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Research Working Paper

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Intertemporal effects of bank market power on risk taking: Evidence from Indonesian listed banks

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Abstract

Using a sample of listed banks in Indonesia from 2000 to 2016, this paper finds that higher bank market power exacerbates risk immediately, but enhances bank stability two years ahead regardless of the measure of bank risk. This is because higher market power enables banks to reduce leverage risk by increasing capital ratio after two years. Hence, the competition-stability hypothesis and the charter-value hypothesis can occur simultaenously in a single country setting depending on whether we consider immediate impact or longer term impact of bank market power. Overall, we highlight that although bank consolidation is beneficial for financial stability, strengthening prudential regulation and supervision remains necessary to ensure that the benefit of bank market power can occur immediately. In addition, this paper also advocates the importance of strengthening market discipline, because we find that bank depositors react positively by increasing deposit growth two years ahead due to higher bank market power.

JEL Classification: G21, G28
Keywords: Bank market power, risk taking, intertemporal effect, Indonesia

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The views expressed in this paper are entirely the authors' and do not necessarily reflect the views of the Indonesia Deposit Insurance Corporation (*Lembaga Penjamin Simpanan*). Part of this paper is written when the first author was affiliated at the Indonesia Deposit Insurance Corporation.

1. Introduction

Bank consolidation is one of the major banking reforms to restrore financial stability in dealing with financial crises. Consolidation in banking is indeed expected to increase bank franchise value as a self-disciplining factor of bank risk taking (e.g. Keeley, 1990; Berger et al., 2009; Turk-Ariss, 2010). However, consolidation may create large banks or systemically important banks. This can in turn be detrimental for financial stability when large banks are prone to moral hazard to exploit government bailouts. Yet, consolidation in banking tends to create banks with higher market power to attract more deposits. Boyd and De Nicolo (2005) postulate that banks with higher market power on deposit markets tend to offer higher deposit rates, which increases lending rates to offset the cost of deposits. Consequently, entrepreneurs borrowing from banks with higher market power will likely undertake excessive risk taking to offset higher lending rates, exacerbating credit risk borne by such banks.

Given unclear consequences of bank consolidation, some developed countries are not always in favor of bank consolidation through mergers and acquisitions (M&As). For instance, the Bank of England has been actively involved in the debates whether UK large banks should be split up to reduce public finance risk, while the Wall Street Reform and the Consumer Protection Act (Dodd-Frank Act) does not allow M&As in banking when the total liabilities of merged banks exceed 10% of the US financial system's total liabilities (Bertay et al., 2013). While bank consolidation in developed countries have been revisited, some developing countries still adopt regulatory-driven bank consolidation in dealing with financial crises. Several Asian countries tend to promote bank M&As as a resolution strategy following the 1997 Asian financial crisis (AFC). Accordingly, bank M&As have grown rapidly in Asian banking, reaching more 25% per year since 2003 (Santoso, 2009).

As a country hardest hit by the AFC with the fiscal cost of crisis reaching more than 50% of gross domesic product as documented in Valencia and Laeven (2012), Indonesia has also adopted bank consolidation policies in addition to bank closures after the AFC. In 1999, 38 commercial banks in Indonesia were liquidated due to owners' inability to inject more capital, while 16 commercial banks were taken over by the government before they have been privatized in 2004 and 2005 (Hadad et al., 2013). In the meantime, the government initiatives to promote commercial bank consolidation continue since 2004, which are expected to drive small banks consolidation if their capital is less than IDR 100 billion by 2010. This initiative has been reinforced by a series of regulation as desribed in Hadad et al. (2013). These include: (1) minimum capital requirements, (2) foreign ownership limitation, (3) the establishment of anchor banks consisting of high performing banks that may acquire smaller banks, and (4) the single presence policy preventing investors to become controlling shareholders in more than one commercial bank.

Indeed, hypothetical mergers among state-owned bank or two non-foreign exchange banks might be associated with higher cost efficiency in the Indonesian banking industry (Hadad et al., 2013). However, the impact on financial stability of bank consolidation that increases bank market power in the Indonesian context is far less understood, particularly when Indonesia is characterized as a country with bank-based financial system with high bank net interest margins and market power in the Asian context (e.g. Yusgiantoro et al., 2019; Trinugroho et al., 2014). This present paper therefore aims to revisit prior literature on the impact of bank market power on risk taking using a sample of Indonesian banks.

