How Market Power Influences Bank Failures: Evidence from Russia

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Abstract

A vast debate in the literature on banking exists on the impact of bank competition on financial stability. While the dominant view is in favor of a detrimental impact of competition on the stability of banks, this view has recently been challenged by Boyd and De Nicolo (2005) supporting the opposite effect. The aim of this paper is to contribute to this literature by providing the first empirical investigation of the role of bank competition on the occurrence of bank failures. We analyze this issue on a large sample of Russian banks for the period 2001-2007 by measuring bank competition with the Lerner index. The Russian banking industry is a unique example of an emerging market which has undergone a large number of bank failures during the last decade. Our findings clearly support the view that greater bank competition is detrimental for financial stability. This result is robust to tests controlling for the measurement of market power, the definition of bank failure, the set of control variables, the linear specification of the relationship. The normative implications of our findings therefore suggest that measures increasing bank competition could weaken financial stability.

JEL Codes : G21, P34.

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I. Introduction

The impact of competition on bank failures is a fundamental issue for policymakers especially with the current banking consolidation around the globe. A detrimental effect of competition on the stability of banks would be in favor of limiting competition on the banking markets, rather than making efforts to blindly enhance competition.

This question has led to a vast debate in the literature on banking. Indeed, while gains from competition are obvious in most industries, the banking industry is different and it might suffer from a negative effect of competition. The dominant view in the literature has long been in favor of a detrimental impact of competition on the stability of banks. It is based on the impact of competition on bank profits which reduces the "buffer" against adverse shocks, and on the fact that lower bank profits contribute to increasing incentives for bank owners and managers to take excessive risk (Keeley, 1990). This view has however recently been challenged by Boyd and De Nicolo (2005). Their model shows a beneficial impact of bank competition on financial stability which is based on the effect of competition on borrower's behavior. By reducing loan rates, bank competition makes it easier to repay loans and then reduces moral hazard behavior of borrowers to shift into riskier projects, which leads to lower default risk of borrowers.

Relation between competition and bank failures has also been widely investigated in studies considering the impact of bank competition on financial stability (Beck, Demirgüc-Kunt and Levine, 2006; Jimenez, Lopez and Saurina, 2008; Berger, Klapper and Turk-Ariss, 2009; Boyd, De Nicolo and Jalal, 2006). However, empirical literature shows two striking points: no clear finding regarding the impact of bank competition on financial stability, and more interestingly no paper providing a microeconomic investigation of the role of bank competition on bank failures. All papers analyze financial stability either using macroeconomic variables like the occurrence of banking crises or microeconomic variables other than bank failures (e.g. risk-taking measures). Therefore, these papers do not provide empirical test for the findings of theoretical literature on the impact of competition on bank failures.

Our aim in this paper is to investigate the impact of bank competition on the presence of bank failures in Russia for the period 2001-2007. The Russian banking

industry presents a unique opportunity to test the role of competition on bank failures with nearly 300 Russian banks that were liquidated or vanished during this time period. Moreover, Russia is a very interesting example of an emerging market which experienced an impressive economic as well as banking sector growth in recent years. The ratio of banking sector assets to GDP has doubled since the year 2000 and the same holds true for the ratio of bank credit to private sector to GDP.

We utilize a rich panel dataset coming from the financial information agency Interfax and the Central Bank of Russia. The major advantage over the panels used in previous studies is that our dataset covers the whole banking sector and, thus, unlike the Bankscope dataset, it is not subject to the selection bias. Furthermore, we use quarterly data which allows us to track the failures and bank's situation preceding it even more precisely.

This research therefore provides a major contribution to the literature on financial stability with the first empirical study investigating the impact of bank competition on bank failures. In line with recent studies on bank competition (Fernandez de Guevara, Maudos and Perez, 2005, Solis and Maudos, 2008, Carbo et al., 2009), we measure competition by Lerner indices. Following earlier works on the determinants of bank failures in Russia (Lanine and Vander Vennet, 2006, Claeys and Schoors, 2007), we adopt the logit model in this investigation.

The rest of the article is structured as follows. Section 2 reviews the literature on the impact of competition on bank failures. Section 3 presents the recent history of the Russian banking industry. Section 4 discusses data and methodology. Section 5 displays the results, and Section 6 concludes.

II. Literature review

II.1 Theoretical literature

As recently summarized by Berger, Klapper and Turk-Ariss (2009), there are two opposing views concerning the impact of bank competition on financial stability and therefore also on the risk of bank failure.

