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DID THE CRISIS STRENGTHEN BANK COMPETITION IN INDONESIA?: MARKET STRUCTURE ANALYSIS PRE AND POST THE 2008 FINANCIAL CRISIS

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ABSTRACT

The banking industry has become a substantial part of the economy. This paper traces the change in market structure and assess the level of competition among the top 10 banks of Indonesia for the period 2005-2014. Then also distinguishing between before and after the Global Financial Crisis. Utilizing the Panzar-Rosse method and panel data, we discovered that the results show an increase in the H-value from 2005-2009 to 2010-2014 and a movement towards an almost perfectly competitive environment. Interest rates drove the short response of post-crisis on the competition. Therefore governmental supervision is required to prevent liquidity issues due to the imposition of high-interest rates.

Keywords: *Banking, Competition, Global Financial Crisis, Panzar-Rosse Model*

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Introduction

The banking industry plays a substantial role in supporting the economy. As a financial intermediary, it can drive economic performance by connecting those parties with money in reserve (i.e., savers) to those who do not have sufficient funds to conduct their desired activities (i.e., borrowers). In Indonesia, the top 10 banks control 60 percent of the market, which indicates an oligopolistic market structure. A significant event that hampered the overall stability of the Indonesian economy, including that of the banking industry, was the 2008 global financial crisis. The country was not immune to the adverse impacts of the global financial crisis. Its monetary authority conceived of a range of regulations and policies aimed at directly affecting the banking sector's competition pattern, including a lowering of banks' required reserves and establishing a crisis management protocol aimed at preventing banks from collapsing during a crisis. A blanket guarantee was yet to be enacted at the time, which led to capital outflows and domestic liquidity issues.

In response to the situation and to maintain banks' intermediary performance, the government reduced the minimum reserve requirement rate from 9.1 percent to 7.5 percent

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to increase their liquidity. Additionally, it enacted several policies through the Government Regulations in lieu of Laws 3/2008 and 4/2008, which, among others, permitted the performing of loans as collateral to acquire short-term funding, increased the deposit threshold that the Deposit Insurance Agency secured from IDR 100 million to 2 billion. The application of a financial system safety net to prevent any liquidity issues for banks and other financial institutions, the bankruptcy of which it was deemed would create a systemic effect.

Indonesia's banking industry is currently dominated by ten banks that account for 60 percent of the total market. The top 10 banks are BRI, Bank Mandiri, BCA, BNI, CIMB, Bank Permata, Bank Danamon, Bank Panin, BTN, and BII. Since 2010, these ten banks between them have consistently dominated 60 percent of the total market. That being said, their combined share appears to have fallen, from 64.7 percent in 2010 to 62 percent in 2014. However, even though the ten banks have lost some of their market shares, they still consistently hold the most significant total assets volume among other banks operating in Indonesia. Therefore, this research focuses only on the ten largest banks as these are deemed to represent the condition of Indonesia's banking industry as a whole.

Intuitively, the existence of the top 10 banks should have been an indication of oligopoly. Any collusion or price manipulation that can occur under such a market structure is deemed to impede the financial inclusion envisioned by the government. However, previous studies on Indonesia's banking industry structure have discovered that it is characterized by a monopolistic market structure (Bikker et al. 2012, Sutardjo et al., 2011). Since the interest rate charged on loans by these banks often deviates from that of the central bank, potential borrowers tend to be disincentivized from borrowing from them. Therefore, it is intriguing to undertake a further examination to identify the structure of competition among the ten dominant players in the market. Over-competition in the banking industry may oblige its players to opt for excessive risk, especially in the savings deposit and credit markets. Since any incidence of market failure and anti-competitive conduct carries the potential to substantially affect the Indonesian economy and lead to the impacts being inflicted on society, it is essential to ensure fair competition in the industry.

