Bank consolidation and financial stability revisited: Evidence from Indonesia

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Abstract

This paper extends prior literature on the link between consolidation and stability in banking using a single country setting. From a sample of Indonesian commercial banks over the 2010-2015 time span, we construct the Lerner index as a measure of bank market power due to consolidation. Our empirical results document that higher bank market power tends to reduce insolvency risk and increase capital ratios. A deeper analysis however reveals that higher market power is detrimental for financial stability in state-owned banks and small private-owned banks. We therefore highlight that although consolidation among state-owned banks reduces cost inefficiency as in Hadad et al. (2013), further efforts to reduce state-owned banks' market power are necessary after consolidation. This paper also suggests that strengthening market power in large private-owned banks, but encouraging competition in small private-owned banks to reduce market power, are of particular importance for financial stability.

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1. Introduction

This paper aims to extend previous work on the nexus between bank consolidation and financial stability in a single country setting. We use a sample of Indonesian commercial banks to specifically assess the impact on financial stability of higher bank market power presumably gained from bank consolidation, and whether such impact depends on bank-specific characteristics[2]. To the best of our knowledge, only Jeon and Lim (2013) examine the bank competition-stability nexus in a single country study, revealing that Korean commercial banks and mutual savings banks behave differently in terms of risk taking in response to higher market competition. Unlike Jeon and Lim (2013) who construct the measure of banking market competition, we construct the Lerner index to reflect market power at the bank level, which enables us to provide policy recommendations addressed to each bank, i.e. whether increasing bank market power is necessary to mitigate bank riskiness.

Focusing on the case of Indonesian banks to study the competition-stability nexus in a single country setting is contextually relevant for several respects. First, the role of Indonesian banking is important to the global banking performance. Vinayak et al. (2016) document that Indonesian banks' ROEs account the highest in the Asian context (20.3% in 2014), rendering Asian banking's contribution to global banking profits after tax economically noteworthy, ranging from 46% to 49% during the 2010-2014 period. Second, banking still dominates the Indonesia financial sector and hence, the role of banking is also systemically important for the Indonesian economy. The contribution of total assets of Indonesian banking accounts for the highest, reaching around 80% of the Indonesia's financial system total assets (Hadad et al., 2013). Third, Indonesia exhibits lower financial deepening and intermediation, but higher bank net interest margin, than the majority of Asian countries (e.g. Soedarmono et al., 2017b; Trinugroho et al., 2014). This suggests that encouraging bank competition to reduce inefficiency and intermediation costs for the real sector remains a major policy focus for Indonesia. However, the implications of competition on risk in Indonesian banking is far less known, while the efforts to strengthen bank consolidation continue since 2004 as in Hadad et al. (2013).

Indeed, strengthening consolidation in banking has been a long standing issue for Indonesia. Since the 1997 Asian financial crisis, attempts to promote bank consolidation

[2] Uhde and Heimeshoff (2009) consider bank concentration ratio as the result of bank consolidation, but we use bank market power to reflect the effect of bank consolidation.

emerged in Indonesia through the establishment of IBA (Indonesian Banking Architecture) in 2004 followed by a series of regulation on minimum capitalization to establish a bank, foreign ownership limitation, and the single presence policy prohibiting investors from becoming controlling shareholders in more than one bank[3].

As a further attempt to promote bank consolidation in Indonesia, Hadad et al. (2013) investigate the impact of hypothetical mergers on bank efficiency. On the one hand, hypothetical mergers indeed improves cost efficiency in Indonesian banking. In this regard, higher cost efficiency is particularly driven if mergers occur within the state-owned bank grouping. On the other hand, higher consolidation that leads to higher market power in banking might also be detrimental for bank stability, especially in the case of Asian banks in general (Soedarmono et al., 2013). By investigating the link between market power and stability in Indonesian banks, this present paper might therefore be a benchmark for policy makers in Indonesia as to how to promote consolidation without exacerbating bank riskiness.

The rest of this paper is organized as follows. Section 2 provides a brief literature review on the competition-stability nexus. Section 3 describes our data, variables and methodology to assess the issues raised in this paper. Section 4 provides empirical results, related discussions, and several sensitivity analyses to ensure for robustness. Section 5 concludes the paper.

2. Brief literature review and research focus

Studies on the link between bank consolidation and financial stability can be partitioned into two groups: the “charter-value” hypothesis and the “competition-stability” hypothesis. The charter value hypothesis suggests that higher competition resulting in lower market power in banking can be detrimental for financial stability, because banks lose their charter value in response to higher competition. This in turn exacerbates bank risk-taking incentives and deteriorate financial stability (e.g. Keeley, 1990; Beck et al., 2006; Fungacova et al., 2009; Turk-Ariss, 2010). Meanwhile, the competition-stability hypothesis postulates that higher bank market power is detrimental for financial stability (e.g. Boyd and De Nicolo, 2005; Boyd et al., 2006; Uhde and Heimeshoff, 2009; Liu et al., 2012; Soedarmono et al., 2013; Fu et al., 2014). Banks with higher market power tends to charge higher lending rates for entrepreneurs. Considering the

[3] See Hadad et al. (2013) for detailed discussions on the issues, trends and regulatory efforts in strengthening bank consolidation processes in Indonesia.

presence of information asymmetry in the credit markets, such bank behavior exacerbates borrowers' moral hazard to undertake risky projects after loans are granted. Higher entrepreneurial moral hazard increases the likelihood of loan defaults, which in turn adversely affects bank stability.