Focusing on the Indonesian context to assess the impact of bank market power on risk taking is also relevant for additional two reasons. First, the Indonesian financial system is still dominated by banking in which around 80% of total assets are held by the banking industry (Hadad et al., 2013) and hence, the stability of Indonesian banking is essential for the financial system stability as a whole. Second, the contribution of Indonesian banking in influencing Asian banking stability is also economically noteworthy, because the performance of Indonesian banking measured by return on equities exceeds 20% as of 2014, which accounts for the highest in the Asia-Pacific region (Vinayak et al., 2016). Moreover, Vinayak et al. (2015) also document that Asian banking contributes significantly to global banking performance in which Asian banking profit consitutes 46-49% of the total profit of global banking system.

The rest of this paper is organized as follows. Section 2 describes not only literature review, but also our research contribution. Section 3 presents our data, variables and methodology. Section 4 presents our empirical findings and some robustness checks. Section 5 concludes.

2. Literature review and research contribution

Extensive studies using a cross-country setting or a single-country setting, taking developed or developing countries into consideration, remain inconclusive regarding the impact of bank consolidation or market power on financial stability. There are two major hypotheses on the link between bank market power and financial stability: (1) the franchise value hypothesis, and (2) the competition-stability hypothesis.

According to the franchise value hypothesis, bank market power is a self-disciplining factor of risk taking, as banks with higher market power tend to have greater franchise value. Hence, these banks tend to behave prudently due to higher cost of failure when they default (e.g. Turk-Ariss, 2010; Fungacova et al., 2009; Beck et al., 2006; Keeley, 1990). Meanwhile, the competition-stability hypothesis suggests that both credit and deposit markets are characterized by the presence of asymmetric information (Boyd and De Nicolo, 2005). In this regards, banks with higher market power on deposit markets will likely charge higher lending rates to offset the cost of deposits. This will in turn exacerbate entrepreneurial risk taking that adversely affects bank stability. Some empirical studies also support the competition-stability hypothesis (e.g. Fu et al., 2014; Soedarmono and Tarazi, 2016; Liu et al., 2012; Uhde and Heimeshoff, 2009; Boyd et al., 2006).

Another strand of literature extends the bank competition-stability literature in several ways. Berger et al. (2009) suggests that the franchise value hypothesis and the competition-stability hypothesis can occur simultaneously. In their findings, although bank market power is positively linked to non-performing loans (following the competition-stability hypothesis), bank market power is also positively linked to bank solvency ratio because higher market power increases bank capitalization (following the charter value hypothesis). Tabak et al. (2012) find a non-linear relationship between bank market power and financial stability. Meanwhile Beck et al. (2013) report that the link between competition and stability in banking is conditional on country-specific environment, including the depth of credit information sharing. Soedarmono et al. (2013) show that financial crisis and the extent to which the banking industry benefits from the too-big-to-fail" effects can also alter the relationship between bank competition and stability.

Despite all these findings, recent literature in developed and developing countries still finds mixed results. Using a sample of commercial banks in GCC (Gulf Cooperation Council) countries, Saif-Alyousfi et al. (2018) document that both concentration and competition can exacerbate bank risk taking in the aftermath of the 2008 global financial crisis. Danisman and Demirel (2018) investigate the interplay of bank market power, regulation, and risk taking in developed countries. Although their findings confirm the charter-value hypothesis in general, the role of bank market power in affecting risk taking is also conditional on the stringency of prudential regulations. Specifically, higher capital requirements and activity restrictions tend to diminish bank risk taking along with an increase in bank market power, while higher supervisory power exacerbate risk taking when bank market power increases.

Using a sample of banks in the transition markets of the Commonwealth of Independent States (CIS), Clark et al. (2018) assess the nexus between bank competition and financial stability by incorporating the impact of borrowers' legal rights and supervisory power. Their findings are in favor of the competition-stability hypothesis. Using a sample of developed countries and emerging markets, Natsir et al. (2019) point out that in emerging markets, higher bank concentration exacerbates credit risk one year ahead, but reduces credit risk one year ahead when the number of foreign bank branches increase.

In the meantime, previous studies on the nexus between bank competition and risk taking in emerging markets tend to use a cross-countries setting. Soedarmono and Tarazi (2016) use a sample of Asian banks and find that higher competition in banking is beneficial for financial stability and intermediation. Fu et al. (2014) find that bank concentration and competition might affect financial stability differently depending on the measurement of bank concentration and competition.