In empirical works using banking data, the evidence points to competition within the banking industry. However, the existing studies have varied across different countries and periods (Bikker et al., 2012; Bikker and Haaf, 2002; Claessen and Laeven, 2004; Shaffer, 1993; Shaffer, 2002; Sutardjo et al., 2011). For instance, Claessen and Laeven (2004) estimated the degree of competition within the banking industry in 50 countries—including Indonesia—using the Panzar-Rosse model (1987) and found that Indonesia's banking industry featured monopolistic competition. It was supported by the study from Bikker et al. (2012) that examined 105 banks in Indonesia and revealed that, in general, the competition in Indonesia's banking industry was monopolistic. Sutardjo et al. (2011) also reported similar results.

Nevertheless, none of these authors has addressed the distinction between the banking industry's market structure in periods leading up to and following a financial crisis. In light of the reform during the 2008 financial crisis that positively affected the degree of competition in the banking industry and the dynamic changes in the sector, this research aims to trace the change in market competition pattern among the ten previously identified banks in Indonesia by comparing the respective conditions in the periods 2005–2009 and 2010–2014. Therefore, this study sheds light on policy response on whether the imposition of government regulations has been successful in driving the banking industry to be more efficient, which becomes a paramount issue to be examined in anticipation of any future financial crisis.

This paper examines the change in market structure among the top 10 banks in Indonesia before and after the 2008 global financial crisis. It utilized the Panzar-Rosse method and panel data for the top 10 banks in 2005–2009 and 2010–2014. this paper contributes to the literature by demonstrating the short impact of a financial crisis on market structure. The Indonesian banking industry was characterized by a monopolistic market structure that almost

became perfect competition following the 2008 financial crisis.

The paper is organized as follows. This first section briefly outlines the background and gives an overview of this research's importance and novelty. The second section contains a literature review of related studies to explore further the structure of competition in the Indonesian banking industry. The third section presents the empirical modeling, data, and variable construction. The analyses and results drawn from the empirical model are contained in the fourth section. Finally, we draw our conclusions and give some recommendations for the banking industry's monetary authority policy in the fifth section.

Literature Review

The extant literature used two types of approaches to measure the degree of competition in the banking sector, namely, structural and non-structural systems (Bikker, 2004). The structural method uses the paradigm of structure-conduct-performance (SCP) as its basis, and competitiveness, in terms of efficient price, can be maintained in two different spectrums, a non-concentrated market and a highly concentrated market (Shaffer, 1993). Industrial organization theory argues that industrial competitiveness is barely measured in the event of reliance solely on market structure characteristics, such as the number of firms, or the Herfindahl and other market concentration indexes (Baumol et al., 1983). Economics contends that performance measurements, including the size of banking margins, interest spread, or profit, do not always reflect the degree of banking sector competitiveness. Shaffer (1993) mentioned that empirical evidence and newly developed theory have proven that the relationship between market concentration and monopoly power may vary. A competitive outcome is no longer exclusive to an unconcentrated market but can also be attained in a concentrated market. Therefore, public policy should no longer rely on a structural approach.

The New Empirical Industrial Organization (NEIO) approach has attempted to establish a non-structural model due to the structural model's unreliability for precisely estimating the relationship between market power and market concentration. A structural approach assesses the degree of competitiveness from the change in market concentration and market power. For instance, studies employing a structural approach have found that market concentration or efficiency affects firms' performance (Claessen and Laeven, 2004). Meanwhile, a non-structural approach assesses the degree of competitiveness based on the cost structure of firms. However, the non-structural approach does not require any information regarding market structure to gauge the level of competitiveness (Bikker and Haaf, 2002).

A well-known non-structural model developed by Panzar and Rosse (PR) can be utilized to assess the degree of competition using the "H-statistic," which is measured by input price elasticity (Panzar and Rosse, 1987). This approach estimates the reduced-form equation relating gross revenue to input prices and other control variables, such as bank-specific factors, that reflect differences in the risks, costs, size, and banks' structures. The degree of competition (H-statistic) is obtained by summing the gross revenue elasticity concerning the input process (marginal cost) by assuming a stable cost function. All changes in marginal cost are attributed to changes in one or more input prices. The H-statistic results are estimated as follows: the banking industry is a monopoly if H=0, the market competition is monopolistic if 0<H<1, and the market is in a perfect match if H=1 (Bikker and Haaf, 2002; Hondroyiannis et al., 1999).

