国際開発研究フォーラム
FORUM OF INTERNATIONAL DEVELOPMENT STUDIES

研究論文
ARTICLE

Does Competition Diminish Indonesia's Banking Stability?

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Abstract

　　In 2004, the Indonesian banking supervisory authority issued a series of policy guidelines to strengthen the banking sector in which consolidation is one of the agendas. Consolidation decreases the number of banks and affect competition. In 2015, the Indonesia Financial Supervisory Authority issued Financial Service Masterplan 2015–2019, in which it is stated that maintaining financial stability is one of the aims that need to be achieved. This study analyzed the relationship between competition and stability employing an Indonesian commercial bank dataset from 2001 to 2015. The results show that an increase in competition decreases stability. The relationship between the Lerner index and the Z index forms an inverse U shape. Moreover, as mergers and consolidations also affect ownership structure, this study includes an indicator of ownership dispersion as an additional regressor. Compared to banks with concentrated ownership, banks with disperse ownership were shown to be more stable.

Keywords: Competition, Banking Stability, Lerner Index, Ownership Dispersion

1. Introduction

　After the 2007 global financial crisis, discussion on banking competition and stability has intensified (Adhamovna 2016: 27). Banking competition is affected by a decrease in the bank number due to the consolidation process. Consolidation has happened in Indonesia's Banking sector. The number of banks in Indonesia has fluctuated following policy direction from Indonesia's government.

　In 1988, after Indonesia's banking deregulation called Pakto 88, the number of banks in Indonesia increased significantly. Pakto 88 was a deregulation package that encouraged the banking industry to expand. The deregulation was a counter policy in response to closed banking licensing policy from 1977; new banking licenses were open in 1988. After Pakto 88 was issued, the number of banks increased significantly until the Asian currency crisis started in 1997.

　The Asia currency crisis that started in 1997 severely affected the Indonesian economy. During the crisis, many banks in Indonesia suffered because of sharp rupiah depreciation. As a recommendation from the IMF, 16 banks were liquidated. After the liquidation, the banking industry lost trust from people, and the number of banks further decreased.

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In 2004, Bank Indonesia as the banking supervisory authority encouraged banks to conduct consolidation. The consolidation policy was issued through a policy guideline called Indonesia Banking Architecture, which is a set of policy guidelines to strengthen Indonesia's banking industry. Several policies were implemented under the program such as consolidation policy, risk management, governance, and customer protection. Under consolidation policy, small banks were encouraged to merge with bigger banks or with other small banks.

As one of the tools to encourage small banks to merge, Bank Indonesia issued regulation No. 8/17/PBI/2006 regarding the Incentive for Banking Consolidation. Under the regulation, a bank that conducts consolidation through mergers and acquisitions will receive several benefits. On the other hand, as a pull factor Bank Indonesia also increased the minimum tier one capital that was mentioned in Bank Indonesia Regulation No. 7/15/PBI/2005.

Furthermore, policymakers have been conducting consolidation programs to strengthen the banking industry. Small banks are encouraged to become bigger entities, which is vital to achieving economies of scale. By conducting consolidation policies, it is expected that the banking sector will have a smaller bank number with a bigger size. Likewise, the number of players is one of the components of market structure that shapes competition (Adhamovna 2016: 26). Nevertheless, the stability of the banking sector is essential for Indonesia's economy as mentioned in Indonesia Financial Service Master Plan 2015–2019. This study would like to measure banking sector competition by calculating the Lerner index in relation to bank stability.

The theoretical background for the competition-stability relationship follows theoretical background for the competition-risk relationship as stability is known as a measurement of risk. The "franchise value" hypothesis says that competition will create instability as the bank will try to limit their risk-taking to protect the quasi-monopolies granted by the government charters. In other words, a bank may be at a greater risk when competition increases. On the other hand, the "competition-stability" hypothesis explain that a decrease in competition will allow a bank to gain more market power. Higher market power means charging higher loan rates. However, in a hazardous environment, entrepreneurs that pay higher loan interest rates prefer to increase the risk of their investment projects (Stiglitz and Weiss 1981). Hence, a decrease in competition will increase bank risk and create instability. Martinez-Miera and Repullo (2010: 13–15) propose a way to reconcile both of these views. They show that the competition-stability relationship forms a "U" shape. Hence, a quadratic form of competition is suggested when exercising the competition-stability relationship.