To our knowledge, only Jeon and Kim (2013) and Yusgiantoro et al. (2019) investigate the bank competition-stability nexus in emerging markets using a single country setting. Jeon and Kim (2013) analyze the impact of competition on risk taking in Korean banks and document that commercial banks and saving banks pursue different risk taking behavior when bank competition increases. Using a sample of 122 commercial banks in Indonesia, Yusgiantoro et al. (2019) supports the charter-value hypothesis in general, although this finding depends on bank ownership type. Specifically, state-owned banks and small private-owned banks tend to pursue higher risk taking when market power increases.

In this paper, we build on the work of Yusgiantoro et al. (2019) to investigate the nexus between market power and risk taking in Indonesian banking, but we focus on a sampel of listed banks. This is because Hadad et al. (2011) document that market discipline is more pronounced for listed banks and hence, listed banks are more prone to risk taking issues than non-listed banks. Focusing on a sample of listed banks in Indonesia also enable us to understand the risk taking behavior of large banks, given the fact that large important banks tend to suffer from moral hazard issues to exploit the presence of deposit insurance and government subsidies for banks with the too-big-to-fail effects (Soedarmono et al., 2013). Yet, several regulatory initiatives have also been introduced by Bank Indonesia since 2005 for large banks to acquire small banks (Hadad et al., 2013).

Eventually, our contribution in this paper is threefold. First, no previous studies consider the intertemporal effects of bank market power or competition, while this present paper aims to investigate whether the impact of bank market power on risk taking can be different from time to time. Arguably, banks might need adjustment periods in response to bank consolidation that increases market power and hence, the effect of market power on bank financial condition can be altered along with bank capacity in managing risk and developing businesses. Second, we augment the analysis by assessing channels through which bank market power can affect risk taking from time to time. Berger et al. (2009) document that bank capacity to increase capitalization is essential to ensure that an increase in non-performing loans due to higher market power does not exacerbate insolvency risk. In this regard, we examine whether banks require adjustment periods to reshuffle their portfolio risk and enhance capitalization due to higher market power, so that the risk taking behavior of banks after an increase in market power can change over time. As an additional contribution, we build on the work of Soedarmono and Tarazi (2016) who find the existence of market discipline in Asian banking due to changes in bank competition. However, they do not take into account the intertemporal effects of bank competition that can affect deposit growth as a proxy for market discipline. In this present paper, we specifically assess whether market discipline occurs in Indonesian banking due to the intertemporal effects of bank market power on risk taking.

3. Data, variables and methodology

3.1. Data

In order to investigate the effects of bank market power, we retrieve several indicators from balance sheet and income statement of 43 publicly traded banks in Indonesia (listed on the Indonesia Stock Exchange) during the 2000-2016 period. Our dataset comes from Thomson-Reuters Datastream International retrieved in 2017.

3.2. Variables

As a dependent variable, we initially consider the Z-score index (*ZSCORE*) for each bank *i* and year *t*, which is calculated as follows based on Barry et al. (2011).

$$ZSCORE_{i,t} = \frac{AVROA_i + AVEQTA_i}{SDROA_{it}}$$

AVROA is the average value of the return on assets (*ROA*) for bank *i* from 2000 to 2016, in which *ROA* is calculated as the ratio of net income to total assets. Meanwhie, *SDROA* is the standard deviation of *ROA* for bank *i* during the 2000-2016 period calculated on the basis of five year rolling window. *AVEQTA* is the average value of the ratio of total equity to total assets for bank *i* during the 2000-2016 period. Higher *ZSCORE* means that banks can cover income volatility by increasing return and capitalization. Accordingly, banks with higher *ZSCORE* exhibit lower insolvency risk.

In addition to considering bank solvency ratio, we also incorporate bank credit risk (*LLPTA*) as a dependent variable for robustness consideration. *LLPTA* is the ratio of loan loss provisions to total assets. Higher *LLPTA* means that banks exhibit higher credit risk.

Moreover, we also follow Barry et al. (2011) by examining the impact of bank market power on the decomposition of *ZSCORE* to identify channels through which bank market power can affect bank insolvency risk. These include *SDROA* and the following indicators (*ZP* and *ZLEV*).

$$ZP_{i,t} = \frac{AVROA_i}{SDROA_{it}}; \quad ZLEV_{i,t} = \frac{AVEQTA_i}{SDROA_{it}}$$

ZP is the measure of bank portfolio risk, while *ZLEV* is the measure of bank leverage risk. Higher *ZP* and *ZLEV* are associated with lower bank riskiness, while higher *SDROA* reflects higher bank income volatility due to risk taking.