The dominant view in the literature has long been the "competition-fragility" view, which assumes that competition favors the risk of bank failure. It has its roots in the seminal paper of Keeley (1990), according to which greater competition reduces the franchise value of the bank and then enhances bank incentives to take risks. This argument has been supported by many theoretical papers stressing the positive impact of bank competition on risk-taking. Among others, Besanko and Thakor (1993) show that increased competition reduces informational rents resulting from relationship banking and thus increases incentives for risk-taking. Therefore, as greater risk-taking enhances the risk of bank failure, these papers support the view that competition brings about bank failures.

Matutes and Vives (2000) investigate the role of bank market power on risk taking incentives by focusing on the deposit market. They consider a framework with limited liability for banks and a social cost of failure. Their main conclusion is in favor of a positive impact of competition on the risk of bank failures, depending on the deposit insurance scheme. This view is also supported by the intuitive argument according to which lower bank profits reduce the "buffer" against adverse shocks. As a consequence, enhanced competition increases the fragility of banks.

It is however challenged by the "competition-stability" strand of literature according to which greater competition could contribute to bank stability. In a nutshell, this literature focuses on the impact of bank competition considering moral hazard and adverse selection problems. Boyd and De Nicolo (2005) explain that the standard argument according to which competition would be detrimental for bank stability neglects the potential role of competition on borrower's behavior. Indeed, models supporting the "competition-fragility" view consider that banks choose the riskiness of their assets and may consequently increase or decrease it depending on the degree of competition. In opposition, Boyd and De Nicolo argue that borrowers really choose the riskiness of their investment financed by the bank loan. As a consequence, the impact of greater competition goes through lower loan rates, which reduces incentives for borrowers to undertake moral hazard behavior by shifting into riskier projects. Therefore, greater competition reduces default risk of borrowers and hence banks losses.

Stiglitz and Weiss (1981) also provide theoretical foundations to the "competition-stability" view by showing that greater loan rates, which result from lower competition, lead to adverse selection and therefore enhance default risk of borrowers.

Caminal and Matutes (2002) present a model specifically devoted to the connection between market power and bank failures, in which competition influences bank solvency through the incentives to invest in technologies reducing information asymmetries, and hence moral hazard problems. They find an ambiguous impact of market power on bank failures, resulting from the existence of two countervailing forces. On the one hand, market power provides more incentives to monitor for banks. On the other hand, it leads to greater loan rates which enhance moral hazard problems. Consequently the relationship depends on the level of monitoring costs for banks, that influences the first force.

Finally, Martinez-Miera and Repullo (2008) extend Boyd and De Nicolo's (2005) perspective by assuming imperfect correlation of loan defaults. This hypothesis is based on the assumption that greater competition reduces interest payments from non-defaulting loans, which are a buffer to cover loan losses. As a consequence, the risk-shifting effect developed by Boyd and De Nicolo has to be considered next to this margin effect which goes in the opposite direction. In that framework, the conclusion is a U-shaped relationship between competition and the risk of bank failure, such that greater competition enhances the risk of bank failure in very competitive markets but reduces it in very concentrated markets.

In summary, theoretical literature provides opposing arguments with respect to the impact of competition on the risk of bank failures. Whereas theories based on the impact of competition on bank incentives for risk-taking assume a positive role, the research analyzing the effects of competition accounting for moral hazard and adverse selection problems suggests a negative impact or at least an ambiguous one. Does the empirical literature provide a clear answer supporting only one of these views?

II.2 Empirical literature

Many empirical works investigate bank competition and financial stability. They differ in the measurement of competition and in the considered dimension of financial

stability. The studies that provide the most relevant findings concerning the impact of bank competition on the risk of bank failure can be classified into two categories.

The first one includes the micro-based research investigating the influence of bank competition on risk-taking. Jimenez, Lopez and Saurina (2008) have recently analyzed the impact of bank competition on the risk-taking of banks in a study on 107 Spanish banks. Competition is alternatively measured by concentration indices and Lerner indices. Risk-taking is measured by the ratio of non-performing loans to total loans. While they find no significant impact of bank concentration, they point out a negative relationship between the Lerner index and bank risk-taking.

Berger, Klapper and Turk-Ariss (2009) provide a cross-country investigation of the impact of bank competition, alternatively measured by the Herfindahl index and by the Lerner index, on three measures of bank risk-taking (non-performing loans ratio, Z-score, capitalization ratio). The analysis is performed on a sample of 9000 banks from 89 developing and developed countries. They find support for a positive impact of competition on risk-taking in developed countries, nevertheless, the results are ambiguous for developing countries.

While both of the above mentioned studies confirm a detrimental effect of bank competition on bank stability, Boyd, De Nicolo and Jalal (2006) and De Nicolo and Loukoianova (2007) arrive at a different conclusion. They test the link between the Herfindahl index and the Z-score, on two different samples, one of 2500 US banks and one of 2700 banks, from 134 countries excluding major developed countries. These studies confirm a positive impact of bank concentration on bank risk, and therefore support the "competition-stability" view in line with Boyd and De Nicolo (2005).