As consolidation programs may change the structure of ownership, the present study conceptualizes ownership structure in our equation as an independent variable. Merging two banks into one will create a new ownership structure. Furthermore, dispersion of ownership is employed by calculating the Herfindahl-Hirschman Index of ownership. A concentrated owner can have a good impact on stability when the owner conducts a supervisory function. However, a concentrated ownership

structure can also create instability when the owner imposes their interest and undermine the bank's interest.

Despite the fact that there are some limitations in our study, to our knowledge, the present study extends the empirical literature in some aspects. First, this paper includes the price of capital to mitigate risk in the trans-log cost function to take into account risk in the Lerner index. Second, this paper proves the quadratic function of the Lerner index using Indonesia banking sector dataset, and third this paper examines the relationship between dispersion of ownership and stability.

Below is a literature review. This is followed, in part three, by an explanation of data and methodology. Lastly, the discussion and policy recommendation are described in section four.

2. Literature Review

2.1. Literature Review on Competition Measurement

There are several ways of measuring competition, including the concentration ratio, the Herfindahl-Hirschman Index (HHI), the H-Index, the Boone Indicator, and the Lerner index. The HHI, H-Index, and Lerner index are the most commonly used indicators (Adhamovna 2016: 28), with the Lerner index being the most widely cited index (Elzinga and Mills 2011: 1).

In this research, the Lerner index is often employed as it is different from the HHI and H-index which produce one number for an entire market. The Lerner index measures competition for each player in the market. The Lerner index explains the gap between product prices and the marginal cost of production. The standard formula of the Lerner index is the difference between price and marginal cost divided by price. There are several methods to get a proxy for a price and marginal cost.

Price can be calculated by computing the ratio of the total revenue to the total assets. Marginal cost can be determined by employing a trans-log cost function. The homogenous price index is used in this equation so that the price of the input is normalized by one of the input prices.

There is some variation in the trans-log cost function. The number of inputs and outputs is varied, the type of input price and output is also varied. Moreover, researchers such as Ariss (2010) and Klaus (2008) add net-put variables in their trans-log cost function such as fixed assets, the nominal value of balance sheet items, and equity capital. In terms of output, the asset has been chosen by numerous researchers including Koetter, Kolari, and Spierdijk (2008: 8–10), Liu and Wilson (2011: 33), Ariss (2010: 767), Weill (2011: 7), and (Risfandy 2018: 46). Not only a single output may be used in the equation, but two types of output in one trans-log cost function can also be implemented, such as in the research by Maudos and de Guevara (2007: 2108) that uses loans and deposits as outputs.

Another way to calculate price and marginal cost is using interest rate. Jiménez, Lopez, and Saurina (2013: 10–11) utilize loan interest rate as the proxy for price, while marginal cost is derived from the inter-bank loan that was adjusted to the probability of default and the loan at a given default to consider

risk premium. To employ this method, a study needs to have individual data on loan interest rates. It may be difficult to replicate this method as the data are not publicly available. Hence, Maudos and de Guevara (2007: 2107–2110) estimate the Lerner index with an interest rate formula. However, the data on the interest rate for a loan is calculated by dividing interest income and other operating income by the total loan, while the interest rate for deposits is calculated by dividing the interest expense by deposits.

The Lerner index was initiated by Abba Lerner's 1934 paper in the Review of Economic Studies (Elzinga and Mills 2011: 2). The study tried to measure social loss from monopolies by taking the gap between price and marginal cost. For Lerner, the bigger the gap, the higher degree of monopoly. Despite its limitations, the Lerner index is the best-known measure of monopoly power (Elzinga and Mills 2011: 1).

The Lerner index measures the gap between price and marginal cost. Hence, the higher the Lerner index, the higher the market power. In a perfect competition that is "top competition," each player will sell at a price close to their marginal cost. On the other hand, when a player can reap high margins above their marginal cost, competition is relatively low such that the player can enjoy an excess profit.

Competition can also be described as market structure, which usually can be measured by concentration ratio. There is some research about competition and market structure. Several researchers have proved the theory of structure conduct and performance (SCP). Under the SCP hypothesis, it is said that market structure will determine performance through conduct or behavior. The SCP hypothesis suggests that market concentration has a positive relationship with profit. Some research that supports the SCP hypothesis includes Mishra and Sahoo (2012: 235) that used Indian data, Bhatti and Hussain (2010: 174) that utilized Pakistani commercial banking data, and Katib (2004: 1) that utilized Malaysian commercial bank data.