As an additional analysis, we also assess whether market discipline occurs in Indonesian banking due to changes in bank market power. For this purpose, we consider two measures of deposit growth as a proxy to assess the existence of market discipline following Soedarmono and Tarazi (2016). Specifically, we calculate deposit growth weighted by total assets (*DDEPO*) and actual deposit growth (*GDEPO*) as in the following formula in which *D* and *TA* represent total deposits and total assets, respectively.

$$DDEPO_{i,t} = \left(D_{i,t} - D_{i,t-1}\right)/0.5\left(TA_{i,t} + TA_{i,t-1}\right)$$
$$GDEPO_{i,t} = \left(D_{i,t} - D_{i,t-1}\right)/D_{i,t-1}$$

For explanatory variable of interest, we compute bank market power using the Lerner index (*LERNER*). Higher *LERNER* means bank higher market power. *LERNER* is constructed as follows, in which *i* and *t* represent bank index and time index, respectively.

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

Price is defined as the ratio of total revenue to total assets, in which total revenue is the sum of total interest revenue and non-interest revenue. Meanwhile, banks' marginal cost (*MC*) is calculated as follows:

$$MC_{i,t} = \frac{TC}{TA}\left(\propto_1 + \propto_1 \ln(TA) + \sum_{j=1}^{2} \gamma_j \ln(W_j)\right)$$

TC is calculated as the sum of interest expenses and non-interest expenses. Regarding the marginal cost measurement, two input factors following Fu et al. (2014) are considered due to data availability. These two input factors are represented by W_j. Specifically, W_1 is the cost of deposits measured by the ratio of interest expenses to total customer deposits (i.e. savings, current account, and demand deposits), and W_2 is the ratio of total non-interest expenses to total assets. Eventually, *TC* is represented by the following formula:

$$\ln(TC) = \propto_0 + \propto_1 \ln(TA) + \frac{1}{2} \propto_2 (\ln(TA))^2 + \sum_{j=1}^{2} \beta_j \ln(W_j) + \sum_{j=1}^{2}\sum_{k=1}^{2} \beta_{jk} \ln(W_j)\ln(W_k)$$
$$+ \sum_{j=1}^{2} \gamma_j \ln(TA)\ln(W_j) + \varepsilon$$

Moreover, we also incorporate bank-level indicators as control variables. These include: (1) the cost-to-income ratio (*CTI*) calculated as the ratio of total operating expenses to total operating income, (2) the ratio of total equity to total assets (*EQTA*), (3) the ratio of total loans to total assets (*LTA*) and (5) the logarithm of bank total assets (*SIZE*).

CTI is the measure of bank efficiency. Higher efficiency is likely to strengthen bank stability, because higher efficiency contributes to increase profitability that enables banks to maintain sufficient levels of capitalization. *EQTA* is the measure of capital ratio, which is expected to positively affect bank stability. On the contrary, *LTA* can be a source of bank riskiness following prior literature highlighting that excessive lending is associated with higher bank risk taking (e.g. Foos et al., 2014; Soedarmono et al., 2017a). Finally, *SIZE* is incorporated to control for the extent to which bank moral hazard occurs, because of the expectation that large banks will be rescued by the government in case of failure (Beck et al., 2013).

3.3. Methodology

Regarding research methodology, we proceed our analysis in several stages. First, we regress bank risk taking measures on bank market power (*LERNER*) and a set of control variables as shown in Eq. (1).

$$Y_{it} = \beta_0 + \beta_1 Y_{it-1} + \beta_2 LERNER_{it} + \beta_3 CTI_{it} + \beta_4 EQTA_{it} + \beta_5 LTA_{it} + \beta_6 SIZE_{it} + error_{it} \quad (1)$$

Second, we repeat the first stage, but we replace *LERNER* with *LERNER(-1)* and *LERNER(-2)* in order to take into account the effect of bank market power on riskiness in the next one year to two years as in Eq. (2).

$$\begin{aligned} Y_{it} &= \alpha_0 + \alpha_1 Y_{it-1} + \alpha_2 LERNER_{it-1} + \alpha_3 LERNER_{it-2} + \alpha_4 CTI_{it} + \alpha_5 EQTA_{it} \\ &+ \alpha_6 LTA_{it} + \alpha_7 SIZE_{it} + error_{it} \end{aligned} \quad (2)$$

This approach follows Foos et al. (2010) who consider the effect of bank loan growth on riskiness from one year to four years ahead, although we only consider a time lag of one to two years due to data limitation. In Eq. (1) and Eq. (2), *Y* represent one of the dependent variables reflecting bank riskiness (*ZSCORE*, *LLPTA*, *ZP* or *ZLEV*).