In the meantime, recent studies using a cross-country setting find mixed results on the impact of competition on stability in banking. Yet, such relationship may also depend bank-specific and country-specific factors. For instance, Berger et al. (2009) suggest that the charter value hypothesis and the competition-stability hypothesis might occur simultaneously, depending on the ability of banks to increase capitalization in response to higher market power. Their results show that banks with higher market power exhibit higher non-performing loans, but higher capital ratios. Consequently, bank insolvency risk declines, because higher capital ratios can offset higher non-performing loans. From a sample of Latin American banks during the 2003-2008 period, Tabak et al. (2012) find that competition and risk in banking has a non-linear relationship. Meanwhile, Beck et al. (2013) document that the link between competition and stability in banking is affected by country-specific factors. Their results suggest that higher competition is detrimental for bank stability, particularly in countries with stricter activity restrictions and less heterogeneous market environments. The negative impact of competition on stability in banking is also affected by the quality of credit information sharing and the scheme of the deposit insurance policy. In parallel, Soedarmono et al. (2013) find that country-specific factor related to the size of the largest banks matters in affecting the competition-stability nexus in Asian banking, but these relationships are also altered in times of crisis.

Although a large number of studies have been devoted to analyze the nexus between competition and stability in banking, very few studies analyze the link in a single country setting. As described earlier, only Jeon and Lim (2013) analyze the impact of competition on stability using a sample of Korean banks in which the relationship between competition and stability varies depending on the types of banks and bank-specific factors such as business risk and corporate governance. Several studies using a single-country setting indeed assess the impact of bank competition, but its implication on bank stability remains unexplored. For instance, Yang and Shao (2016) examine the impact of bank competition on the bank lending channel in China. Tan and Anchor (2017) also uses a sample of Chinese banks to examine the joint-impact of bank risk-taking behavior and competition on technical efficiency. Sanyal and Shankar (2011) examine the impact of competition on productivity in Indian banking and whether such relationship depends on the ownership types of banks.

In this paper, we build on the work of Berger et al. (2009) in order to assess the impact of market power on stability in Indonesian banking. We examine the impact of bank market power on capital ratios and insolvency risk, so as to highlight whether the link between competition and stability in banking is affected by the degree of bank capitalization. Considering the role of capitalization in Indonesian banking is relevant, given that the bank capitalization level is relatively high, achieving more than 20% in average when minimum capital requirements only reach around 8%, although this level might slightly increase depending on the riskiness profile of banks.

As further contribution, we extend the analysis whether strengthening consolidation that results in higher bank market power is beneficial for financial stability taking into account the influence of bank-specific characteristics. Hadad et al. (2013) document that consolidation in state-owned banks and non-foreign exchange private banks can be beneficial in terms of improving cost efficiency. However, we do not follow the similar bank grouping as in Hadad et al. (2013) who assess the impact of hypothetical mergers on bank efficiency.

Instead, we use the bank grouping that have been used by Bank Indonesia and the Indonesia Financial Services Authority in stipulating various prudential regulations. Specifically, we focus on analyzing whether bank-specific characteristics related to ownership types and the size of core capital matters in influencing the impact of bank market power on financial stability[4]. Additionally, we also examine whether large banks and small banks in terms of total assets differ substantially with regards to risk taking behavior due to an increase in bank market power, in order to take into account the effect of the “too big to fail” or the “too big to connected” effects that may aggravate financial instability (Beck et al., 2013; Soedarmono et al., 2013).

[4] With respect to the ownership types, Indonesian banking can be divided into state-owned banks, private-owned banks, regional development banks, joint-venture banks, and foreign-owned banks. Meanwhile, the bank grouping based on the size of core capital can be divided into four categories (BUKU 1, BUKU 2, BUKU 3 and BUKU 4) stipulated by Bank Indonesia in the regulation PBI No. 14/26/2012. Banks under BUKU 1 are those with core capital of less than IDR 1 trillion. BUKU 2 comprises banks with core capital from IDR 1 trillion to IDR 5 trillion. BUKU 3 comprises bank with core capital from IDR 5 trillion to IDR 30 trillion, while BUKU 4 comprises banks with core capital exceeding IDR 30 trillion.

3. Data, variables and methodology

In order to examine whether market power affects both insolvency risk and capital ratios in banking, we retrieve balance-sheet and income statement data from 122 commercial banks in Indonesia from 2010 to 2015. Such data come from the Indonesian Banking Directory provided by Bank Indonesia and the Indonesia Financial Service Authority.

In terms of the dependent variables, we use several measures reflecting bank insolvency risk and capital ratios. In order to measure insolvency risk, we follow Lepetit and Strobel (2013) in constructing two measures of *Z-score* for bank *i* at year *t* based on the following formula[5]:

$$ZEQTA_{i,t} = \frac{MROA_i + EQTA_{i,t}}{SDROA_i}$$

$$ZCAR_{i,t} = \frac{MROA_i + CAR_{i,t}}{SDROA_i}$$

MROA represents the average value of the return on assets, while *SDROA* is the standard deviation of the return-to-assets ratio. For each bank, both *MROA* and *SDROA* are calculated from 2010 to 2015. Meanwhile, *EQTA* is the ratio of total equity to total assets and *CAR* is the ratio of total capital to risk weighted assets. *EQTA* and *CAR* are also used to represent bank capital ratios as our dependent variables other than bank insolvency risk.