2.2. Literature Review on the Competition-Stability Relationship

Stability is usually understood in the context of measuring risk. There are several methods that can be used to measure risk. Non-Performing Loan (NPL) is one of the measures that are widely used as a parameter of risk, as done by Jiménez, Lopez, and Saurina (2013: 14). Other measurements such as the ratio of loan loss provision to the total loan are employed to measure credit risk; the ratio of liquid assets to total assets is employed to calculate liquidity risk, and the ratio of total equity to the total assets is used as a proxy for capital risk. Brissimis, Delis, and Papanikolaou (2008: 17) use these three indicators as parameters of risk in the banking sector. Risk-adjusted ROA and Risk-adjusted ROE have been used by Ariss (2010: 768) to measure risk in addition to the Z index. The Z index, which measures the stability of a bank, can also be used as a parameter of bank risk as a whole, as it was done by Agoraki, Delis, and Pasiouras (2011: 6–7).

The competition-stability relationship is not conclusive. Some research has found a positive

relationship and supports the competition-stability hypothesis, but some other research has found a negative relationship, supporting the competition-fragility hypothesis. Berger, Klapper, and Turk-Ariss (2009a: 1), Ariss (2010: 765), Jiménez, Lopez, and Saurina (2013: 1), and Agoraki, Delis, and Pasiouras (2011: 1) are among researchers that support competition fragility, while Mulyaningsih, Daly, and Miranti (2016: 333) and Fiordelisi and Mare (2013: 1) support the competition-stability hypothesis. Havránek and ˇZigraiová (2015: 1) analyzed 31 studies on competition and stability; their analysis shows that the definitions of stability and competition will define the result.

Some researchers have studied competition and market power in the Asian banking sector, with Indonesia as one of the case studies. Soedarmono, Machrouh, and Tarazi (2013: 1) show that impact of bank market power on bank risk is conditional on the whether the banking sector receives benefits from a "too big to fail" policy. In Soedarmono, Machrouh, and Tarazi (2011: 1) it is shown that higher market power is related to instability. However, high economic growth can neutralize the impact of high instability in a less competitive market. In Soedarmono and Tarazi (2016: 1), the positive relationship between market power and instability is further documented.

Some research has explored Indonesia's banking competition. Widyastuti and Armanto's (2013: 413–417) researched competition in Indonesia's banking industry by employing the Panzar-Rose model and found that from 2001–2006 most of the banks were in a monopoly or collusive oligopoly. Mulyaningsih and Daly (2011a: 141) have investigated the medium-sized banks which were found to be the most competitive and least concentrated market. Large banks, on the other hand, were found be more concentrated, and thus less competitive. Some results have also found that during the consolidation process the market becomes less concentrated. Rokhim and Susanto (2013: 137) found that competition and efficiency in Indonesia's banking sector increased after deregulation in 1998 along with an increase in foreign ownership; on the other hand, they also found an increase in insolvency risk. Mulyaningsih, Daly, and Miranti (2016: 333) investigated the competition-stability relationship in Indonesia's banking industry. Their result shows that a competitive environment contributes to reducing a bank's insolvency risk. It signals that there is no competition-stability trade-off in Indonesia's banking industry. However, Wibowo (2016: 1) found the Lerner index has a negative relationship with credit risk in Indonesia's banking sector.

3. Data and Methodology

3.1. Data and Methodology to Calculate the Lerner Index

As shown in the literature, there are several measurements to describe competition. Each of the measures has its limitations. The present study uses the Lerner index as it will give an individual measurement.

The Lerner index is the gap between price and marginal cost, divided by price. Price is estimated

by computing the ratio of total revenue to total loans as bank output. Following other researchers such as Maudos and de Guevara (2007), Klaus (2008), Koetter, Kolari, and Spierdijk (2008: 8), Ariss (2010: 767), Liu and Wilson (2011: 33) and Weill (2011: 7), the present study derived marginal cost from the trans-log cost function.