In estimating Eq. (1) and Eq. (2), we use a two-step dynamic panel data model or the so-called the system GMM (generalized methods of moments) following prior literature on bank riskiness (e.g. Foos et al., 2010; Soedarmono et al., 2017a). This is because bank risk is likely dependent on its past value and using the two-step GMM estimator developed by Arrelano and Bover (1995) and Blundell and Bond (1998) is more efficient than the standard GMM estimator (Hadad et al., 2011; Baltagi, 2005). Moreover, because *LERNER* is based on econometric estimation affected by bank-level variables, we consider *LERNER* as a predetermined variable because *LERNER* might be affected by other bank-specific factors.

Considering the system GMM estimation also enables us to measure the immediate impact, as well as the intertemporal effect of bank market power on riskiness. Yet, we use orthogonal transformation of instruments to account bank-specific characteristics, in addition to incorporating time-specific dummy variables. In order to ensure for robustness, we also implement first difference transformation of instruments that do not take bank-specific characteristics into account. Overall, the system GMM is reliable when the AR(2) test and the Hansen-J test are both not significant.

4. Empirical results

4.1. Bank market power and risk taking

Table 1 presents the descriptive statistics of dependent and independent variables as stated earlier, while Table 2 shows the structure of correlation among variables. In Table 1, we have already eliminated outliers in *LTA* (the loan-to-asset ratio), because it is impossible that total loans exceeds total assets. We can also notice that the correlation of independent variables is not strong enough, suggesting that multicollinearity issues are less likely to occur.

[Insert Table 1 and Table 2 here]

In Table 3, we document that higher market power measured by *LERNER* is associated with lower *ZSCORE*, suggesting that market power adversely affects solvency ratio in banking. This result is consistent with the competition-stability hypothesis in the Asian context (e.g. Soedarmono and Tarazi, 2016). When we consider the lagged values of *LERNER*, we find that higher *LERNER* is associated with higher bank insolvency risk (*ZSCORE*) and lower credit risk (*LLPTA*) with a time lag of two years. Our results are therefore consistent with the charter value hypothesis (Turk-Ariss, 2010; Fungacova et al., 2009; Berger et al., 2009; Keeley, 1990). These findings are robust regardless of whether we consider orthogonal deviation transformation of instruments or first difference transformation of instruments. Overall, our findings in Table 3 are also valid, because the AR(2) test and the Hansen-J test as validity tests for the system GMM are not statistically significant.

[Insert Table 3 here]

In the next turn, Table 4 presents whether bank market power also affects the decomposition of *ZSCORE* comprising *SDROA*, *ZP* or *ZLEV* to examine channels through which bank market power can affect risk taking. We show that higher market power indeed exacerbates bank income volatility (*SDROA*) after one year, but bank market power can no longer affect bank income volatility after two years. Aside from *SDROA*, only *ZLEV* is significantly affected by bank market power with a time lag of two years. In other words, higher bank market power indeed increases bank capacity to increase capitalization after two years. From Table 3 and Table 4, we reveal that the negative link between bank market power and risk taking after two years (Table 3) can partly be explained by bank capacity to increase capitalization. Consolidation that increases bank market power can indeed strengthen bank capitalization with a time lag of two years and hence, bank riskiness also declines after two years. Our regression models in Table 4 are also valid, because the AR(2) test and the Hansen-J test are not statistically significant.

[Insert Table 4 here]

For a robustness check regarding the impact of bank market power on the decomposition of *ZSCORE*, we repeat regression models presented in Table 4, but we now consider first difference transformation of instruments instead of using orthogonal deviation transformation. Consequently, we do not consider the presence of bank-level fixed effect, because listed banks in Indonesia are subject to similar macroeconomic and regulatory environments. Table 5 presents these findings using first difference transformation of instruments. Our previous results in Table 4 are not altered and all regressions in Table 5 are valid, as the AR(2) test and the Hansen-J test are not rejected. Eventually, our findings suggest that the competition-stability hypothesis and the charter-value hypothesis might occur simultaneously in a study with single country setting depending on whether lagged values of bank market power is considered.