The second group of studies are the macro-based papers analyzing the impact of bank competition on financial stability. In this strand of literature, two papers are closely related to ours as they focus on the impact of bank competition on the occurrence of a banking crisis.

Beck, Demirgüc-Kunt and Levine (2006) investigate the impact of bank concentration on the likelihood of a systemic banking crisis. Bank concentration is measured by the share of the three largest banks in total banking assets, while banking crisis is defined as a situation when the banking system has suffered high losses or when

emergency measures like large-scale nationalizations or deposit freezes were taken to assist the banking system. The analysis is performed on a sample of 69 countries for the period 1980-1997, which includes 47 crisis episodes. The conclusion is that banking crises are less likely in more concentrated banking systems. Thus, this paper supports the "competition-fragility" view.

Schaeck, Cihak and Wolfe (2009) extend this work by using another measure of bank competition, the non-structural H-Statistic, and by analyzing the impact of bank competition on the occurrence of a banking crisis but also on time to crisis. The investigation is done on a sample of 45 countries for the period 1980-2005, which includes 31 banking crises. The main finding is that competition reduces the likelihood of a banking crisis and increases time to crisis. Hence, this work is in favor of the "competition-stability" view.

This brief survey of empirical literature confirms that there seems to be no consensus on the impact of bank competition neither on risk-taking at the micro level, nor on the occurrence of a banking crisis at the macro level. Accordingly, empirical literature does not provide clear evidence that would enable us to discriminate between the "competition-fragility" and the "competition-stability" views.

III. The recent evolution of the Russian banking industry

Following the recovery from severe crises in 1998, the Russian economy started to grow by more than six percent annually. Favorable macroeconomic development and institutional reforms initiated rapid growth also in the banking sector. The ratio of total banking sector assets has doubled since year 2000 and currently stands at 65% of GDP. The same holds true for banking credit which accounts for more than 40 % of GDP.

Banks started to perform their function of financial intermediaries. Structure of the banking activities changed, proportion of loans in total sector assets was increasing fast, conditions for lending became more market-based, claims on the government contracted significantly. Banks began to provide all types new of services, not only to traditional corporate clients but increasingly also to the households.

Legal and regulatory environment started to improve as well[1]. A large number of institutional reforms took place, starting from the amendments of the major banking sector laws. The most important is the introduction of deposit insurance by the law adopted in December 2003. The Deposit Insurance Agency was established in 2004 and by the end of March 2005 the first 824 banks that managed to fulfill the requirements were admitted to the system in the first wave. Altogether there were 1150 applicants and by September 2005 which was the deadline for joining the system, 927 banks were admitted (Camara & Montes-Negret, 2006).

Despite these developments, Russian banking system remains small, even in comparison to other emerging markets. Its structure has not changed significantly. The number of credit institutions remains high; it still exceeds 1100. It has however decreased from more than 1300 that were registered in the year 2000. More than 350 banking licenses were revoked by the Central Bank of Russia (CBR) in the period between 2000 and 2007. Liquidity crisis in 2004 demonstrates fragility that is still characteristic for the whole sector. This crisis was caused by the lack of trust that paralyzed interbank market and initiated withdrawals of private deposits. This lead to increased number of revoked licenses in 2005. Afterwards, in 2006 and 2007 CBR was gradually revoking the licenses of the banks that were not part of the deposit insurance system.

Even though the number of registered banks is still high, the system is dominated by a few large state-controlled ones. The biggest five banks account for about 40 % of the sector's assets. Moreover, the proportion of the state-controlled banks remains, unlike other transition countries, relatively high. These banks account for almost half of the banking sector assets. The biggest bank is the state-controlled Sberbank. Its share of private deposits has decreased from over 70% in 2000 but remains still high, at about 50%. At the same time, foreign participation in the sector remains modest. The number of foreign-owned banks has increased from 130 in 2000 to 202 in the year 2008. Thanks to several acquisitions by foreign banks in 2006 and two big IPOs in 2007 the share of foreign-owned institutions in banking sector capital increased from 7 to 28 % between 2000 and 2007. This development created a more competitive environment in some segments of the market.

[1] For detailed description see Barisitz (2008).

IV. Data and methodology

IV.1 Data

We use quarterly bank-level data from the financial information agency Interfax. Our sample is composed of observations from the first quarter of 2001 to the first quarter of 2007 for data reasons. The list of failed banks comes from www.banki.ru. As mentioned before, the Russian banking industry is composed of a large number of banks among which only a few are state-controlled, but still dominating the market. Owing to this specific status and to the fact that the risk of failure does not mean the same thing for public and private banks, we have dropped all publicly-owned banks from the sample. To ensure that a bank carries out lending activities, we keep only banks with more than 5% of loans in total assets. Our final sample consists of over 20000 bank quarter observations available for estimations.