As failure to account for risk in the Lerner index may produce a biased conclusion (Jiménez, Lopez, and Saurina 2013: 10), this study includes risk in the trans-log cost function. This study adds the cost of capital set aside for impairment provision as one of the input prices. The quality of a banks' asset may be deteriorated, for example, when a debtor fails to service its loan and interest for more than three months; in this case, the bank is forced to set aside capital to cover the potential loss. This, in turn, creates an impairment cost for the bank.

The trans-log cost function follows an intermediary approach and uses one output and four input prices. The total loan represents output, and the input price is labor, physical capital, borrowed funds, and capital charges for risk mitigation. As the banking sector is related to risk in terms of asset value deterioration, this study includes the price of capital charge for asset deteriorations that were represented by impairment expenses. The price of capital charge for asset deterioration is computed by dividing impairment expenses by total assets. Moreover, to capture technological changes, this study includes the trend in the trans-log cost function. Hence the trans-log cost function is:

$$
\begin{aligned}
Ln\ TC = {} & \alpha_0 + \alpha_1\ Ln\ y + \frac{1}{2}\alpha_2(\ln y)^2 \\
& + \sum_{j=1}^{3}\beta_j \ln w_j + \sum_{j=1}^{3}\frac{1}{2}\beta_j \ln w_j^2 \\
& + \sum_{j=1}^{3}\sum_{k=1}^{3}\beta_{jk} \ln w_j \ln w_k \\
& + \sum_{j=1}^{3}\gamma_j \ln y \ln w_j + \sum_{j=1}^{3}\rho_j\ \text{trend} \ln w_j + \mu_0(Ln\ y*\text{trend}) + \mu_1\ tren + \frac{1}{2}\mu_2\ trend^2 + \varepsilon
\end{aligned}
\tag{1}
$$

Where TC is total cost, y is the total loan, W_1 is the price of labor (the ratio of personnel cost to the total assets), W_2 is the price of physical capital (the ratio of all other costs excluding interest, personnel, and impairment costs to the total assets), W_3 is the price of borrowed funds (the ratio of interest cost to third-party funds). W_4 is the price of capital charged for asset deterioration (the ratio of impairment costs to the total assets). Total cost and input price are normalized by W_4 to have a homogenous price standard.

The trans-log cost function is computed using random effect GLS. The regression result is used to calculate marginal costs by employing the first derivative of the cost function with respect to total loan as shown below:

$$
MC = \frac{TC}{y}\left(\alpha_1 + \alpha_2\ lny + \sum_{j=1}^{3}\gamma_j \ln w_j + \mu_0\ trend\right)
\tag{2}
$$

Table 1   Data Summary Statistics of Trans-log Cost Function

Variable	Obs	Mean	Std. Dev.	Min	Max
Non-Operational Revenue	1,333	34,294	214,461	0	5,353,313
Interest Revenue	1,356	2,340,048	6,657,283	0	82,200,000
Noninterest Operational Revenue	1,356	424,078	1,513,942	0	18,200,000
Total Revenue	1,373	2,763,197	8,070,677	0	96,400,000
HR Expense	1,331	373,002	1,112,417	0	15,300,000
Interest Expenditure	1,327	949,292	2,358,706	0	25,700,000
Other Expenditure	1,261	302,947	1,144,663	6	13,300,000
Impairment Expenditure	1,332	197,923	752,311	0	10,500,000
Physical Capital Expenditure	1,297	557,602	1,674,342	0	17,300,000
Total Cost	1,395	2,081,276	5,586,932	0	64,200,000
Profit	1,354	657,707	2,645,434	−7,180,681	32,200,000
Total Asset	1,332	24,500,000	74,800,000	0	846,000,000
Total Loan	1,332	14,500,000	46,000,000	0	558,000,000
Third Party Fund	1,332	19,900,000	61,900,000	0	643,000,000

Source: Indonesia Financial Service Authority, author calculation

Data to calculate the Lerner index was taken from bank profit and loss statements as well as the balance sheets that were published and submitted to Indonesia's banking supervisory agency. Data used in this study is from the Indonesia Financial Service Authority. Some macro economy data is taken from the World Development Indicator.

As a sample, this study uses all Indonesian commercial bank data that still existed in 2016 except for foreign bank branches and Syariah banks. In total there are 93 banks in the sample with a sample period of 2001–2015. The total cost was derived from total revenue plus bank profit. Some negative data on cost, assets, loans, and third-party funds were deleted. Table 1 shows the summary statistics of data used to calculate the Lerner index.