[Insert Table 5 here]

As additional robustness checks, we also modify regression models in several ways[3]. First, we exclude all control variables and our previous findings describing that higher bank market power reduces risk taking after two years are not altered. Second, we exclude *SIZE* as a control variable, because all listed banks are considered as large banks that are not substantially different. By doing so, our findings discussed earlier regarding the intertemporal effects of bank market power on risk taking remain consistent. Finally, we repeat all the regression models from Table 3 to Table 5, but we consider the one-step GMM estimation instead of the system GMM. Using this specification, all the findings presented earlier are also consistent.

4.2. Additional analysis: Bank market power and market discipline

In order to assess the presence of market discipline in the nexus between bank market power and risk taking, we use *DDEPO* or *GDEPO* as dependent variables. Because higher market power can reduce bank risk taking with a time lag of two years, we directly assess whether *LERNER* with a time lag of one to two years can affect the deposit growth following Eq. (2). Table 6 documents that higher market power is indeed associated with higher deposit growth two years ahead. Accordingly, we characterize the presence of market discipline by depositors in Indonesian banking after two years following an increase in bank market power. Specifically,

[3] The results of these robustness checks are not presented in this present paper, but are available on request to the authors.

bank depositors tend to react positively by increasing the amount of deposits in the banking system along with higher bank market power after two years, because higher bank market power reduces risk taking two years ahead as discussed earlier from Table 3 to Table 5. All models presented in Table 6 are also robust, because the AR(2) test and the Hansen-J test are not rejected.

[Insert Table 6 here]

5. Conclusion

This paper contributes to prior literature on the effect of bank competition on financial stability by investigating whether there is an intertemporal effect of bank market power. Using a sample of 43 listed banks in Indonesia from 2000 to 2016, we find that higher market power in banking is associated with higher riskiness in the short run, but lower riskiness two years ahead. We also characterize the presence of market discipline by depositors in Indonesian banking two years ahead after an increase in bank market power.

Hence, this paper is in favor of consolidation in banking that enhances bank-level market power in order to ensure financial stability. Although higher bank market power is beneficial for longer term, managing riskiness in the short run after bank consolidation occurs remains necessary because higher market power immediately exacerbate riskiness in banking. In addition, strengthening bank capacity to increase capitalization should also acquire particular attention after bank consolidation, because the positive impact of bank market power on financial stability is dependent on the extent to which banks can reduce leverage risk by increasing capitalization. Yet, we also also advocate the importance of strengthening environments to enable market discipline immediately after consolidation that increases in bank market power, because bank depositors can only react positively after two years due to higher bank market power that enhances bank stability.

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Appendix

Table 1. Descriptive statistics

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
ZSCORE	Solvency ratio	265	40.29453	64.8036	-1.59559	563.5978
ZP	Portfolio risk	265	3.645247	8.590535	-50.1368	78.6934
ZLEV	Leverage risk	265	36.64928	58.39538	0.159647	507.21
SDROA	Income volatility	265	0.015786	0.030862	0.000149	0.23958
LLPTA	Ratio of loan loss provisions to total assets	428	0.02143	0.060238	-0.43509	0.4984
LERNER	Bank market power	543	0.316903	0.134752	-0.04511	0.58597
CTI	Ratio of total cost to total gross income	543	0.091612	0.028828	0.01044	0.26966
EQTA	Ratio of total equity to total assets	550	0.124915	0.080822	-0.27488	0.88859
LTA	Ratio of total loans to total assets	503	0.58038	0.160565	0.08489	0.93661
SIZE	Logarithm of total assets	550	30.22067	1.904143	23.8498	33.4837

Source and notes: Authors' calculation.