The focus of our research is to investigate the role of market power of banks on the occurrence of bank failure. The explained variable is a dummy variable which equals one for a quarter in which a bank loses its license and zero otherwise. Our definition is in line with works on the determinants of bank failures (Lanine and Vander Vennet, 2006, Claeys and Schoors, 2007).

The explanatory variable of primary concern is the Lerner index (*Lerner Index*), measuring market power. Its computation is described in the next subsection. To select control variables, we follow the empirical literature on the determinants of bank failures (e.g. Arena, 2008) with an additional constraint: the fact that, unlike earlier papers, we focus on the role of bank competition. Therefore, as theoretical literature suggests channels of transmission through risk-taking of banks, we cannot include risk-taking variables e.g. non-performing loans or equity to total assets in the model. Furthermore, as market power is related to profitability, we also cannot consider profitability measures like the return on assets.

We however include five control variables in line with literature on the determinants of bank failures. Size is measured by the logarithm of total assets (*Size*), as the scale of operations can exert an impact on the probability of bank failure through the "too big to fail" argument. The ratio of loans to total assets (*Loans*) is included in the estimations, as it measures the structure of assets. We also account for the share of

deposits in total assets (*Deposits*), as sources of financing can influence the occurrence of bank failure through several mechanisms. One can notably consider the possibility of bank runs which is of course related to the importance of deposits in total balance sheet. But even if we do not consider this extreme case, several papers have provided evidence on the depositor discipline on the Russian banking markets (Ungan, Caner and Özyildirim, 2006; Karas, Pyle, Schoors, 2009). According to them the perception of increasing probability of failure could lead to deposit withdrawals.

Following Lanine and Vander Vennet (2006) and Claeys and Schoors (2007), we include the ratio of government bonds to total assets (*Government Bonds*). Three reasons are provided by these authors to consider this variable as a determinant of bank failures in Russia. First, it controls for liquidity as government bonds can be sold in case of a liquidity shortage. An alternative measure of liquidity would be the ratio of liquid assets to total assets, but we cannot include this variable in our estimations, as it is strongly correlated with the ratio of loans to total assets. Second, the government might have more incentives to rescue banks with higher share of government bonds. Third, this ratio controls for the effects of the big 1998 crisis, as holding a large share of government securities may indicate injuries suffered during this crisis with the government's default on its bonds in August 1998. Therefore, the expected sign is ambiguous, as the first two reasons are in favor of a negative impact on the probability of bank failure, while the latter one pleads for a positive role.

Finally, we also consider a dummy variable which is equal to one if the bank's headquarter is located in the Moscow area and zero otherwise (*Moscow*). The inclusion of this variable is motivated by the fact that about half of the banks surveyed are located in the Moscow region.

Dummy variables for each quarter and each year are also included in the estimations to control for seasonal and year effects. Descriptive statistics for all variables are reported separately for failed and non-failed banks in table 1.

IV.2 The Lerner index

Empirical research provides several tools for measuring bank competition. They can be divided into the traditional Industrial Organization (IO) and the new empirical IO approaches. The traditional IO approach proposes tests of market structure to assess bank competition based on the Structure Conduct Performance (SCP) model. The SCP hypothesis argues that greater concentration causes less competitive bank conduct and leads to greater profitability of the bank. According to this, competition can be measured by concentration indices such as the market share of the largest banks, or by the Herfindahl index. These tools were widely applied until the 1990s.

The new empirical IO approach provides non-structural tests to circumvent the problems of the competition measures based on the traditional IO approach. These traditional measures infer the degree of competition from indirect proxies such as market structure or market shares. In comparison, non-structural measures do not infer the competitive conduct of banks through the analysis of market structure, but rather measure banks' conduct directly.

Following the new empirical IO approach, we compute the Lerner index so that we have an individual measure of competition for each bank of our sample. The Lerner index has been computed in several recent studies on bank competition (e.g. Solis and Maudos, 2008, Carbo et al., 2009). It is defined as the difference between the price and the marginal cost, divided by the price.