The PR model is based on a reduced form of gross revenue that omits common issues that are usually encountered to obtain supply-side information since revenue-related information is relatively easy to obtain. Furthermore, the PR approach also requires individual bank data to accommodate banks' heterogeneity in the industry. The PR test assumes that banks will set different prices[1] in line with any change in the market price, which is affected by the market structure, both in a monopoly and a perfectly competitive market. The price

[1] In this context, price means the interest charged by banks on their loan-based products (credit cards, mortgages, etc.)

strategy will indeed affect the total revenue of banks. Suppose a bank has monopoly power and aims for profit maximization. In that case, it will set the price as its own, meaning that the gross income response will be negatively correlated with the input price. If all input prices increase, subsequently reducing bank size, the total cost will also decrease. However, this action will lead to a fall in the gross income of banks. Therefore, an increase in input price will reduce gross income (Panzar and Rosse, 1987). Panzar and Rosse (1987) also stated that if the bank is in a perfectly competitive market, increasing input prices will lead to fewer banks in the market. Consequently, those that remain, i.e., the banks that survive the increasing input prices, will earn higher gross revenues.

In general, the question regarding the willingness to compete during a systemic crisis has remained obscure. The application of tough competition during a crisis is a substantial measure taken to ensure fairness and a controlled reaction to the crisis; moreover, it is also necessary to avoid excessive subsidies intended to attract depositors and investors. Smith et al. (2003) worked with general economic equilibrium to examine the cost of banking crises under competitive and monopoly situations. They discovered that the price of a problem in both cases could not be estimated separately from inflation. However, there is a greater probability that the cost of a banking crisis under perfect competition would exceed that in a monopoly situation (Smith et al., 2003).

The methodology used by Panzar and Rosse (1982); Panzar and Rosse (1987) has been widely applied to assess competition in the financial sector, particularly in the banking sector. Furthermore, Shaffer (2002) used the Panzar-Rosse model to examine Kent County State Bank, a monopoly bank in Jayton, Texas, by utilizing quarterly data from 1984–1999. It was found that the bank operated in a firmly rejected static monopoly, oligopoly variations, a constant markup, and entirely debatable behavior, yielding results comparable to some form of monopoly competition. However, further testing did not reject the hypothesis that the bank was also in long-run equilibrium, i.e., a zero economic profit condition. The said condition arose due to the demand curve being tangential to the average cost curve (Shaffer, 2002).

Claessen and Laeven (2004) also sought to estimate input price changes, as reflected in banks' revenues in 50 countries. From their 50-country observations, it was discovered that a banking system in which foreign banks are relatively abundant, and barriers to entry are low tends to be more competitive. It confirms that the degree of openness determines competition pattern, especially if foreign banks are allowed to enter the market, and the controls over banks are loosened. There was also no evidence that competitiveness is negatively correlated with banking system concentration (Claessen and Laeven, 2004). On the other hand, Bikker and Haaf (2002) examined the degree of competition in the European banking system and investigated market concentration's effects on the competition pattern. It was found that structural reform in the banking sector can influence competition, especially in local and retail banking (Bikker and Haaf, 2002). They discovered that the H-statistic could indicate a monopolistic structure in industrialized countries and perfect competition in other cases. This study provides empirical evidence in favor of conventional perspectives, arguing that market concentration will sap competitiveness.

Açikalin and Sakinç (2015) recently conducted another study comparing the change in competition structure between two periods. They found a tightening of the degree of competition in Turkey's banking sector, as indicated by a rising H-statistic (from 0.501 in 2002–2007 to 0.707 in 2008–2013). This finding may reflect the 2000 consolidation policy results and the 2001 domestic financial crisis, which led to a decrease in the number of banks from 61 (in 2001) to 54 (2002). Finally, it became 50 (the year 2003) (Açikalin and Sakinç, 2015).