Table 2. Correlation matrix

Variables	*ZSCORE*	*ZP*	*ZLEV*	*SDROA*	*LERNER*	*LLPTA*	*CTI*	*EQTA*	*LTA*	*SIZE*
ZSCORE	1									
ZP	0.7714	1								
ZLEV	0.9956	0.7083	1							
SDROA	-0.2527	-0.1765	-0.2543	1						
LERNER	-0.1108	0.084	-0.1353	-0.2641	1					
LLPTA	-0.0932	-0.0986	-0.0889	0.1364	0.1064	1				
CTI	-0.1022	-0.1588	-0.09	0.2084	-0.3041	0.1219	1			
EQTA	-0.0793	-0.0965	-0.0738	-0.1533	0.3277	-0.0068	-0.2288	1		
LTA	-0.0583	-0.0588	-0.056	0.0243	0.1896	-0.2587	0.0851	0.1803	1	
SIZE	-0.1352	0.1211	-0.1679	-0.013	0.6927	0.1882	-0.2397	-0.0224	0.0868	1

Source and notes: Authors' calculation.

Table 3. Bank market power and risk taking

Explanatory variables	Dependent variables							
	Orthogonal deviation				*First difference*			
	ZSCORE		*LLPTA*		*ZSCORE*		*LLPTA*	
Dep. var(-1)	0.45164***	0.45475***	-0.00232	-0.09722	0.45963***	0.47083***	-0.01306	-0.09929**
	(0.010)	(0.016)	(0.016)	(0.138)	(0.012)	(0.014)	(0.020)	(0.037)
LERNER	-37.24602*		0.19061***		-41.11692*		0.11619***	
	(21.592)		(0.057)		(24.664)		(0.039)	
LERNER(-1)		-34.47142**		0.09404		-51.07124**		0.05608
		(15.204)		(0.229)		(19.279)		(0.064)
LERNER(-2)		40.24939***		-0.07942**		59.45336***		-0.06713***
		(13.276)		(0.034)		(12.385)		(0.022)
CTI	-150.00438*	-132.05123	0.30262***	0.30380**	-169.37287**	-89.39300	0.37080***	0.34153***
	(75.768)	(104.671)	(0.092)	(0.117)	(66.622)	(87.031)	(0.075)	(0.058)
EQTA	18.51391	-7.27493	-0.13411**	0.04797	3.85543	-10.58986	-0.07509	0.06621
	(21.196)	(27.072)	(0.057)	(0.194)	(20.192)	(26.163)	(0.045)	(0.070)
LTA	27.46226**	20.25086**	-0.08393***	-0.04504	32.49820***	16.41481*	-0.07529***	-0.04731***
	(10.365)	(9.793)	(0.017)	(0.048)	(8.226)	(9.523)	(0.016)	(0.017)
SIZE	-0.03380	-2.05980	-0.00382	0.00325	1.08784	-1.71303	0.00047	0.00608*
	(1.601)	(2.173)	(0.003)	(0.010)	(1.608)	(2.095)	(0.002)	(0.003)
Observations	211	211	382	376	211	211	382	376
Number of banks	31	31	38	38	31	31	38	38
AR(2) test	0.551	0.551	0.379	0.500	0.532	0.472	0.347	0.280
Hansen-J test	0.786	0.787	0.998	0.996	0.699	0.620	0.998	0.998

Source and notes: Authors' calculation. Regressions are carried out using the system GMM model taking into account time-specific characteristics. Standard errors are in parentheses. *** indicates significance at the 1% level, while ** and * indicate significance at the 5% and 10% levels, respectively.

Table 4. Bank market power and the decomposition of insolvency risk (*ZSCORE*): Orthogonal deviation transformation of instruments

Explanatory variables	Dependent variables					
	Orthogonal deviation					
	SDROA		*ZP*		*ZLEV*	
Dep. var(-1)	0.69383***	0.82441***	0.35886***	0.38356***	0.43186***	0.42675***
	(0.052)	(0.032)	(0.068)	(0.078)	(0.012)	(0.015)
LERNER	-0.04974		-7.95035		-30.74682	
	(0.032)		(7.290)		(22.005)	
LERNER(-1)		0.03367**		-7.64116		-23.00823
		(0.013)		(6.379)		(14.281)
LERNER(-2)		-0.00148		-7.44205		46.27677***
		(0.006)		(6.636)		(12.765)
CTI	0.07956**	0.06401***	-24.67500**	-19.38798	-132.65318*	-179.57501*
	(0.034)	(0.019)	(11.852)	(19.706)	(70.820)	(103.318)
EQTA	0.05245	-0.01430*	3.32134	4.31086	13.81026	-29.80689
	(0.039)	(0.008)	(5.192)	(8.855)	(19.227)	(26.376)
LTA	0.00430	-0.00595	2.96900	3.84398	26.59707**	17.05597
	(0.011)	(0.004)	(2.250)	(3.367)	(10.144)	(10.716)
SIZE	0.00273*	-0.00189**	0.59351	0.58334	-0.29112	-2.50839
	(0.002)	(0.001)	(0.447)	(0.519)	(1.300)	(2.057)
Observations	211	211	211	211	211	211
Number of banks	31	31	31	31	31	31
AR(2) test	0.548	0.479	0.616	0.610	0.596	0.577
Hansen-J test	0.882	0.937	0.940	0.773	0.861	0.653

