using the Chow Test, Hausman Test, and the LM Test. 3 types of models can be used to perform panel data regression, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The first test that will be carried out is the Chow Test to select a model between CEM and FEM, and the second test is the Hausmann Test to select a model between FEM and REM. Based on the Chow Test, the probability value (0.00) is smaller than the p-value (0.05), so that the null hypothesis which states that the CEM model is better can be rejected. So that the chosen model is FEM. Based on the results of the Hausman test, the probability value is 1,000 and the test results show the cross-section test variance is invalid because there are variables that do not meet the random effect requirements. In this case, there is insufficient evidence to reject the null hypothesis which states that there is no specification or estimation error. Similar results regarding the Hausman Test were also found in research by (Djayasinga & Prasetyo, 2019), and the model chosen was FEM. Based on the two tests performed, the model chosen was the Fixed Effect Model (FEM).

Best Linear Unbiased Estimator

In order to form the reliable estimator on analyzing the regression model, some of following test need to be conducted to meet the requirement based on the Best

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Linear Unbiased Estimator assumption. The required test conducted in the study are explained below:

Normality test

Regression estimation requires data that are normally distributed to obtain accurate estimation results. Based on the normality test, the FEM model was regressed using Generalized Least Square with cross-section weights option and obtained a probability of 0.33, so it can be concluded that the data is normally distributed because it has a probability value greater than a p-value of 0.05.

Multicollinearity Test

Furthermore, the regression model needs to be tested with a multicollinearity test. The criteria for testing multicollinearity is to look at the correlation between the variables used in the study, and ensure that there is no correlation between variables that are worth more than 0.8. Based on the test results, the correlation between the variables in this study is less than 0.8 so it can be concluded that there is no multicollinearity.

Autocorrelation Test and Heteroscedasticity Test

In this study, the panel data regression model has been estimated using the White Period method for coefficient covariance, which is used to accommodate heteroscedasticity and series autocorrelation (Startz, 2009). So it is not necessary to test heteroscedasticity and autocorrelation. Furthermore, after the classical assumption test has been carried out, it will be continued with the estimation of the FEM model.

Panel Data Regression Estimation and Moderating Effects

Estimation conducted in this research used Moderated Regression Analysis based on the Fixed Effect Model to analyze how the effect of market power on bank's profitability that reflected by net interest margin. On the other hand, the research is conducted in order to see how the moderating effect of financial access, which consists of 3 variables, namely branch, mobile banking & internet banking, and digital branch, can have an effect on the interaction between market power and net interest margin. The interpretation of the relationship between these variables will be explained using two model equations. The first is the basic model to see how market power and net interest margin are affected, and the second is the interaction model to see the moderating effect caused by financial access. The following is a summary of the estimation results for the basic model to analyze the effect of market power on net interest margin and the interaction model to analyze the effect

Table 4. Estimation Results of Fixed Effect Model for Basic Model and Interaction Model

Description	Code	Basic Model		Interaction Model	
		Coefficient	*Probability*	*Coefficient*	*Probability*
Constant	C	**- 0.273**	**0.000**	**- 0.248**	**0.000**
Market Power (Lerner Index)	MP	**0.027**	**0.019**	**0.118**	**0.000**
Branch	B	- 0.003	0.597	- 0.008	0.256
Mobile Banking & Internet Banking (Dummy)	MBIB	**- 0.008**	**0.017**	**- 0.019**	**0.009**
Digital Branch (Dummy)	DB	**- 0.011**	**0.000**	- 0.001	0.813
Non-Performing Loan	NPL	- 0.051	0.320	- 0.028	0.575
Loan to Deposit Ratio	LDR	0.004	0.796	- 0.014	0.309
Bank of Indonesia Rate	BI	- 0.027	0.338	- 0.020	0.426

Interaction between Market Power and Branch	MP*B	NA	NA	-	**0.029**	**0.002**
Interaction between Market Power and Mobile Banking & Internet Banking	MP*MBIB	NA	NA	-	**2.033**	**0.043**
Interaction between Market Power and Digital Branch	MP*DB	NA	NA		1.952	0.052
R-squared			0.909			0.923
Adjusted R-squared			0.893			0.909

Based on the regression estimation results, it can be seen in the basic model, the significant variables are market Power, mobile banking & internet banking, and digital branch because the probability value of each coefficient is smaller than the p-value 0.05. Meanwhile, in the interaction model, it can be seen that the significant variables are market power, mobile banking & internet banking, interaction between market power and branch, and interaction between market power and mobile banking & internet banking.