Data and Research Methods

In this research, we utilized secondary data in a quarterly frequency encompassing the ten largest banks for the periods 2005–2009 (pre and during the 2008 global financial crisis)

and 2010-–2014 (post the 2008 global financial crisis) as we interested in examining the effect of the policy due to the crisis. We observed only the ten largest banks in our analysis because these ten banks represent the majority of the market share for the commercial banking industry in Indonesia. Also, the largest ten banks' position remains relatively stable during the observation period compared to the sample variation bias if we include all commercial banks in our observation. The data were obtained from the official website of Bank Indonesia (www.bi.go.id), as derived from the financial reports of the respective banks. The observed banks are commercial banks whose assets are ranked in the top 10 and whose financial statements were issued annually during the experimental periods. Based on the Indonesian Banking Statistics May 2014 edition published by Bank Indonesia, the ten banks comprise BRI, Bank Mandiri, BCA, BNI, CIMB, Bank Permata, Bank Danamon, Bank Panin, BTN, and BII. We took 2005–2009 and 2010–2014 as the observation periods to observe the effect of the crisis on the banking industry's competition structure by employing a reduced form of the Panzar-Rosse model. This study's regression model is adapted from the original version of the Panzar-Rosse model (1987).

$$\log TR = \alpha + \sum_{i=1}^{n} \beta_1 \log w_i + \sum_{j=1}^{m} \gamma_i \log CF_j + \varepsilon \quad (1)$$

TR is total revenue, wi is the price of input i, and CFj is the specific variable control of firm j. Then, following Panzar and Rosse (1987), we gauged the total elasticity as follows:

$$H^r = \sum_{i=1}^{n} \beta_i \quad (2)$$

In a measure the degree of competition, an estimate is made based on the reduced form income equation adjusted to the Panzar-Rosse (P-R) model above as follows:

$$\ln(P_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \delta DBUMN + \varepsilon_{it} \quad (3)$$

In which the i subscript indicates bank i and t tell the year.

The H-statistic is an increasing function of the demand elasticity, which means that as H increases, less market power is exercised on the banks. It implies that the H-statistic magnitude can serve as a measure of competitiveness, assuming that the bank faces a constant demand elasticity (Cihák and Schaek, 2007). In the above model, the H-statistic is the sum of the coefficients $\beta_1 + \beta_2 + \beta_3$ that will determine the type of market structure for the Indonesian banking industry in the periods 2005–2009 and 2010–2014. The tested hypothesis is as follows: the banking industry is characterized as a monopoly for H = 0, monopolistic competition for 0 < H < 1, and perfect competition for H = 1 (Bikker and Haaf, 2002; Hondroyiannis et al.,1999). In short, the Panzar-Rosse method of determining banking competition is advantageous to be utilized in this research as the H-statistic produced by the estimation will measure Indonesia's banking industry competitive landscape.

As the P-R model is only valid in a market equilibrium state, a calculation was needed to determine this equilibrium condition. An empirical test for equilibrium had to be conducted as competitive capital markets will equalize the risk-adjusted return rates across banks. In equilibrium, the return rates should not be correlated statistically with input prices (Molyneux et al., 1994). Profit-maximizing firms in equilibrium will choose prices and quantities. Marginal costs equal their (perceived) marginal revenue, which coincides with the demand price under perfect competition or with the industry's marginal revenue under perfect collusion (Bresnahan, 1989). The equilibrium model was derived from the primary P-R model. The modification is presented as follows:

$$\ln(ROA_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \varepsilon_{it} \quad (4)$$

In the model, the E-statistic is calculated with the return on assets (or equity), replacing bank revenue as the left-hand variable in the regression equation. The sum of $\beta_1 + \beta_2 + \beta_3$ expresses the equilibrium of the E-statistic. Using the F-test with the hypothesis E = 0, rejecting the F-test indicates that the market is assumed not to achieve long-run equilibrium (Claessens and Laeven, 2004). In short, Equation 3 is utilized to find the degree of competitiveness using the H-statistic, and Equation 4 is used to determine whether the market is in long-run equilibrium using the E-statistic. The definitions and rationales for the variables contained in Equations 3 and 4 are presented in Table 1.