In order to measure bank market power as our explanatory variable of interest, we construct the Lerner index following prior literature (e.g. Meslier et al. 2017; Berger et al., 2009; Love and Martinez-Peria, 2015; Turk-Ariss, 2010; Weill, 2011). For each bank *i* at year *t*, the Lerner index is defined as follows:

$$LERNER_{i,t} = \frac{Pricing_{i,t} - MC_{i,t}}{Pricing_{i,t}}$$

MC is the marginal cost of banks, which is computed using the following formula:

$$MC_{i,t} = \frac{TC}{TA}\left(\alpha_1 + \alpha_1 \ln(TA) + \sum_{j=1}^{3} \gamma_j \ln(W_j)\right)$$

Meanwhile, *TC* and *TA* denote banks' total costs and total assets, respectively. Specifically, *TC* is the sum of interest expenses and non-interest expenses. In calculating the marginal cost equation,

[5] Lepetit and Strobel (2013) provide evidence that the approach in computing *Z-score* based on mean and standard deviation of the return on assets from the whole period combined with time-varying values of bank capital ratios is empirically robust compared to other approaches. This approach may reduce substantially intertemporal volatility for each bank and hence, avoiding the potential "spurious" volatility issues.

we use three input factors represented by W_j. These include the cost of labor (W_1), the cost of capital (W_2), and the cost of deposits (W_2). W_1 is calculated using the ratio of personnel expenses to total assets. W_2 is the ratio of total non-interest expenses to total assets, while W_3 is the ratio of interest expenses to total short-term deposits. Finally, *TC* is estimated using the following equation:

$$\ln(TC) = \alpha_0 + \alpha_1 \ln(TA) + \frac{1}{2}\alpha_2 (\ln(TA))^2 + \sum_{j=1}^{3} \beta_j \ln(W_j) + \sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} \ln(W_j)\ln(W_k) + \sum_{j=1}^{3} \gamma_j \ln(TA)\ln(W_j) + \varepsilon$$

Besides bank market power measured by the Lerner index, we also consider five bank-specific control variables that might affect bank insolvency risk and capital ratios. These include the cost-to-income ratio (*CTI*), the ratio of total banks' third party funds to total assets (*DEPO*), the ratio of loans to total assets (*LTA*), the ratio of non-interest income to total assets (*NON*) and the size of total assets measured using the logarithm of banks' total assets (*SIZE*).

CTI is measured by the ratio of operating expenses to operating income to control for bank inefficiency. Higher bank inefficiency is expected to negatively affect bank profitability, which in turn reduces the capacity of banks to raise capitalization and strengthen financial stability. Banks' third party funds include time deposits, current account, and savings. *DEPO* is expected to have a positive impact on bank stability, because lower deposits tend to increase the likelihood of bank runs that may aggravate bank solvency ratio. Because loans might be a source of bank risk coming from financial intermediation activities, especially if loans are granted excessively (e.g. Foos et al., 2010; Soedarmono et al., 2017a), we also include *LTA* as one of the control variables. The ratio of non-interest income to total assets (*NON*) is also considered as control variable to take into account the impact of bank income diversification. However, the impact of *NON* on bank stability measured by bank solvency ratios based on *Z-score* and capital ratios remains unclear.

On the one hand, higher non-interest income might strengthen bank profitability and stability when banks have the capacity to manage risk proportionately through product diversification instead of relying on lending activities, although such relationship might be conditional on bank-specific factors (e.g. Hidayat et al., 2012; Meslier et al., 2014). On the other hand, higher non-interest income might reflect that banks undertake cross-subsidization strategies between lending activities and non-interest income generating activities (Trinugroho et al., 2014). Consequently, such bank behavior might increase bank riskiness due to the fact that banks can loosen credit standards and underestimate credit risk.

Finally, we incorporate *SIZE* as control variable to account for the role of the “too big to fail” effect in which larger banks tend to undertake risky projects to exploit the government bailout (Beck et al., 2013). Because Indonesia financial safety nets law No.9/2016 eliminating the explicit government bailouts is only effective since 2016, the issues of bank moral hazard due to the “too big to fail” effect in Indonesian banking remains due to the fact that our datasets covers from 2010 to 2015.

Regarding the econometric methodology, we run regressions in four stages. In the first stage, we regress the equation of bank risk measured by either bank insolvency risk or capitalization on bank Lerner index and a set of control variables simultaneously. In the second stage, we repeat the previous stage, but we also include the interaction terms between Lerner index and bank ownership types. Bank ownership types are represented by dummy variables, such as *SOB* (state-owned banks), *POB* (private-owned banks), *RDB* (regional development banks), *JVB* (joint-venture banks), and *FOB* (foreign-owned banks). In the third stage, we also repeat the first stage by further adding the interaction terms between Lerner index and dummies representing the size of bank core capital size (*BUKU 1*, *BUKU 2*, *BUKU 3* and *BUKU 4*). Finally, we also repeat the first stage, but we add an interaction term between bank Lerner index and bank assets size (*LERNER* x *SIZE*) to account for the influence of bank size on the impact of market power on risk in banking.

In order to estimate these stages, we utilize the dynamic panel data model, because bank riskiness can be affected by its past values (e.g. Foos et al., 2010; Soedarmono et al., 2017a). Yet, the link between market power and stability in banking might also suffer from a reverse causality problem. Our dynamic panel data model is estimated using the two-step GMM (generalized methods of moments) or the system GMM following Blundell and Bond (1998) in order to produce more efficient estimates than using the one-step GMM (Baltagi, 2005). We further take into account a finite sample correction developed by Windmeijer (2005) and specify orthogonal transformations of instruments that might somehow account for unobservable factors related to bank-specific characteristics. Overall, our system GMM is valid when the AR(2) test and the Hansen-J test are not rejected.