The price is computed by estimating the average price of bank production (proxied by total assets) as the ratio of total revenues to total assets, following Fernandez de Guevara, Maudos and Perez (2005) and Carbo et al. (2009) among others. The marginal cost is estimated on the basis of a translog cost function with one output (total assets) and three input prices (price of labor, price of physical capital, and price of borrowed funds). Symmetry and linear homogeneity restrictions in input prices are imposed. The cost function is specified as follows:

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

where *TC* denotes total costs, *y* total assets, w_1 the price of labor (the ratio of personnel expenses to total assets)[2], w_2 the price of physical capital (the ratio of other non-interest expenses to fixed assets), w_3 the price of borrowed funds (the ratio of paid interests to all funding). Total costs are the sum of personnel expenses, other non-interest expenses and paid interest. The indices for each bank have been dropped from the presentation for the sake of simplicity. The estimated coefficients of the cost function are then used to compute the marginal cost (MC) as follows:

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

Once marginal cost is estimated and price of output computed we are able to calculate the Lerner index for each bank and obtain a direct measure of bank competition.

V. Results

This section presents our results for the impact of market power on the occurrence of bank failure. We start with the main estimations, and then perform some robustness check tests.

V.1 Main estimations

We perform logit regressions of the occurrence of bank failure on a set of variables including market power. The panel logit model is commonly used in studies investigating the occurrence of bank failure (e.g. Arena, 2008) and has been widely adopted in studies on bank failures in Russia (Peresetsky, Karminsky and Golovan, 2004; Styrin, 2005; Lanine and Vander Vennet, 2006; Claeys and Schoors, 2007).

We use lagged values for all explaining variables for two reasons. First, accounting information can become very poor or even missing for failed banks. Second, market power can influence the occurrence of bank failure with a lag.

[2] As the Bankscope database does not provide information on the number of employees, we use this proxy variable for the price of labor following Maudos and Fernandez de Guevara (2007).

We try several lags in our estimations. Following Lanine and Vander Vennet (2006), we use information for explaining variables 3, 6, 9 and 12 months before bank failure, as we have quarterly data.

The increasing number of lags influences the composition of our sample in two ways. First, it reduces the number of observations as we need to drop observations of the first quarters of our sample. For instance, with 12 months, we drop observations for the four quarters of 2001. Second, the increasing number of lags used provides us with higher number of bank failures in our sample (see Table 1) as some failed banks have no available accounting information in the quarters just before the failure. Therefore, by using four quarters instead of one quarter, we are able to benefit from more failed banks in the sample.

Our main results are displayed in Table 2. The key finding is the negative coefficient of *Lerner Index*, which is significant at the 1% level. This result is observed for all specifications of the lagged values, which confirms that it does not depend on the number of months before the bank failure. Therefore, our main conclusion is that market power has a negative influence on the occurrence of bank failure. In other words, our findings support the "competition-fragility" view according to which more competition results in more bank failures. This is in line with the results obtained at the micro level by Jimenez, Lopez and Saurina (2008) and Berger, Klapper and Turk-Ariss (2009) who confirm a positive role of bank competition on risk-taking, and at the macro level by Beck, Demirgüc-Kunt and Levine (2006) who find that banking crises are less likely in more concentrated banking industries.

We now turn to the analysis of control variables. We observe a negative sign for the size of the bank, which is significant in most specifications. This result is in line with the "too big to fail" argument according to which big banks have a lower probability of bank failure. This was also observed by Claeys and Schoors (2007).

The ratio of loans to total assets is not significant in all cases. This is not in line with what is observed in other regions of the world. Among others, Wheelock and Wilson (2000) for the US and Arena (2008) for East Asian and Latin American countries find a positive impact of this ratio on the probability of bank failures. Nevertheless, this result has also been found by Lanine and Vander Vennet (2006) in their investigation of

Russian bank failures. It might be explained by the fact that, while in other countries a higher ratio of loans to assets is associated with excessive risk-taking, the level of financial intermediation by banks in Russia is so low, i.e. they do not lend so much, that they are far from taking excessive risk when granting more loans. This explanation is in line with the one proposed by Männasoo and Mayes (2009) in their analysis of the determinants of distress of banks in transition countries. They also find a non-significant sign for the loans to assets ratio in most of their estimations. They claim that lending activity is underdeveloped in transition countries and it is a marginal part of banks' activities. Consequently, the exposure to credit risk is relatively low in transition countries.

We find a significantly negative coefficient for the share of deposits to total assets. This result can be explained by the depositor discipline which has been observed in Russia (Ungan, Caner and Özyildirim, 2006; Karas, Pyle and Schoors, 2009). According to this argument, depositors adapt their deposits to their perception of the probability of bank failure. Consequently, more deposits mean more confidence of depositors in the bank's health.

The share of government bonds in total assets is not significant in all estimations. We explain this absence of significance by the existence of counteracting influences. On the one hand, a greater value of this variable contributes to the liquidity of banks and enhances the incentives to rescue the bank for the government. On the other hand, it may also mean a greater injury following the government's default on its securities in 1998. Studies that were using this variable to explain the occurrence of bank failures in Russia also find contradictory results, as Lanine and Vander Vennet (2006) obtain a significantly negative sign while Claeys and Schoors (2007) find a significantly positive coefficient. The differences between the results may come from the different periods used for these studies. Indeed the negative role of the share of government bonds is linked to the 1998 crisis. Therefore, as our analysis is based on the period 2001-2007 while Claeys and Schoors (2007) have an earlier period from 1999 to 2002, the detrimental effects of the 1998 crisis are stronger in their latter work.