Source and notes: Authors' calculation. Regressions are carried out using the system GMM model taking into account time-specific characteristics. Standard errors are in parentheses. *** indicates significance at the 1% level, while ** and * indicate significance at the 5% and 10% levels, respectively.

Table 5. Bank market power and the decomposition of insolvency risk (*ZSCORE*): First difference transformation of instruments

Explanatory variables	Dependent variables					
	First difference					
	SDROA		*ZP*		*ZLEV*	
Dep.var(-1)	0.77508***	0.91793***	0.35952***	0.37613***	0.44558***	0.45519***
	(0.097)	(0.017)	(0.011)	(0.096)	(0.015)	(0.014)
LERNER	-0.06073		-6.85262			
	(0.044)		(2.808)			
LERNER(-1)		0.02679***		-4.36539		-38.28763**
		(0.008)		(19.463)		(16.627)
LERNER(-2)		-0.02117***		-3.60546		62.06619***
		(0.004)		(19.695)		(13.054)
CTI	0.03224	0.04578***	-19.45957**	-16.54446	-175.71524***	-74.48732
	(0.037)	(0.015)	(7.558)	(80.535)	(61.403)	(80.880)
EQTA	0.05818	0.00512	6.13793***	2.88049	-2.31237	-14.39525
	(0.043)	(0.005)	(1.296)	(25.531)	(19.286)	(22.885)
LTA	0.00771	0.00094	2.50547**	3.35660	32.85388***	13.78948
	(0.017)	(0.003)	(1.070)	(29.271)	(7.747)	(9.194)
SIZE	0.00299	-0.00041	0.59495***	0.11106	0.32506	-3.14177*
	(0.002)	(0.001)	(0.146)	(0.615)	(1.398)	(1.562)
Observations	211	211	211	211	211	211
Number of banks	31	31	31	31	31	31
AR(2) test	0.530	0.491	0.531	0.663	0.588	0.485

Hansen-J test	0.921	0.839	0.579	0.052	0.721	0.614

Source and notes: Authors' calculation. Regressions are carried out using the system GMM model taking into account time-specific characteristics. Standard errors are in parentheses. *** indicates significance at the 1% level, while ** and * indicate significance at the 5% and 10% levels, respectively.

Table 7. Bank market power and deposit growth: Additional analysis

	Dependent variables			
	Orthogonal deviation		*First difference*	
Explanatory variables	*DDEPO*	*GDEPO*	*DDEPO*	*GDEPO*
Dep.var(-1)	0.20006***	0.12975*	0.18928***	0.19013**
	(0.066)	(0.066)	(0.062)	(0.081)
LERNER(-1)	0.24818	0.42415**	0.13358	0.23484
	(0.162)	(0.192)	(0.159)	(0.224)
LERNER(-2)	0.37974***	0.23867*	0.38086**	0.18356
	(0.140)	(0.126)	(0.152)	(0.165)
CTI	-3.34961***	-3.15919***	-3.96898***	-3.78663***
	(0.605)	(0.817)	(0.659)	(0.803)
EQTA	-0.76046***	-1.35200***	-0.87762***	-1.30426***
	(0.251)	(0.384)	(0.304)	(0.413)
LTA	-0.17278**	-0.12091*	-0.22796**	-0.16354
	(0.069)	(0.061)	(0.091)	(0.104)
SIZE	-0.06100***	-0.06444***	-0.05549***	-0.04997***
	(0.009)	(0.010)	(0.010)	(0.012)
Observations	420	398	420	398
Number of index	40	39	40	39
AR(2) test	0.654	0.175	0.820	0.347
Hansen-J test	0.570	0.836	0.595	0.504

Source and notes: Authors' calculation. Regressions are carried out using the system GMM model. Standard errors are in parentheses. *** indicates significance at the 1% level, while ** and * indicate significance at the 5% and 10% levels, respectively.