3.2. Data and Methodology to Examine the Competition-Stability Relationship

This study tries to capture the quadratic form of competition to prove the Martinez-Miera and Repullo (2010: 13–15) hypothesis. Moreover, this study also conducted regression with the non-performing loan (NPL) as the dependent variable to check the consistency of the result. The non-performing loan that represents the bad loan to total loan represents credit risk. To find the competition-stability relationship, below is our model:

$$Z\ index_{it} = \alpha + \delta_1 Compete_{it} + \delta_2 Compete_{it}^2 + \gamma_1 HHIownership_{it} + \gamma_2 LA_{it} + \gamma_3 CI_{it}$$
$$+ \gamma_4 lnGDP_t + \varepsilon_{it} \tag{3}$$

Where Compete is competition that will be measured by the Lerner index, HHI ownership is the dispersion of ownership measured by the HHI index, LA is the Loan to Asset ratio, CI is Cost to

Income ratio, and GDP is Gross Domestic Product.

3.2.1. Dependent Variables

The Z Index is used as the stability measure. The formula of Z Index is:

$$Z = \frac{(ROA + EA)}{\sigma\_(ROA)} \tag{4}$$

Where ROA is Return on Assets, EA is the ratio of equity to assets and $\sigma\_(ROA)$ is the standard deviation of the return on assets. The standard deviation was calculated using three-year rolling windows. The Z value is in a log form to scale it down, as was done by Ariss (2010: 773) as well as Liu and Wilson (2011: 28–31).

In order to check the consistency of the result, this study also computes a regression using non-performing loans as a dependent variable. Z index is regarded as bank risk as a whole, while the non-performing loan is a measure of bank credit risk. As the Z Index shows stability, the NPL shows credit risk. The expected sign in the equation with the Z Index as the dependent variable is the opposite of the one with the NPL. A higher value of the Z index shows higher stability and means lower risk. On the other hand, the higher the NPL, the higher the bank risk.

3.2.2. Independent Variables

Competition is our main independent variable that I measure by the Lerner index. There are two central hypotheses on the competition-stability relationship. For Indonesia's banking industry case, which hypothesis holds is not clear. Hence, there is no expectation on the sign of the Lerner index coefficient. To prove Martinez-Miera and Repullo's (2010: 13–15) hypothesis, the quadratic form of the Lerner index needs to have opposite sign as the Lerner index itself. As this study employs the Z Index and NPL as dependent variables, the sign of the competition coefficient in the Z index equation is opposite to the NPL equation. Z Index and NPL will explain risk in opposite angle.

In order to check the relationship between ownership structure and stability, this study employs the dispersion of ownership as one of the independent variables. Ownership structure is known as one of the components of bank governance. The higher the value of the HHI index, the more concentrated the owner is. When the owner is fully distributed into minority shareholders, the owner may lose their power to supervise management. Hence the bank quality depends on the management. However, in concentrated ownership, controlling shareholders also have a possibility to pursue their interest and may abuse the bank. When the owner's objectives are in line with bank interest, the concentrated ownership structure will have a positive impact on stability. On the other hand, when the owner tends to use the bank for their interest and undermine bank interest, concentrated ownership will have a negative impact on stability. In this regard, the sign of the estimated coefficient could be either positive or negative.

The loan to asset ratio shows a bank's asset portfolio. High loan to asset ratios means that the bank invests most of their assets in providing credit. The high loan to asset ratio also shows that bank face high liquidity risk. A bank that collects money from people in a relatively short-term tenor needs to extend loan usually with longer-term maturities. Hence, a larger loan to asset ratio may well create liquidity risk to the bank. In that regards, we expect a negative relation between stability and loan to asset ratio as found by Berger et al. (2004: 19).

The cost to income ratio represents inefficiency. The formula to compute cost to income ratio is operating expenses divided by operating revenue. A higher number of the ratio will show that a bank needs more costs to produce the same output or with the same output the bank will generate less revenue. Inefficiency may come from less capable management, which can cause higher risk to the bank. The inefficient bank is expected to create instability; in other words, the operational expense to revenue expense ratio will have a negative relation with the Z Index. Studies by Agoraki, Delis, and Pasiouras (2009: 15–16), as well as Liu and Wilson (2011: 30–31) have shown a negative relationship between the inefficiency ratio and stability.