Finally, we observe that the dummy variable for the Moscow location is significantly positive, which means that banks located in Moscow have a greater

probability of failure. This finding is in concordance with the observation of a greater number of bank failures in Moscow region than in other parts of Russia.

V.2 Robustness checks

We check the robustness of our results in different ways. For all robustness checks, we restrict ourselves to the specification of explanatory variables with four lags for conciseness reasons, with the exception of the last one focusing on the number of lags.

First, we use an alternative measure for bank competition in our estimations. Following the wide utilization of concentration indices in the literature, we take indicators of bank concentration as a natural robustness check, even though we are fully aware of the limitations of such indices. Bank concentration is alternatively measured by the Herfindahl index for assets (*Herfindahl*) and by the share of the three largest banks in total banking assets (*Concentration*), both computed at the regional level. The variability of these measures in time is very low and therefore we use the average value of each measure during the period under review for each region. As these measures of concentration are computed at the regional level, we drop the dummy variable for the location in the Moscow region from the estimations. Table 3 displays estimation results with these concentration indices. We observe a significantly negative coefficient for both indices of concentration, meaning that bank concentration reduces the probability of failure. Hence, these results corroborate those obtained with the Lerner index.

Second, we test an alternative definition of bank failure, our dependent variable. Our definition is based on the revocation of the banking license and might consequently be sensitive to non-economic motives in some cases. Therefore, in this robustness check the failed banks are the banks with a ratio of equity to total assets lower than 10 percent. In their investigation of the determinants of U.S. bank failures, Wheelock and Wilson (2000) use a similar approach by considering two alternative definitions for bank failure. After considering only banks that were closed by the FDIC, they extend this definition to banks with a ratio of equity less goodwill divided by total assets of less than two percent. In the case of Russian banks, the same value of the ratio would not be relevant owing to different prudential regulation measures. Regulation forces banks to have the bank equity capital adequacy ratio higher than 10% and for small banks with capital lower than 5 mil.

euros it is 11%. We display the estimation results with this alternative definition of bank failure in table 4. We observe that findings are similar to our main results with a negative coefficient for the Lerner index.

Third, we include the squared Lerner index (*Lerner Index²*) in the estimations to consider possible nonlinearity in the relationship between market power and the occurrence of bank failure. Furthermore, this specification helps us test the predictions of Martinez-Meria and Repullo (2008) on the existence of a U-shaped relationship between competition and the risk of bank failure. It might indeed happen that this relationship is not linear. However, the results in table 5 confirm that neither of the market power variables is significant. The lack of significance for Lerner Index is likely to be the result of the inclusion of the squared term, owing to their high correlation (0.90). Therefore, we find no evidence for a nonlinear relationship between market power and the occurrence of bank failure.

Fourth, we check the robustness of our results to the choice of control variables. To this end, we run our estimations again, dropping one control variable at a time. As table 6 shows, our results were affected only slightly, either qualitatively or quantitatively.

Fifth, we try longer time horizons prior to failure (15, 18, 21, 24 months), as the effects of bank competition can take more time than we assume in our main estimations. These estimations are presented in table 7. We find that the Lerner index remains significantly negative in all these specifications as well.

Our main results have thus survived several robustness checks, leading to findings that are consistent with the "competition-fragility" view.

VI. Conclusion

In this paper, we investigate the impact of market power on the occurrence of bank failures in Russia. The Russian banking industry provides an example of a very interesting emerging market which has undergone a large number of bank failures during the last decade. According to the "competition-fragility" view, we should observe a negative relation between market power and competition, as competition increases

incentives for risk-taking for banks and reduces the "buffer" against adverse shocks. The "competition-stability" is however in favor of a positive relation, owing to the impact of competition on moral hazard behavior of borrowers (Boyd and De Nicolo, 2005).

We find that a higher degree of market power, measured by the Lerner index, reduces the occurrence of failure. Therefore our findings support the "competition-fragility" view, according to which greater bank competition is detrimental for financial stability. In addition, this result is robust to tests controlling for the measurement of market power, the definition of bank failure, the set of control variables and the nonlinear specification of the relationship. These results are in line with the previous literature on the relationship between bank market structure and financial stability (Beck, Demirgüc-Kunt and Levine, 2006, Jimenez, Lopez and Saurina, 2008 and Berger, Klapper and Turk-Ariss, 2009).