4. Results and robustness checks

4.1. Empirical results

Table 1 shows the descriptive statistics of variables used in this study, while Table 2 presents their correlation matrix. From Table 2, it can be shown that only *CTI* and *NON* are highly correlated. However, the values of the VIF test is less than 10, suggesting that multicollinearity issues are less likely to exist[6].

[Insert Table 1 and Table 2 here]

From Table 3, we document that higher bank market power tends to increase bank solvency ratio measured by *ZEQTA* and *ZCAR*. Our results therefore follow the charter value hypothesis in which banks with higher market power tend to have with higher charter value, which is an important factor to limit excessive bank risk taking. The positive link between market power and financial stability in banking is also due to the fact that higher market power increases capital ratios in banking measured by *EQTA* or *CAR* as in Table 3. These results is consistent with the findings of Berger et al. (2009), suggesting that higher capital ratios in response to higher market power matter in offsetting higher risk taking in banking. On the contrary, our results do not follow the notion that bank capitalization is a peer-market disciplining device as in Schaeck and Cihak (2012), showing that higher competition drives banks to increase bank capital ratios. Our results regarding the positive impact of bank market power on financial stability and capital ratios is robust, regardless of whether or not we include the squared term of the Lerner index as independent variable. Yet, our dynamic panel data models are also valid, because the AR(2) test and the Hansen-J test are not significant at least at the 5% level.

[Insert Table 3 here]

[6] We do not present the results of the VIF test in this paper, but the results are available on request to the authors.

In Table 4, we examine whether the impact of bank market power on insolvency risk can be differentiated among banks with different ownership types, while Table 5 shows the identical issues but we focus on bank capital ratios as dependent variable. Our system GMM estimations in Table 4 document that only in state-owned banks, the positive impact of bank capital on financial stability measured by either *ZEQTA* or *ZCAR* is reversed. Moreover, column (1) and (6) in Table 4 show that the magnitude of the negative coefficient of *LERNER* x *SOB* is higher than that of *LERNER*. This means that in state-owned banks, higher Lerner index is associated with lower *Z-score* measured by either *ZEQTA* or *ZCAR* and hence, higher market power is detrimental for financial stability in state-owned banks.

[Insert Table 4 here]

In addition, it can also be shown that higher market power is associated with higher capital ratios in all types of banks as in Table 5. Our empirical estimation With regards to state-owned banks in particular, we can characterize that an increase in state-owned banks' capital ratios due to higher market power is not sufficient to cope with higher risk taking. In turn, state-owned banks' insolvency risk tends to increase along with higher market power. These findings are in line with Soedarmono et al. (2013) who analyze the impact of bank competition on financial stability and capitalization in Asian banks. In general, their results highlight that an increase in the capital ratios of banks operating in less competitive markets is not enough to overcome higher bank risk taking, exacerbating insolvency risk.

[Insert Table 5 here]

Our findings in state-owned banks also confirm the notion that in response to higher charter value coming from an increase in market power, state-owned banks might exploit the "too big to fail" effects due to their large size of total assets[7]. Moreover, our findings with regards to state-owned banks shed light on the importance of mitigating risk when bank mergers involve state-owned banks. This is because mergers can potentially increase state-owned banks' market power. Concomitantly, mergers among state-owned banks should also be more of a

[7] See Andrews (2005) for further details on the implications of state-owned banks on financial stability.

concern for policy makers. Although Hadad et al., (2013) document that mergers among state-owned banks are beneficial in terms of strengthening bank efficiency, efforts remain to be done so as to ensure that such mergers do not result in higher market power in state-owned banks.

In Table 6 and Table 7, we document the empirical results whether the impact of bank market power on financial stability and capital ratios is unaltered for banks with the different size of core capital. However, we cannot find any significant difference regarding the impact of bank market power on financial stability and capital ratios when we observe banks based on the classification of the size of core capital ranging from *BUKU 1* to *BUKU 4* categories as described earlier.

[Insert Table 6 and Table 7 here]

Because the link between bank market power and financial stability is not altered for different types of banks with respect to the size of core capital, we further examine whether the impact of bank market power on financial stability and capital ratios is dependent on the size of bank total assets. In doing so, we initially exclude state-owned banks from our bank sample, because state-owned banks exhibit different behavior in terms of risk taking in response to higher bank market power as documented in Table 4.

From a sample of private-owned banks, Table 8 documents that the impact of bank market power on financial stability (*ZEQTA* or *ZCAR*) and capital ratios (*EQTA* or *CAR*) is indeed conditional on the size of bank total assets. The positive impact of bank market power on financial stability only holds for private-owned banks with higher size of total assets. In other words, private-owned banks with higher market power tends to have lower insolvency risk and higher capital ratios. Our dynamic panel data estimations are also valid due to the fact that the AR(2) test and the Hansen-J test are not significant at the 5% level.