This study includes *Gross Domestic Product (GDP)* in the log form as a macro economy variable. On a bigger scale of economy, there is more opportunity for the real sector to do their business in comparison to a small economy. That situation also gives a chance to the banking sector to provide financial services. Hence banks may raise higher funds and lend more loans so that their profitability will increase. The expected sign of GDP is positive. Berger et al. (2004: 20) found that GDP per capita has a positive relationship with the Z index. However, some research such as that done by Ariss (2010: 773) found that GDP per capita did not significantly predict stability. GDP is chosen as it varied across time. Hence, by adding GDP in the equation, this study compares the size of the economy over-time. The bigger economy is expected to have a better opportunity for banking business. In that regard, the expected sign of the GDP coefficient is positive.

This study considers endogeneity and heteroscedasticity issues by employing the Generalized Method of Moment (GMM) as explained in Berger, Klapper, and Turk-Ariss (2009b: 13–14). Activity restriction is used as an instrumental variable as was done by Fu, Lin, and Molyneux (2014: 66) as well as Berger, Klapper, and Turk-Ariss (2009b: 13–14). In the case of Indonesia banking sector, activity restriction is defined based on Bank Indonesia's regulation that classified banks into four categories. The Bank Indonesia Regulation No. 14/26/PBI/2012 regarding Banking Activities and Branch Offices Based on Tier One Capital defines which activities are allowed for each bank classification. This study creates an index of 1 to 4 that shows restriction in the banking business. Index 1 is given for banks with business activities limited to regular banking, while 4 is assigned to banks that get a full license. Restriction to business activities can be a good instrument as the restriction defines bank competition (Berger, Klapper, and Turk-Ariss, 2009b: 13–14). The weak instrument test shows that the instrument is strong as shown by the F test that is far higher than 10 (183.487 for Lerner and 150.309 for Lerner[2]).

The result of regression showed that there is no endogeneity as the Durbin-Wu-Hausman test cannot reject the H_0. The result of endogeneity tests and weak instrument are shown in Table 4. Hence, fixed effects and random effects regressions are employed. The Durbin-Wu-Hausman test is used to choose whether fixed effects or random effects are appropriate. This study also controls heteroscedasticity and autocorrelation problems by clustering the model by cross-section. In the case of heteroscedasticity, robust standard error is used in the regression.

In the banking industry, one bank connects to another through the interbank money market, and one bank also depends on another bank when they define their price strategy. This situation suggests

Table 2　Data Summary Statistics for Stability and Competition Regression

Variable	Obs	Mean	Std. Dev.	Min	Max
Z Index	1,139	1.527391	1.204997	−3.912023	6.022673
NPL	1,347	2.125417	3.125072	0	44
CI	1,374	81.06267	21.79709	20.33548	461.8113
GDP	1,395	26.86487	0.6010766	25.79844	27.54546
LA	1,367	0.5687058	0.1647296	0.0107289	0.931841
HHI Ownership	1,288	5020.186	2891.73	0	10000
Lerner	1,073	0.3798037	0.1618262	−0.6121485	0.990739
Lerner 2	1,073	0.1704142	0.119237	6.96E−07	0.981564
Restriction	1,395	3.574194	0.9458324	1	4
Restriction 2	1,395	13.66882	4.996627	1	16

Source: Indonesia Financial Service Authority and World Development Indicator, author calculation

Table 3　Correlation Matrix

	Z Index	NPL	CI	GDP	LA	Owner	Lerner	Lerner 2	Restrict	Restrict 2
Z Index	1									
NPL	−0.2399	1								
CI	−0.3623	0.0639	1							
GDP	0.0878	−0.2386	0.1239	1						
LA	0.0197	−0.0119	0.0243	0.3426	1					
Ownership	−0.091	−0.0123	−0.0302	0.0413	0.0397	1				
Lerner	0.1087	−0.1013	−0.3625	−0.068	−0.1413	0.0778	1			
Lerner 2	0.0744	−0.0769	−0.3978	−0.0765	−0.187	0.0925	0.9638	1		
Restrict	−0.0078	0.1161	−0.1083	−0.4839	−0.2134	0.0088	−0.0919	−0.0715	1	
Restrict 2	−0.0105	0.1161	−0.1133	−0.5051	−0.226	0.0121	−0.0529	−0.0349	0.9927	1

Source: Indonesia Financial Service Authority and World Development Indicator, author calculation

that there is a correlation among cross-sections. Ignoring cross-section correlations may cause bias in estimations (Hoechle 2007: 1–2). Hence Hoechle (2007: 3–4) recommends the Driscoll and Kraay standard error in panel estimation. Therefore, this study uses the Driscoll and Kray standard error as an alternative method to conventional and robust standard error. The problem of heteroscedasticity and autocorrelation has been solved by using Driscoll and Kraay standard error.