Table 1: Description of Variables

No	Variable	Description and Rationale
1	P = ratio of gross interest income to assets	Proxy for lending rate and price of credit as the bank output. This variable is consistent with the P-R equation in which financial intermediaries are the core function of banks.
2	ROA = Return on Assets	Ratio of pre-tax profits to total assets. In equilibrium, ROA cannot be correlated with input prices. The equilibrium test proves that in a competitive capital market, risk-adjusted rates of return between banks are indifferent. Thus, the return cannot be correlated with input price.
3	W_1 = ratio of interest rate to saving deposit	Proxy for average funding rate and proxy for price of input from saving deposit.
4	W_2 = ratio of personnel expenses to total assets	Proxy for price of labor since it is estimated as the wage rate. Assets were used as the divider because of the dearth of valid data mentioning the quantity of labor employed.
5	W_3 = ratio of miscellaneous expenses to assets	Proxy for price of capital. Covering all capital, not limited solely to physical capital.
6	Y_1 = Return on Equity	Indicating leverage and the variety of risk preference among banks.
7	Y_2 = ratio of credit to assets	Proxy for risk.
8	Y_3 = total assets (Rp billion)	A scale to control the effect of banks' size.
9	DBUMN = 1 if the bank is state-owned, = 0 if otherwise	Indicating different treatment for state-owned banks (BUMN).

Note: Except for dummy variables, other variables are transformed into their natural logarithm (ln) form.

Source: Adapted from Athoillah (2010); Bikker and Haaf (2002); Bikker et al. (2012 Claessen and Laeven (2004);), Shaffer (1993); Shaffer (2002); and Sutardjo et al. (2011).

Equations 3 and 4 for testing the market structure and long-run equilibrium were empirically estimated using panel data modeling with random effects estimation. Panel random effects were selected in consideration of the fact that panel fixed effect estimation is unable to accommodate dummy variables that remain unchanged over time (time-invariant), such as the dummy for state-owned banks (DBUMN)[2]. Using the random model made it possible to estimate the variable for DBUMN. The dummy variable DBUMN indicates whether the bank observed is a state-owned bank (in which case it takes the value 1) or a private bank. This variable is included as we would like to ascertain whether government regulation favors

[2] A Hausman test has confirmed the choice of a random model against a fixed model

state-owned banks since these are claimed to be inefficient in the industry. By imposing bank fixed effects, we may control for a bank's unobservable characteristics in random-effects estimation. Moreover, we applied a heteroskedasticity test and found there to be no violation of the assumption.

Finding and Discussion

The table with summary statistics of the variables used for the estimations is provided in Table 2. It shows that the price of capital has the highest variability among the independent variable, while credit to assets is the lowest one. In the average logarithm term of all ratio variables, the highest average value is the ratio of credit to purchase. Five hundred twenty-eight valid observations to be analyzed in estimation.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LP	538	1.6090	0.6176	-2.7713	2.9135
LW1	538	1.1295	0.6897	-2.4018	2.8544
LW2	538	-0.3078	0.7176	-3.0189	1.3849
LW3	537	-1.1917	1.0945	-5.4896	0.6845
LY1	528	2.9721	0.6137	-1.1712	4.2553
LY2	538	3.9735	0.3258	2.7140	4.3764
LY3	538	11.6133	0.9256	9.4978	13.6136

Table 3 shows that the ten banks have consistently maintained a combined share of the commercial banks market of greater than 60%. The top 10 banks in 2010 increased its market share. However, data in 2014 showed a decline in market share from 61.3% (2006) and 64.7% (2010) to 62% (2014). In 2006 and 2010, Bank Mandiri was the largest bank with a market share of 15.1% and 13.6%. Then, in 2006 followed by BCA at 10.4% and BNI at 9.8%. Meanwhile, in 2006, BRI was in the fourth position with a percentage of 9.1%. However, in 2010, it rose to second place with 13.1%. And finally, in 2014, it occupied the first position with 13.9%. The top five positions have not changed, except Danamon dropping out of the top 10 in 2010 and 2014.