[Insert Table 8 here]

In the next turn, we examine the impact of control variables on bank insolvency risk and capital ratios. From Table 3 to Table 8, the cost-to-income ratio (*CTI*) is positively linked to higher capital ratios measured by *EQTA* or *CAR*, but has no significant impact on bank insolvency risk. Moreover, higher the deposit-to-asset ratio (*DEPO*) is associated with lower bank insolvency risk and capital ratios. Although banks with lower liquidity risk appears to hold less capital, such banks exhibits lower insolvency risk, presumably due to the presence of market discipline exerted by bank depositors. We also find that banks with higher loan-to-asset ratio (*LTA*) tends to have lower capital ratios, but the impact of bank loans on insolvency risk remains unclear. With regards to the impact of income diversification, banks with higher ratio of non-interest income to total assets (*NON*) tend to have higher insolvency risk as in Table 4, Table 5, and Table 7. Higher non-interest income also reduces capital ratios in banking from Table 3 to Table 8. Finally, bank size (*SIZE*) is negatively linked to Z-score measured by either *ZEQTA* or *ZCAR*. Yet, banks with higher size of total assets also hold lower capital ratios. This suggests that Indonesian commercial banks observed in our study still suffer from moral hazard problems.

4.2. Robustness checks

Although we find that the link between market power, insolvency risk and capital ratios is robust with different measure of bank insolvency risk and capital ratios, we also conduct several robustness checks to ensure our results are stable[8]. Firstly, we re-estimate the impact of bank market power on financial stability and capital ratios from Table 3 to Table 8 by considering the first-difference transformation of instruments instead of orthogonal deviations. Our empirical results presented earlier are not altered using this modification. Second, we use an alternative proxy of bank market power. Instead of using the Lerner index, we construct the market share of total assets at the bank level, which is the ratio of each bank's total assets to the banking system's total assets. Using this measure of bank market power also does not change our previous findings regarding the impact of bank market power on financial stability and capital ratios.

[8] The results of robustness checks are not shown in this paper, but are available upon request to the authors.

5. Conclusion

From bank-level data over the 2010-2015 period, this paper assesses whether higher market power can lead to higher stability in Indonesian banking. Empirical results from the dynamic panel data analysis reveal that the charter value hypothesis and the competition-stability hypothesis might occur simultaneously depending on bank-specific characteristics. Although higher market power reduces bank insolvency risk and capital ratios in general following the charter value hypothesis, higher market power can also be detrimental for financial stability to some extent following the competition-stability hypothesis.

Specifically, we find that the competition-stability hypothesis occur when we observe state-owned banks. Higher market power in state-owned banks is indeed detrimental for financial stability, although higher market power enables state-owned banks to increase capital ratios. Hence, state-owned banks might conduct excessive risk taking along with an increase in market power, so that higher capital ratios are not enough to keep pace with higher risk taking, rendering state-owned banks' insolvency risk higher. Efforts as to how encouraging consolidation involving state-owned banks without implying higher market power warrants further examination for future research.

By excluding state-owned banks from our sample, we further document that the competition-stability hypothesis and the charter value hypothesis depend on the size of private-owned banks' total assets. For private-owned banks with higher size of total assets, our results support the charter value hypothesis in which higher market power leads to lower insolvency risk. Strengthening consolidation that might increases the market power of large private-owned banks is therefore essential to strengthen financial stability. Conversely, small private-owned banks are likely to suffer from an increase in market power. Encouraging competition in small private-owned banks becomes necessary, while consolidation among small private-owned banks also needs to be managed in a way that does not increase bank-level market power.

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Appendix

Table 1. Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
ZEQTA	539	41.872	33.904	-0.160	323.582
ZCAR	475	57.251	49.150	-1.239	306.879
EQTA	539	0.151	0.095	-0.007	0.827
CAR	476	0.204	0.133	0.000	0.993
LERNER	649	0.162	0.179	-0.690	0.620
CTI	650	0.060	0.084	0.004	1.328
DEPO	649	0.689	0.172	0.001	0.915
LTA	650	0.619	0.124	0.043	0.871
NON	649	0.026	0.059	-0.001	0.824
SIZE	650	16.064	1.704	11.799	20.560

Table 2. Correlation matrix

Variables	*ZEQTA*	*ZCAR*	*EQTA*	*CAR*	*LERNER*	*CTI*	*DEPO*	*LTA*	*NON*	*SIZE*
ZEQTA	1									
ZCAR	0.9101	1								
EQTA	0.3413	0.3203	1							
CAR	0.312	0.5047	0.7862	1						
LERNER	0.0381	0.0222	-0.0245	0.0023	1					
CTI	-0.1377	-0.1962	0.2831	-0.0129	-0.1758	1				
DEPO	0.0037	-0.0152	-0.516	-0.4128	-0.0334	-0.2408	1			
LTA	-0.0073	-0.1541	-0.2236	-0.3524	0.1066	-0.0801	0.2195	1		
NON	-0.0855	-0.14	0.2263	-0.0653	0.0494	0.7817	-0.2897	-0.1238	1	
SIZE	-0.1939	-0.2085	-0.4332	-0.3967	0.4895	-0.0725	0.1526	0.1461	0.1041	1