The normative implications of our findings are that taking measures that increase bank competition could lead to weakening financial stability. We do not mean that policies favoring bank competition should be given up, but rather suggest to qualify them. Indeed we stress the existence of a trade-off between the benefits through lower banking prices (and notably of loan rates that may contribute to greater investment) and the losses resulting from higher financial instability, that are the consequence of greater competition. Our analysis can be extended in a number of ways. Additional case studies would notably provide further validation of the findings.

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Table 1
Descriptive statistics

This table provides the descriptive statistics for failed and non-failed banks.

	FAILED BANKS				NON-FAILED BANKS			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
3 months to failure								
Lerner Index	0.19	0.14	-0.19	0.47	0.21	0.11	-0.28	0.57
Size	6.79	1.64	3.45	10.71	6.30	1.73	0.10	12.76
Loans	0.65	0.24	0.06	1.00	0.60	0.19	0.05	1.00
Government Bonds	0.02	0.04	0	0.14	0.02	0.04	0.00	0.29
Deposits	0.57	0.23	0.10	0.95	0.64	0.18	0.01	0.98
Moscow	0.64	0.48	0	1	0.43	0.50	0	1
N	77	77	77	77	20659	20659	20659	20659
6 months to failure								
Lerner Index	0.17	0.16	-0.27	0.56	0.21	0.11	-0.28	0.57
Size	6.32	1.61	3.05	10.65	6.29	1.72	0.11	12.61
Loans	0.62	0.24	0.06	1.00	0.60	0.19	0.05	1.00
Government Bonds	0.01	0.04	0	0.21	0.02	0.04	0	0.29
Deposits	0.55	0.23	0.10	0.88	0.64	0.18	0.01	0.98
Moscow	0.66	0.48	0	1	0.43	0.50	0	1
N	126	126	126	126	19266	19266	19266	19266
9 months to failure								
Lerner Index	0.18	0.14	-0.19	0.48	0.21	0.11	-0.28	0.57
Size	6.22	1.62	1.77	10.65	6.26	1.71	0.15	12.46
Loans	0.61	0.22	0.06	0.98	0.60	0.19	0.05	1.00
Government Bonds	0.01	0.03	0	0.18	0.02	0.04	0	0.29
Deposits	0.56	0.20	0.05	0.88	0.64	0.18	0.01	0.98
Moscow	0.66	0.47	0	1	0.43	0.50	0	1
N	139	139	139	139	18198	18198	18198	18198
12 months to failure								
Lerner Index	0.20	0.12	-0.24	0.52	0.21	0.11	-0.27	0.57
Size	6.20	1.64	2.15	10.63	6.23	1.70	0.10	12.37
Loans	0.60	0.21	0.13	0.99	0.59	0.19	0.05	1.00
Government Bonds	0.01	0.04	0	0.25	0.02	0.04	0	0.29
Deposits	0.57	0.20	0.09	0.90	0.64	0.18	0.01	0.98
Moscow	0.66	0.48	0	1	0.43	0.50	0	1
N	148	148	148	148	17225	17225	17225	17225

Table 2
Main estimations

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, which equals one when a bank's license was revoked and zero otherwise. Standard errors appear in parentheses below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level. Dummy variables for quarters and years are included in the regressions but are not reported.

	Months prior to bank failure			
	3 months	6 months	9 months	12 months
Intercept	-4.311***	-2.735***	-2.035***	-2.620***
	(-0.950)	(0.808)	(0.710)	(0.708)
Lerner Index	-2.158**	-3.157***	-3.121***	-1.434**
	(1.018)	(0.732)	(0.713)	(0.725)
Size	0.023	-0.120*	-0.174***	-0.157***
	(0.081)	(0.065)	(0.064)	(0.062)
Loans	0.802	0.149	0.021	-0.158
	(0.655)	(0.487)	(0.465)	(0.452)
Deposits	-2.404***	-2.296***	-2.009***	-1.734***
	(0.637)	(0.491)	(0.477)	(0.462)
Government Bonds	-0.463	-2.169	-4.488	-2.259
	(3.174)	(2.644)	(2.837)	(2.419)
Moscow	0.644***	0.913***	1.054***	1.032***
	(0.266)	(0.211)	(0.207)	(0.199)
Log likelihood	-469.935	-707.004	-755.514	-801.107
N	20736	19392	18337	17373
Number of banks	1251	1239	1228	1218

Table 3
Robustness tests: With alternative measures of competition

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, which equals one when a bank's license was revoked and zero otherwise. Standard errors appear in parentheses below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level. As *Herfindahl* and *Concentration* are computed at the regional level, we drop the Moscow variable. Dummy variables for quarters and years are included in the regressions but are not reported.