In Table 2 and Table 3 are the summary statistics and correlation matrix of the data used to estimate the equation.

4. Result and Findings

The regression results show that in terms of signs, calculation using Driscoll-Kray standard error produced consistent signs as robust standard error. The regression results for the relationship between stability and competition are shown in Table 4. The column in the middle is the regression result using random effects with cross section clusters to treat heteroscedasticity and autocorrelation.

The regression results support the competition-fragility or franchise value paradigm in which market power has a positive relationship with stability. The acceleration of the positive relationship

Table 4　Result for Z Index and Lerner Index Regression

Dependent Variable: Z Index Independent Variable:	Random Effect GLS with Cluster		Regression with Driscoll-Kraay standard errors	
	Coefficient	P Value	Coefficient	P Value
CI	−0.0366909	0.00000	−0.0365056	0.0000
GDP	0.4564221	0.00000	0.3724689	0.0020
Loan/Asset	−0.896893	0.02100	−0.4866437	0.0160
HHI Ownership	−0.0000279	0.09700	−0.0000373	0.0010
Lerner	7.468757	0.00000	5.304742	0.0000
Lerner 2	−8.892659	0.00000	−7.405571	0.0000
Constant	−8.649756	0.00000	−5.965324	0.0410
Inflexion Point	0.419939		0.35816	

Hausman Test	Prob＞chi2＝	0.0002	RE more appropriate	
Modified Wald test	Prob＞chi2＝	0.0000	Heteroskedastic	
Wooldridge test	Prob＞F＝	0.0000	Autocorrelation	
Endogeneity Test	p＝0.8329			
Weak Instrument				
F value	Lerner	183.487		
	Lerner 2	150.309		

Source: Indonesia Financial Service Authority and World Development Indicator, Author calculation

diminishes as the square term of market power shows a negative sign. The results also support the suggestion by Martinez-Miera and Repullo (2010: 13–15) that competition-stability relationship is non-linear. The positive relationship forms an inverse U shape where market power increases and acceleration decrease.

Regression results with conventional standard error produce an inflection point at 0.42 while regression with Driscoll-Kray produces an inflection point at 0.36, but both regression results produce inflection points around the mean of the Lerner index. Having an inflection point explain that the positive relation between stability and Lerner index will reach the peak at the inflection point, and above the inflection point the relation may be changed. Hence, other research that uses a data set that includes higher Lerner index may conclude a different result.

The sign of the estimated coefficient attached to the indicator of ownership concentration is negative and significant. It is suggested that in Indonesia's banking sector, the higher the concentration of ownership is, the less stable a bank becomes. The result infers that owners of high concentrated ownership shares tend to supervise banks based on their self-interest and thus undermine bank interest as well as the stability of the bank. The finding also suggests giving more power to minority shareholders and even creditors to monitor bank. By giving power to minority shareholders and creditors, there will be a balance of power between majority shareholders and minority shareholders.

The cost to income ratio which is the inverse of efficiency shows a negative and significant result. The negative sign shows banks that are inefficient tend to be less stable. This situation is plausible as an inefficient bank may have a low-level of managerial skill that may expose the bank to higher risk and low stability.

GDP as one of my macroeconomic variables shows a positive relationship with stability. This finding indicates that when the size of an economy is big, opportunity in banking business is mostly opened. Banks can sell their product and services better. As a result, a bank can earn higher profits. As one of the stability components in calculating the Z index, higher profits will create a higher Z index.

As expected, the regression results for loan to asset ratio shows that higher loan to asset ratio is associated with lower stability. It suggests that in Indonesia's banking sector, investment in the form of loans are relatively risky as it create liquidity risk to the bank. Moreover, any effort to improve risk management in a bank will be a benefit to the banking sector.