Table 3. Bank market power, insolvency risk and capital ratios

	Dependent variables							
	ZEQTA		*ZCAR*		*EQTA*		*CAR*	
Expl. variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent var. (-1)	0.5985***	0.5998***	0.5405***	0.5399***	0.4451***	0.4437***	0.40065***	0.3939***
	(0.074)	(0.075)	(0.073)	(0.074)	(0.096)	(0.091)	(0.094)	(0.097)
LERNER	17.7260**	15.4426**	22.5116*	22.0758*	0.0624**	0.0571*	0.1461***	0.1437***
	(7.299)	(7.086)	(12.375)	(12.111)	(0.030)	(0.032)	(0.041)	(0.479)
LERNER_SQ		16.1047*		4.2662		0.0768		0.0119
		(9.681)		(21.390)		(0.050)		(0.144)
CTI	16.3133	12.6427	-56.0673	-55.8319	0.6379***	0.6609***	0.5535*	0.5499*
	(60.500)	(61.187)	(70.228)	(71.203)	(0.179)	(0.184)	(0.297)	(0.293)
DEPO	8.7025	10.5674*	-8.5045	-7.6148	-0.0618*	-0.0498	-0.1533**	-0.1559**
	(5.449)	(6.041)	(13.324)	(15.861)	(0.032)	(0.030)	(0.074)	(0.068)
LTA	-4.7292	-4.4680	-29.6776	-29.4052	-0.0434	-0.0469	-0.2609**	-0.2622***
	(8.497)	(8.650)	(25.404)	(25.425)	(0.040)	(0.040)	(0.101)	(0.099)
NON	-44.7818	-37.5234	-83.0779	-81.4912	-0.7250***	-0.7244***	-1.0460**	-1/0495**
	(56.410)	(56.734)	(68.277)	(68.828)	(0.196)	(0.201)	(0.478)	(0.475)
SIZE	-0.9162	-1.0847	-2.1062*	-2.1589*	-0.0104***	-0.0112***	-0.0203***	-0.0205***
	(0.869)	(0.865)	(1.129)	(1.185)	(0.003)	(0.003)	(0.005)	(0.006)
Observations	428	428	363	363	428	428	363	363
Number of bank	109	109	99	99	109	109	99	99
AR(2) test	0.380	0.371	0.406	0.405	0.701	0.734	0.245	0.250
Hansen-J test	0.081	0.062	0.085	0.086	0.649	0.463	0.230	0.234

Sources and notes: Authors' calculation. Constants are included but not reported. ***,**, and * indicate significance at the 1%, 5% and 10%, respectively. Standard errors of each coefficient are in parentheses. Time-specific dummy variables are incorporated.

Table 4. The link bank market power and insolvency risk by bank ownership types

Expl. variables	**Dependent variables**									
	ZEQTA					*ZCAR*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent var(-1)	0.6019***	0.5923***	0.6001***	0.5975***	0.5893***	0.5563***	0.5450***	0.5292***	0.5428***	0.5466***
	(0.076)	(0.080)	(0.079)	(0.073)	(0.076)	(0.074)	(0.076)	(0.084)	(0.086)	(0.074)
LERNER	18.5613**	29.0650***	21.9011***	14.8698*	18.6739**	23.3399*	36.6782**	44.7827***	14.7668	22.4430*
	(7.770)	(8.861)	(7.500)	(8.032)	(8.367)	(12.715)	(16.191)	(12.393)	(13.953)	(12.574)
LERNER x *SOB*	-47.3648**					-85.4668***				
	(18.971)					(30.677)				
LERNER x *POB*		-5.2932					-2.3408			
		(10.376)					(15.933)			
LERNER x *RDB*			16.8123					-37.8248		
			(21.213)					(32.423)		
LERNER x *JVB*				21.3339***					50.8028**	
				(8.039)					(20.473)	
LERNER x *FOB*					4.2192					0.0000
					(10.635)					(0.000)
CTI	19.9566	31.6838	50.2990	18.5763	3.0432	-51.8665	-25.3947	31.6325	-28.3348	-54.2182
	(60.447)	(54.042)	(50.711)	(63.116)	(62.956)	(70.340)	(66.328)	(72.055)	(75.660)	(69.862)
DEPO	9.3489*	5.2576	9.3263*	10.7671*	4.7534	-7.5150	-15.3015	-5.7362	2.0771	-8.7993
	(5.432)	(6.440)	(5.600)	(5.711)	(6.142)	(13.658)	(13.993)	(14.100)	(16.933)	(13.439)
LTA	-5.6943	-7.9317	-7.4017	-5.8062	-7.7304	-28.2631	-33.5078	-48.8178	-28.8914	-27.9153
	(8.648)	(8.172)	(8.881)	(8.871)	(8.178)	(26.213)	(27.887)	(30.715)	(28.237)	(25.765)
NON	-47.7274	-52.5624	-80.7742*	-45.8615	-19.9283	-83.0364	-101.5461	-191.2607***	-89.9477	-85.4481
	(56.570)	(50.502)	(46.786)	(58.982)	(60.169)	(67.793)	(62.820)	(71.170)	(73.706)	(67.567)
SIZE	-0.8664	-0.9256	-1.0436	-0.8511	-0.9054	-2.3922*	-1.9922*	-2.9052**	-1.8319	-2.0438*
	(1.008)	(0.862)	(0.893)	(0.889)	(0.891)	(1.334)	(1.183)	(1.313)	(1.179)	(1.148)
Observations	424	424	424	424	424	361	361	361	361	361
Number of bank	108	108	108	108	108	98	98	98	98	98
AR(2) test	0.375	0.404	0.373	0.370	0.402	0.444	0.422	0.480	0.434	0.410
Hansen-J test	0.082	0.086	0.081	0.079	0.078	0.068	0.067	0.079	0.079	0.023

Sources and notes: Authors' calculation. Constants and dummy variables are included but not reported. ***,**, and * indicate significance at the 1%, 5% and 10%, respectively. Standard errors of each coefficient are in parentheses. Time-specific dummy variables are incorporated.