Table 3: Assets and Share of Assets of Top 10 Banks in 2006, 2010, and 2014

Bank	2006		2010		2014	
	Assets (T)	Share (%)	Assets (T)	Share (%)	Assets (T)	Share (%)
BRI	154.725	9.1%	395.394	13.1%	778.018	13.9%
MANDIRI	256.211	15.1%	408.772	13.6%	755.867	13.5%
BCA	175.984	10.4%	323.349	10.7%	541.911	9.7%
BNI	166.703	9.8%	241.408	8.0%	393.467	7.0%
CIMB	46.464	2.7%	142.922	4.8%	227.08	4.0%
PERMATA	37.8144	2.2%	73.5703	2.4%	185.091	3.3%
DANAMON	79.7027	4.7%	113.861	3.8%	163.092	2.9%
PANIN	39.0909	2.3%	106.508	3.5%	159.008	2.8%
BTN	32.5755	1.9%	68.3341	2.3%	144.782	2.6%
BII	48.3131	2.9%	71.6246	2.4%	135.544	2.4%
Others	656.266	38.7%	1,063.11	35.3%	2,131.29	38.0%
Commercial Bank Total	1,693.85	100.0%	3,008.85	100.0%	5,615.15	100.0%

Source: Bank Indonesia, CEIC (2015), calculated.

Three out of the four state-owned banks—BRI, Mandiri, and BNI—were among those

with the most considerable assets. Meanwhile, BTN occupied the ninth position in 2014. By 2014, the asset gap among the ten banks had undergone a relative narrowing compared to 2006. The ratio of the largest asset to the smallest was 8:1 in 2006. It fell to 6:1 in 2010 and 5.7:1 in 2014. It is indicative of a change or acceleration in asset growth among the smaller banks in the top 10 groups that enabled them to move closer to the assets of the larger banks.

Furthermore, the estimation results for Equation 4, as presented in Table 4, show that the E-statistic does not differ significantly from zero for all observation periods (2005–2014, 2005–2009, and 2010–2014) proven using the Chi-test. The E-statistic values are 0.01044, -0.00761, and -0.03320, respectively. Therefore, it can be deduced that the model for both periods will attain long-run equilibrium and satisfy the assumption for Panzar-Rosse.

Table 4: Summary of E-Statistic

Variable	All Periods	Pre-Crisis	Post-Crisis
	2005-2014	2005-2009	2010-2014
LnW1	0.03873	-0.01289	-0.1114
LnW2	-0.02033	0.00390	0.0269
LnW3	-0.00797	0.00137	0.0513
E-Statistic	0.01044	-0.00761	-0.03320
H0 : E =0			
Chi-square	0.30	0.09	2.99
P-Value	0.5821	0.7651	0.0837

Source: Authors' calculations

Concerning the attainment of long-run equilibrium, we further analyzed to examine the market structure. Table 5 shows the estimation results for Equation 3. From the estimated coefficients, we calculated the H-statistic as the sum of the coefficients of variables comprising W1 (fund), W2 (labor), and W3 (capital). The H-statistic values are 0.864, 0.785, 0.981, respectively, for all of the periods of observation: 2005–2014, pre-crisis 2005–2009, and post crisis 2010–2014. The closer the value of the H-statistic to one, the stronger the indication of a less concentrated market. The increase in the H value from 0.785 to 0.981 (a 25% increase) before and after the 2008 financial crisis indicates that Indonesia's banking industry, which had featured a monopolistic market structure, is approaching a perfectly competitive market structure over time.The finding of monopolistic competition is proved by a Wald test that excludes both H=0 and H=1.