	With Herfindahl	With Concentration
Intercept	-2.187***	-1.062
	(0.699)	(0.779)
Herfindahl	-2.533***	-
	(0.953)	
Concentration	-	-2.621***
		(0.635)
Size	-0.068	-0.115**
	(0.060)	(0.061)
Loans to assets	-0.374	-0.228
	(0.450)	(0.453)
Deposits to assets	-2.061***	-1.827***
	(0.452)	(0.459)
Government Bonds	-1.700	-1.793
	(2.423)	(2.419)
Log likelihood	-812.964	-807.538
N	17373	17373
Number of banks	1218	1218

Table 4
Robustness tests: With an Alternative Measure of Bank Failure

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, which equals one when the ratio of equity to assets is lower than 10 %. Standard errors appear in parentheses below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level. Dummy variables for quarters and years are included in the regressions but are not reported.

	Coefficient
Intercept	-12.745***
	(0.675)
Lerner Index	-0.745*
	(0.444)
Size	0.964***
	(0.062)
Loans to assets	-5.838***
	(0.373)
Deposits to assets	10.269***
	(0.540)
Government Bonds	2.827***
	(1.146)
Moscow	-1.453***
	(0.209)
Log likelihood	-2748.501
N	17373
Number of banks	1218

Table 5
Robustness tests: Allowing a Nonlinear relationship

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, which equals one when a bank's license was revoked and zero otherwise. Standard errors appear in parentheses below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level. Dummy variables for quarters and years are included in the regressions but are not reported.

	Coefficient
Intercept	-2.621***
	(0.709)
Lerner Index	-1.161
	(1.457)
Lerner Index^2	-0.757
	(3.474)
Size	-0.157***
	(0.062)
Loans to assets	-0.165
	(0.453)
Deposits to assets	-1.746
	(0.466)
Government Bonds	-2.228***
	(2.424)
Moscow	1.032***
	(0.199)
Log likelihood	-801.083
N	17373
Number of banks	1218

Table 6
Robustness tests: With Alternative Sets of Control Variables

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, which equals one when a bank's license was revoked and zero otherwise. Standard errors appear in parentheses below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level. Dummy variables for quarters and years are included in the regressions but are not reported.

	-1	-2	-3	-4	-5
Intercept	-3.254*** 0.662	-2.713*** 0.658	-3.692*** 0.664	-2.621*** 0.709	-2.360*** 0.69
Lerner index	-1.157* 0.721	-1.440** 0.726	-1.345** 0.746	-1.387** 0.72	-1.435** 0.728
Size	-	-0.162*** 0.06	-0.219*** 0.06	-0.168*** 0.061	-0.03 0.056
Loans to assets	-0.456 0.434	-	0.203 0.454	-0.082 0.447	-0.493 0.448
Deposits to assets	-2.065*** 0.443	-1.702*** 0.454	-	-1.768*** 0.462	-2.431*** 0.434
Government Bonds	-3.475 2.477	-2.126 2.389	-2.817 2.441	-	-1.936 2.439
Moscow	0.843*** 0.183	1.042*** 0.197	1.233*** 0.192	1.026*** 0.199	-
Log likelihood	-804.322	-801.168	-807.831	-801.584	-815.354
Number of banks	1218	1218	1218	1218	1218
N	17373	17373	17373	17373	17373

Table 7
Estimations with different lags

Logit estimations are performed under the random effects assumption. The independent variable is a dummy variable, bank failure, which equals one when a bank's license was revoked and zero otherwise. Standard errors appear in parentheses below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level. Dummy variables for quarters and years are included in the regressions but are not reported.

	Months prior to bank failure			
	15 months	18 months	21 months	24 months
Intercept	-1.596*	-2.053***	-1.856***	-2.438***
	(0.585)	(0.606)	(0.607)	(0.614)
Lerner Index	-2.823***	-1.593***	-2.077***	-1.589**
	(0.688)	(0.706)	(0.715)	(0.725)
Size	-0.161*	-0.184***	-0.119*	-0.174***
	(0.062)	(0.063)	(0.064)	(0.064)
Loans to assets	-0.310	-0.625	-0.855**	0.295
	(0.448)	(0.451)	(0.466)	(0.482)
Deposits to assets	-1.611***	-1.069***	-1.632***	-1.579***
	(0.462)	(0.474)	(0.481)	(0.482)
Government Bonds	-3.857	-1.896	-2.295	-2.015
	(2.548)	(2.269)	(2.422)	(2.548)
Moscow	0.972***	1.105***	0.892***	1.087***
	(0.196)	(0.199)	(0.203)	(0.205)
Log likelihood	-800.797	-780.943	-728.397	-725.299
N	16558	15578	14585	13627
Number of banks	1208	1199	1191	1181