Table 5. The link between bank market power and capital ratios by bank ownership types

	Dependent variables									
	EQTA					*CAR*				
Expl. variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent var.(-1)	0.4440***	0.4432***	0.4745***	0.4407***	0.4188***	0.4021***	0.3862***	0.3636***	0.3720***	0.7055***
	(0.092)	(0.105)	(0.103)	(0.099)	(0.092)	(0.095)	(0.093)	(0.093)	(0.098)	(0.219)
LERNER	0.0572*	0.0996***	0.1005***	0.0520	0.0700**	0.1402***	0.2379***	0.2475***	0.0955**	0.0935
	(0.033)	(0.037)	(0.037)	(0.033)	(0.035)	(0.043)	(0.076)	(0.048)	(0.048)	(0.058)
LERNER x *SOB*	0.1512***					0.0823				
	(0.048)					(0.071)				
LERNER x *POB*		0.0085					-0.0542			
		(0.049)					(0.081)			
LERNER x *RDB*			0.0347					-0.0982		
			(0.049)					(0.096)		
LERNER x *JVB*				0.0816**					0.2367**	
				(0.041)					(0.104)	
LERNER x *FOB*					-0.0332					0.0000
					(0.082)					(0.000)
CTI	0.6147***	0.7168***	0.7973***	0.7069***	0.5391**	0.5019*	0.6172**	1.0418***	0.7134**	0.6093***
	(0.182)	(0.160)	(0.158)	(0.174)	(0.207)	(0.283)	(0.243)	(0.287)	(0.301)	(0.196)
DEPO	-0.0634*	-0.0810**	-0.0493	-0.0522	-0.0949**	-0.1538**	-0.1829**	-0.1449**	-0.1187	-0.0855
	(0.034)	(0.040)	(0.032)	(0.032)	(0.047)	(0.074)	(0.077)	(0.069)	(0.072)	(0.070)
LTA	-0.0384	-0.0530	-0.0531	-0.0597	-0.0569	-0.2573**	-0.2913***	-0.3564***	-0.2743***	-0.2225**
	(0.041)	(0.041)	(0.042)	(0.039)	(0.041)	(0.103)	(0.108)	(0.108)	(0.097)	(0.105)
NON	-0.6969***	-0.7762***	-0.9120***	-0.7974***	-0.5508**	-1.0159**	-1.1275**	-1.7396***	-1.1880**	-1.0919***
	(0.197)	(0.189)	(0.195)	(0.193)	(0.221)	(0.469)	(0.477)	(0.584)	(0.4864)	(0.343)
SIZE	-0.0116***	-0.0100***	-0.0109***	-0.0100***	-0.0103***	-0.0219***	-0.0194***	-0.0233***	-0.0188***	-0.9817
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.005)	(0.005)	(0.005)	(0.670)
Observations	424	424	424	424	424	361	361	361	361	361
Number of bank	108	108	108	108	108	98	98	98	98	98
AR(2) test	0.699	0.681	0.571	0.697	0.817	0.244	0.267	0.251	0.296	0.366
Hansen-J test	0.653	0.615	0.470	0.543	0.649	0.231	0.172	0.177	0.311	na

Sources and notes: Authors' calculation. Constants and dummy variables are included but not reported. ***,**, and * indicate significance at the 1%, 5% and 10%, respectively. Standard errors of each coefficient are in parentheses. Time-specific dummy variables are incorporated.

Table 6. The link between bank market power and insolvency risk by the size of bank core capital

	Dependent variables							
	ZEQTA				*ZCAR*			
Expl. variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent var (-1)	0.5903***	0.6058***	0.5979***	0.5973***	0.7633***	0.7751***	0.7596***	0.7659***
	(0.080)	(0.074)	(0.073)	(0.075)	(0.163)	(0.146)	(0.155)	(0.150)
LERNER	27.1003***	14.2514	18.1504**	16.7348**	28.8681*	7.5763	19.1207	15.6382
	(8.454)	(10.042)	(7.283)	(7.208)	(15.411)	(16.207)	(11.521)	(11.240)
LERNER x *BUKU1*	-20.6877*				-28.4582			
	(11.510)				(29.458)			
LERNER x *BUKU2*		7.6710				17.5840		
		(9.332)				(19.764)		
LERNER x *BUKU3*			12.3636				-5.9602	
			(10.425)				(28.749)	
LERNER x *BUKU4*				96.9236				131.1926
				(104.123)				(96.997)
CTI	16.0544	12.8578	19.5816	12.3223	32.7753	31.4596	30.5337	28.5643
	(61.851)	(61.673)	(59.333)	(61.611)	(98.863)	(102.351)	(97.239)	(99.294)
DEPO	11.1415*	8.3605	10.2346*	8.0178	-0.8652	-5.4947	-1.3506	-5.6222
	(6.465)	(5.482)	(5.204)	(5.648)	(14.100)	(12.934)	(16.412)	(13.053)
LTA	-6.6735	-6.1224	-6.3476	-3.6881	-40.3920	-35.7176	-42.4446	-37.6575
	(8.946)	(8.208)	(8.433)	(8.204)	(38.784)	(37.454)	(43.840)	(37.563)
NON	-42.3500	-38.0321	-46.4012	-40.2947	-139.3750*	-128.6452	-133.7944*	-134.5608*
	(58.435)	(58.267)	(55.442)	(57.105)	(76.655)	(81.703)	(74.629)	(73.365)
SIZE	-1.4212	-0.6959	-1.3592	-1.2265	-2.0194	-0.5289	-2.0458	-1.3030
	(1.338)	(0.942)	(1.153)	(0.979)	(2.498)	(1.526)	(2.787)	(1.977)
Observations	428	428	428	428	363	363	363	363
Number of bank	109	109	109	109	99	99	99	99
AR(2) test	0.377	0.374	0.375	0.383	0.647	0.578	0.670	0.607
Hansen-J test	0.063	0.072	0.084	0.080	0.022	0.020	0.021	0.022

Sources and notes: Authors' calculation. Constants and dummy variables are included but not reported. ***,**, and * indicate significance at the 1%, 5% and 10%, respectively. Standard errors of each coefficient are in parentheses. Time-specific dummy variables are incorporated.