After the two models have been estimated, the next step is to measure the moderating effect caused by the financial access.

$$f^2 = \frac{R_I^2 - R_B^2}{1 - R_I^2} = \frac{0{,}92 - 0{,}90}{1 - 0{,}92} = \mathbf{0{,}189}$$

The strength of the moderating effect can be estimated through the effect size index (f^2) using the R-squared values of the two models. Based on the calculation results, the effect size index value obtained from the moderating relationship is 0.189

Interpretation of Panel Data Regression Estimation and Moderating Effects

Through the estimation results in the basic model, it can be seen that the market power variable has a significant effect on net interest margin (NIM) with a positive coefficient value of 0.027, which indicates that when the market power of a bank increases by 1 percent, the net interest margin will increase by 0.027 percent. The findings of this study are following the theory stated that banks with high market power can increase the loan interest rate and decrease deposit interest rate (VanHoose, 2010). In addition, other significant variables are the mobile banking & internet banking variable and the digital branch variable. These two variables are proxies for financial access that describe the network and coverage owned by the bank. The coefficient of the two variables is negative, which indicates that if a bank has mobile banking & internet banking, the net interest margin of the bank will be reduced by 0.008 percent. This is following previous research which shows that financial access has an opposite direction relationship with the interest spread, as the previous study has shown that countries with high financial access tend to have lower interest spreads (De Moraes, Galvis-Ciro & Gargalhone, 2021).

Based on the estimation results on the interaction model, it can be seen that the variable interaction between market power and branch has a significant effect on net interest margin with a negative coefficient value of 0.029. Furthermore, based on the estimation results, it was also found that the variable interaction between market power and mobile banking & internet banking significantly affect net interest margin with a negative coefficient value of 2.033. The variable interaction between market power and digital branch shows insignificant results. The moderating effect provided by financial access on the relationship between market power and net

interest margin as a whole is measured using the effect size index with the value obtained is 0.189. This value can be interpreted that the size of the moderating effect provided by financial access on the relationship between Market Power and NIM tends to be moderate because it is in the range between 0.15 and 0.35 (Helm & Mark, 2012).

This is consistent with previous research which found that the greater the financial access, the lower the interest rate spread (De Moraes, Galvis-Ciro & Gargalhone, 2021). In addition, previous research has found that limiting the number of banking branches in the economy can increase a bank's market power, reduce the number of services that consumers have, and ultimately increase interest margin (Saunders & Schumacher, 2000) Then, other research shows that higher financial access will reduce the inefficiencies that exist in financial institutions (Were & Wambua, 2014). Meanwhile, if traced back, it is important to note that the downward trend in net interest margin can be viewed as a positive development as well because it shows greater competition and technological innovations that increase productivity (Saksonova, 2014).

CONCLUSIONS

This study analyzes the effect of market power on a bank's net interest margin in Indonesia and also evaluates the moderating effect of financial access to the interaction between bank's market power and net interest margin. The result indicates an increase in bank's market power will increase the net interest margin of each bank as the relationship between the two variables is positive. The explanation of this finding is when banks increase its market power, they tend to increase the interest rate loan charged to the debtor and decrease the interest rate of deposit given to the customer, thus will increase the net interest margin.

Another finding regarding the moderating effect of the financial access shows that branch and mobile banking & internet banking have a significant moderating effect on the relationship between market power and net interest margin, while the digital branch is not significantly moderate the relationship. Based on the estimation results, the coefficient of these interaction variables is negative, that indicate that the availability of branch and mobile banking & internet banking can negate the effect of market power on bank's net interest margin. The results indicate that the expansion of physical banking network and implementation of electronic or digital banking channel can reduce the bank's profitability ratio.

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