In order to check the consistency of regression result that supports the franchise value paradigm, this study conducts a regression using Non-Performing Loan as the dependent variable. The franchise value hypothesis argues that competition will reduce the franchise value and will encourage a bank to take higher risk. Hence, NPL is expected to have a negative relation with The Lerner index. The regression result is shown in Table 5.

For the regressions with NPL as the dependent variable, the Hausman test suggests that fixed effects are appropriate. The fixed effects model fits the equation where NPL is the dependent variable

Table 5　The Result of NPL and Competition Regression

Dependent Variable: NPL Independent Variables:	Fixed Effects with robust SE		Fixed Effect with Driscoll-Kraay SE	
	Coefficient	P Value	Coefficient	P Value
CI	−0.0031096	0.8080	−0.00311	0.7830
GDP	**−1.777366**	0.0000	**−1.777366**	0.0000
Loan/Asset	1.370041	0.3720	1.370041	0.2210
HHI Ownership	−0.000022	0.7850	−0.000022	0.6930
Lerner	**−13.00894**	0.0170	**−13.00894**	0.0110
Lerner 2	**11.56639**	0.0450	**11.56639**	0.0240
Constant	**52.41924**	0.0000	**52.41924**	0.0000
Inflexion Point	0.56236		0.56236	

Hausman Test	Prob＞chi2＝	0.5847
Modified Wald test	Prob＞chi2＝	0.0000
Wooldridge test	Prob＞F＝	0.8280

Source: Indonesia Financial Service Authority and World Development Indicator, Author calculation

while a random effect model is more appropriate for the equation with the Z index as the dependent variable. Logically speaking the shares of NPL are related to the capacity of risk management that in turn, depends on many bank-specific factors. Random effect models seem to be appropriate in explaining differences in Z indices across banks and over time as they are subject to more system-wide random shock. The Wald test for heteroscedasticity test shows that there is heteroscedasticity in the model. The Wooldridge test indicates that there is no autocorrelation, hence fixed effects with robust standard error are employed.

　The regression result using robust standard error and Driscoll-Kraay produce the same coefficient, but the P value is different. Some independent variables that show a significant effect in Z index regression turn into non-significant. The non-significant independent variables are Cost to Income ratio, Loan to asset ratio, and HHI ownership.

　The primary independent variables, the Lerner index and quadratic form of the Lerner index, show a significant result. In the regression with NPL as a dependent variable, the Lerner index shows a negative relationship with NPL. A higher Lerner index is associated with a lower Non-Performing loan. Lower non-performing loans mean lower credit risk and higher stability. Hence, the regression results with NPL as the dependent variable also prove that competition-fragility holds in Indonesia banking industry. The quadratic form of the Lerner index also shows a significant result, indicating that the relation between credit risk and market power form a U curve with the inflection point at 0.56. The quadratic term of Lerner Index in this equation shows that the acceleration of the Lerner Index decreases.

5. Conclusion and Policy Recommendation

The regression results suggest that there is a negative relationship between competition and stability in the Indonesian banking sector. Higher competition is associated with lower stability. This result supports the franchise value paradigm. The result also promotes the idea of consolidation that was encouraged by the banking supervisory authority. Consolidation policy will ease competition in the banking sector. Reduction in the competition will improve bank stability. This result furthermore supports the authority when the authority would like to consolidate Indonesia' banking sector further. However, there should be additional research to determine how many banks are appropriate for Indonesia's economy.

The quadratic form of the Lerner index shows a significant result suggesting that the relation between market power and stability forms an inverse U curve. At a lower level, higher market power will have a positive impact on stability, but the higher the market power, the more acceleration will decrease. The marginal (and partial) contribution of higher Lerner Index to higher stability will become zero at the inflection point. Thereafter, the marginal contribution becomes negative. The inflection point is around the mean of Lerner Index of Indonesia's commercial banks, suggesting that some bank in the data set has a Lerner index that does not produce stability anymore. As Indonesia Financial Service Authority would like to establish stability as mentioned in Indonesia Financial Service Master Plan 2015–2019, monitoring and supervision of market power are needed.

This study finds that, in Indonesia's banking sector, the higher the concentration of ownership, the less stable a bank becomes. The results suggest that owners of high ownership shares tend to guide bank in line with their self-interest and thus undermine the stability of the banks. When concentrated ownership is chosen, there should be a good transparency policy framework in the bank. The minority shareholder, creditor, and even the public can conduct a supervisory role in the banking industry through their informed decisions.

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