Table 7. The link between bank market power and capital ratios by the size of bank core capital

	Dependent variables							
	EQTA				*CAR*			
Expl. variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variables (-1)	0.4530***	0.4564***	0.4420***	0.4413***	0.3719***	0.4018***	0.3975***	0.3954***
	(0.096)	(0.094)	(0.098)	(0.089)	(0.090)	(0.092)	(0.099)	(0.093)
LERNER	0.1073***	0.0538	0.0686**	0.0551*	0.2104***	0.0990	0.1614***	0.1392***
	(0.025)	(0.040)	(0.031)	(0.032)	(0.047)	(0.084)	(0.042)	(0.043)
LERNER x *BUKU1*	-0.1037***				-0.1704			
	(0.037)				(0.108)			
LERNER x *BUKU2*		0.0228				0.0808		
		(0.042)				(0.113)		
LERNER x *BUKU3*			0.0364				-0.0878	
			(0.054)				(0.117)	
LERNER x *BUKU4*				0.0316				0.2215*
				(0.047)				(0.1167)
CTI	0.6782***	0.6295***	0.6449***	0.6095***	0.6709**	0.5558*	0.5727*	0.5382*
	(0.178)	(0.170)	(0.167)	(0.182)	(0.259)	(0.303)	(0.290)	(0.285)
DEPO	-0.0387	-0.0607*	-0.0574*	-0.0665*	-0.1234*	-0.1551**	-0.1379*	-0.1579**
	(0.030)	(0.032)	(0.031)	(0.035)	(0.068)	(0.077)	(0.071)	(7.454)
LTA	-0.0414	-0.0502	-0.0541	-0.0348	-0.2943***	-0.2680**	-0.2794***	-0.2574**
	(0.040)	(0.039)	(0.039)	(0.041)	(0.094)	(0.103)	(0.105)	(0.099)
NON	-0.7473***	-0.7035***	-0.7209***	-0.6905***	-1.2255**	-1.0525**	-1.0792**	-1.0419**
	(0.197)	(0.185)	(0.183)	(0.198)	(0.4943)	(0.4829)	(0.490)	(0.475)
SIZE	-0.0129***	-0.0095***	-0.0134***	-0.0124***	-0.0306***	-0.0181***	-0.0256***	-0.0225***
	(0.005)	(0.003)	(0.004)	(0.004)	(0.007)	(0.005)	(0.007)	(0.006)
Observations	428	428	428	428	363	363	363	363
Number of bank	109	109	109	109	99	99	99	99
AR(2) test	0.545	0.651	0.666	0.712	0.256	0.261	0.251	0.241
Hansen-J test	0.332	0.634	0.653	0.666	0.219	0.213	0.202	0.238

Sources and notes: Authors' calculation. Constants and dummy variables are included but not reported. ***,**, and * indicate significance at the 1%, 5% and 10%, respectively. Standard errors of each coefficient are in parentheses. Time-specific dummy variables are incorporated.

Table 8. The impact of bank assets size on the link between bank market power and stability

Expl. variables	Dependent variables			
	ZEQTA	*ZCAR*	*EQTA*	*CAR*
Dependent.variables (-1)	0.6029***	0.5476***	0.4734***	0.4155***
	(0.074)	(0.073)	(0.086)	(0.099)
LERNER	-151.3894**	-251.7890*	-0.5796*	-0.5512
	(68.079)	(130.777)	(0.316)	(0.702)
LERNER x *SIZE*	10.7205**	17.4520**	0.0392**	0.0440
	(4.236)	(7.944)	(0.018)	(0.043)
CTI	9.1314	-76.5791	0.5904***	0.4311*
	(58.648)	(71.689)	(0.162)	(0.246)
DEPO	12.2285*	-3.0120	-0.0514	-0.1271*
	(6.260)	(13.990)	(0.036)	(0.067)
LTA	-6.2523	-36.4627	-0.0380	-0.2610**
	(8.729)	(26.941)	(0.043)	(0.106)
NON	-31.5505	-54.2572	-0.6671***	-0.9520**
	(54.931)	(68.591)	(0.186)	(0.465)
SIZE	-2.6315**	-5.6374***	-0.0163***	-0.0282***
	(1.077)	(2.122)	(0.004)	(0.011)
Observations	408	347	408	347
Number of bank	104	94	104	94
AR(2) test	0.362	0.570	0.523	0.242
Hansen-J test	0.071	0.085	0.356	0.186

Sources and notes: Authors' calculation. Constants are included but not reported. ***,**, and * indicate significance at the 1%, 5% and 10%, respectively. Standard errors of each coefficient are in parentheses. Time-specific dummy variables are incorporated.