Table 5: Estimation Results for the Panzar-Rosse Model

Variable	All Periods	Pre-Crisis	Post-Crisis
	2005-2014	2005-2009	2010-2014
LW1	0.470**	0.365*	0.567**
	[0.043]	[0.063]	[0.018]
LW2	0.285**	0.174*	0.238**
	[0.047]	[0.072]	[0.024]
LW3	0.109**	0.246**	0.176**
	[0.027]	[0.051]	[0.022]
LY1	-0.024	-0.019	0.004
	[0.034]	[0.052]	[0.010]
LY2	0,111	0.470*	0.492*

Variable	All Periods	Pre-Crisis	Post-Crisis
	2005-2014	2005-2009	2010-2014
	[0.159]	[0.245]	[0.064]
LY3	0.055	0.404*	0.025
	[0.115]	[0.208]	[0.053]
DBUMN	0.025	-0.150	-0.228*
	[0.139]	[0.213]	[0.094]
N	527	307	220
R^2 Within	0.6809	0.5652	0.9915

Notes: All results are estimated using random-effects GLS regression. Robust standard errors for correcting at the industry-district level are reported in brackets. Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

Source: Authors' estimations

The results of this study confirm the findings of previous studies on competition in the Indonesian banking industry by Claessen and Laeven (2004), Sutardjo et al. (2011), and Bikker et al. (2012), among others. The common finding from the previous studies is that the Indonesian banking industry's market structure can be characterized as monopolistic competition. Furthermore, based on the Indonesian banking industry's observation pre and post the 2008 financial crisis, this study provides strong evidence that the market structure has undergone a change and is leaning increasingly toward perfect competition. It has been due to the development of policies in the banking industry in response to the crisis. These findings are in line with the results of Açikalin and Sakinç (2015). They reported an increase in competition in Turkey's banking industry due to the consolidation rules in 2000 and the financial crisis in 2001.

Our findings might be related to several developments. First, they may reflect the adoption of several Bank Indonesia regulations as a response to the financial crisis. One of the events that effectively hampered the Indonesian economy's stability, including the stability of its banking industry, was the 2008 global financial crisis. A blanket guarantee had yet to be enacted at the time, which led to an outflow of capital and domestic liquidity issues. To maintain the performance of banks' intermediation role, the government reduced the minimum reserve requirement rate to increase banks' liquidity. It also enacted policies through Government Regulations in lieu of Law 3/2008 and Law 4/2008, which, among others, permitted the performing of loans as collateral to acquire short-term funding, increased the deposit threshold that the Deposit Insurance Agency secures, and applied a financial system safety net to prevent liquidity issues among banks and other financial institutions, the bankruptcy of which it was deemed would create a systemic effect. As shown by the dynamic changes in the sector depicted in our findings, the reform appears to have effectively influenced the degree of competition in the banking industry.

Furthermore, the results support Kroes (2010), who asserted that regulating competition forms part of the solution to a crisis and is not part of the problem. Regulation might be undesirable for the government and the competing parties, but its enactment is necessary. The policy aimed at loosening the banking industry's competitive environment during a severe financial crisis is required to maintain financial stability. Thus, government intervention is essential to protect a weakened banking system, even if the effect is a temporary hampering of competition in the industry. The primary responsibility for maintaining banking stability rests with the monetary authority.

Second, changing customers' preferences might have forced the banks to offer more diversified products. Over-competition in the banking industry can lead to bankers taking excessive risks, especially in the competitive credit and savings market. As market failure and

anti-competitive behavior will heavily influence the Indonesian economy and affect people's welfare and production efficiency, it is essential to ensure healthy competition in the industry. Besides, strong competitiveness has been the driver of improvements in the performance of banks. Competitiveness is the main foundation for the strengthening of national banking, and thus any changes in the level of competition will affect how banks conduct their business.

Theoretically, perfect competition is regarded as being the ideal condition for efficient economic performance. If the banking industry is operating with a perfectly competitive market, there is efficient business conduct and no cartel among banks. As the H-statistic was found to be close to one, the ten largest banks in Indonesia can be understood as being situated in a state of nearly perfect competition. Such a condition, however, can be a double-edged sword. On the one hand, it is suitable for depositors as the interest rates offered are more competitive.

On the other hand, with dwindling profit margins, banks with inadequate financial capacity may decide to exit the market. The remaining banks will earn a more significant profit in the latter scenario, as there are fewer players. That said, if the bankruptcy of a bank is not well anticipated, social unrest and anxiety will grow, and any ensuing panic response from the public has the potential to lead to a financial crisis.

We also found the three variables statistically significant in affecting the price of output/revenue (P). This finding is in line with the assumption that an increase in input prices will affect the volume of services and bank output that the banks deliver, potentially leading to a rise in banks' revenue. Among the input variables, the interest rate was the most significant contributor to income in both periods. It indicates that banks in Indonesia rely heavily on the interest rates they impose as their primary source of income (deposit, W1), compared to productivity (labor, W2) and credit disbursed (capital, W3). Compared to 2005–2009, interest rate elasticity and personnel expenses underwent a change in 2010–2014.

Meanwhile, capital elasticity declined in the second period of observation. The increasing elasticity of W1 (deposit) during the post-financial crisis period (2010–2014) suggests that banks were perceived to be more efficient in generating revenue by offering more competitive interest rates. It also implies that competition among banks continues to be reliant on interest rates. The offering of high interest rates to customers which-interest of the competition, despite the adverse game interest rate war on banks' performance.

Furthermore, this research finds that credit significantly affected the banks' income in both periods, thereby suggesting the increasingly significant role of credit as banks' income source. Meanwhile, for the period 2005–2009, assets seemed to be positively affecting banks' revenue, yet they were not subsequently correlated with the banks' income. Additionally, we found significant performance differentials between the state-owned and private banks in the post-2008 global financial crisis period that demonstrates a lower performance of state-owned banks than private banks in terms of generating a higher interest income to total assets ratio.

Conclusion

In this study, we discovered that Indonesia's banking industry has been in long-run equilibrium and was characterized by a monopolistic market structure pre-the 2008 financial crisis and has since approached perfect competition post the 2008 problem. The increasing H-statistic is an indication of strengthening competition in the domestic banking industry. Considering the market's monopolistic structure, however, the banking industry features no monopoly power or cartel, and thus, banks' products have been differentiated only by brand. The H-statistic value implication being close to one is that the market is less concentrated as it approaches a state of perfect competition. This condition may result from the adoption of regulations in response to the 2008 financial crisis and changing customer preferences con-

cerning financial products.

We found interest rate to be the most significant contributor in affecting income in both periods of observation, thus indicating that interest rate (deposit) was the primary contributor to banks' revenue compared to credit volume (labor and capital). Moreover, we found different levels of performance between state-owned and private banks in the post-crisis period that may have been a factor in the difference in interest income, with the latter's higher performance, that is, private banks. Since interest income is positively affected by the interest rate, the government needs to be aware of any interest rate war that develops as banks compete to attract more savers, thus enabling them to maintain liquidity. Any interest rate war among banks, as characterized by the aggressive offering of high-interest rates, may be beneficial to customers on the one hand but would also have adverse effects on banks on the other. If the banking market were to become more competitive or reach a state of perfect competition, some of the players would be forced to leave the market to maintain profit in the market. Otherwise, profit will not rise even if the interest rates are set higher.

The government needs to induce banks to derive a greater level of revenue from credit volume about policy implications. Maintaining sustainability within the banking industry by preventing liquidity problems and insolvency and generating economic growth as interest rate policy alone is not significant in creating value-added. Suppose liquidity problems and insolvencies incurred by banks unable to survive in a perfectly competitive market are ignored. In that case, there is a possibility of the situation developing into a full-blown financial crisis because individual banks are a potential source of systemic risk. Moreover, as it is proved that banking regulation can be beneficial in terms of the industry's competitiveness, the financial authority should maintain its supervision of banks and ensure that the market structure remains the same, even in crisis times.

However, this study's scope is limited since it focuses only on the ten largest banks in Indonesia and thus does not capture smaller banks' nature, including sharia banks and local development banks. Therefore, more sample is necessary to be added so that panel data analysis can capture the different characteristics of banks. Moreover, one of the bold assumptions used in the Panzar-Rosse model is the constant elasticity of demand, which may not hold in the real world scenario. Therefore, the conducting of studies that are broader in scope can be supplemental to this study. A new advanced method may help capture the real-world situation of the banking competition landscape in Indonesia.

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