Laboratoire
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Working Paper
2010-08

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June 2010

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Abstract

There has been a notable debate in the banking literature on the impact of bank competition on financial stability. While the dominant view sees a detrimental impact of competition on the stability of banks, this view has recently been challenged by Boyd and De Nicolo (2005) who see the reverse 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 based on a large sample of Russian banks over the period 2001-2007 and in line with the previous literature we employ the Lerner index as the metric of bank competition. Our findings clearly support the view that tighter bank competition enhances the occurrence of bank failures. The normative implication of our findings is therefore that measures that increase bank competition could undermine financial stability.

JEL Codes: G21, P34
Keywords: bank competition, bank failure, Russia

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[o] For valuable comments and suggestions, we thank Iikka Korhonen, David Mayes, participants of the Conference on 20 Years of Transition in Central and Eastern Europe in London Metropolitan School (September 2009), EBRD seminar in London (September 2009), the Xth International Academic Conference on Economic and Social Development in Moscow (April 2009), and the seminars at Comenius University in Bratislava (April 2009) and BOFIT in Helsinki (March 2009).
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I. Introduction

The impact of competition on bank failures is a fundamental issue for policymakers, especially in light of the current worldwide penchant for banking consolidation. A tendency of competition to have a detrimental effect on the stability of banks would lead one to favor the limiting competition in the banking markets over blindly pushing for enhanced competition.

This question has provoked a wide debate in the banking literature. Indeed, while gains from competition are obvious in most industries, the banking industry, being different, might be subject to a negative impact from competition. The long-standing dominant view in the literature has been that 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 been recently challenged by Boyd and De Nicolo (2005). Their model shows a beneficial impact of bank competition on financial stability, based on the effect of competition on a borrower's behavior. By reducing loan rates, bank competition makes it easier to repay loans, which reduces the moral-hazard behavior of borrowers, i.e. the shifting into riskier projects. This in turn reduces the default risk.

The relation between competition and bank failures has also been widely investigated in studies on 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, looking at the empirical literature, one is struck by two shortfalls: no clear finding on the impact of bank competition on financial stability and, more interestingly, no paper that provides a microeconomic investigation of the role of bank competition on bank failures. All the papers analyze financial stability using either macroeconomic variables such as occurrences of banking crises or microeconomic variables other than bank failures (e.g. risk-taking measures). Therefore, these papers do not provide empirical tests of the findings of the theoretical literature on the impact of competition on bank failures.

Our aim here is to investigate the impact of bank competition on the presence of bank failures in Russia in 2001-2007. The Russian banking industry presents a unique

opportunity to test the role of competition on bank failures; nearly 300 Russian banks were liquidated or vanished during this period. Moreover, Russia is an interesting example of an emerging market which has in recent years experienced impressive economic and banking-sector growth. 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 the private sector to GDP.

We utilize a rich panel dataset obtained 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 even more precisely the failures and preceding bank situations.

This study therefore provides a major contribution to the literature on bank failures, being the first empirical study investigating the impact of 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 the Lerner index. 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.

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 presents 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 on the impact of bank competition on financial stability and hence 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 a bank and then enhances bank incentives to take risks. This argument has been supported by numerous theoretical papers stressing the positive impact of bank competition on risk-taking. Among others, Besanko and Thakor (1993) show that increased competition reduces the informational rents from relationship banking and thus strengthens the incentive for risk-taking. Since greater risk-taking increases the risk of bank failure, these papers support the view that competition promotes bank failures.

Matutes and Vives (2000) investigate the role of banks' 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 for a positive impact of competition on the risk of bank failure, 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, taking account of moral hazard and adverse selection problems. Boyd and De Nicolo (2005) note that the standard argument by which competition is detrimental to bank stability neglects the potential role of competition on a borrower's behavior. Indeed, models supporting the "competition-fragility" view argue that banks choose the riskiness of their assets and may consequently increase or reduce it depending on the degree of competition. In opposition, Boyd and De Nicolo argue that borrowers actually choose the riskiness of their investments financed by bank loans. As a consequence, the impact of greater competition comes via lower loan rates, which reduces borrowers' incentive to undertake moral hazard behavior by shifting into riskier projects. Therefore, greater competition reduces default risk and hence banks' losses.

Caminal and Matutes (2002) present a model specifically devoted to the connection between market power and bank failures, in which competition influences bank solvency via the incentive to invest in technologies that reduce 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 incentive for banks to monitor. On the other hand, it leads to higher loan rates, which increases the moral hazard problems. Consequently the relationship depends on the level of banks' monitoring costs, which influences the first force.

Finally, Martinez-Miera and Repullo (2008) extend Boyd and De Nicolo's (2005) analysis by assuming imperfect correlation of loan defaults. This hypothesis is based on the assumption that tighter competition reduces interest payments from non-defaulting loans which provide a buffer for loan losses. As a consequence, the risk-shifting effect enunciated by Boyd and De Nicolo must be considered against this margin effect which goes in the opposite direction. We then arrive at a U-shaped relationship between competition and the risk of bank failure, such that greater competition enhances the risk of bank failure in highly competitive markets but reduces it in highly concentrated markets.

In summary, the 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 on the effects of competition, taking account of moral hazard and adverse selection problems, suggests a negative impact or at least an ambiguous one. Does the empirical literature provide definite support for one view over the other?

II.2 Empirical literature

There are many empirical studies that investigate bank competition and financial stability. They differ in the measurement of competition and in the dimension of financial stability. The studies that provide the most relevant findings on the impact of bank competition on the risk of bank failure can be divided 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 banks' risk-taking in a study of 107 Spanish banks. Competition is alternatively measured by concentration 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 do find 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-Hirschman index and the Lerner index, on three measures of bank risk-taking (non-performing loans ratio, Z-score, and 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 but obtain ambiguous results 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-Hirschman 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 macro-based ones that analyze the impact of bank competition on financial stability. In this strand of the 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, and banking crisis is defined as a situation where the banking system has suffered high losses or where emergency measures, such as large-scale nationalizations or deposit freezes, have been 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 and on the run-up time to crisis. The investigation is based 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 the run-up time to crisis. Hence, this work supports the "competition-stability" view.

This brief survey of the empirical literature suggests that there is no consensus on the impact of bank competition on either risk-taking at the micro level or the occurrence of a banking crisis at the macro level. Accordingly, the empirical literature does not provide clear evidence that would enable us to discriminate between the "competition-fragility" and the "competition-stability" views.

III. 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 developments and institutional reforms spurred rapid growth also in the banking sector. The ratio of total banking sector assets has doubled since year 2000 and stood at 67% of GDP in 2008. The same holds true for banking credit, which amounted to more than 40 % of GDP in 2008.

Banks have begun to perform their role as financial intermediaries. The structure of banking activities has changed: the proportion of loans in total sector assets has been increasing rapidly, conditions for lending have become more market-based, claims on the government have contracted significantly. Banks began to provide many kinds of new services, not only to traditional corporate clients but increasingly to households.

The legal and regulatory environment has improved as well[1]. A large number of institutional reforms took place, starting with amendments to the major banking laws. The most important was 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 meet the requirements were admitted

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

to the system in the first wave. Altogether, there were 1150 applicants and by September 2005, the deadline for joining the system, 927 banks were admitted (Camara & Montes-Negret, 2006).

Despite all these developments, the 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, still exceeding 1100. It has however decreased from the 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. The liquidity crisis in 2004 demonstrates that fragility still characterizes the whole sector. This crisis was caused by the lack of trust that paralyzed the interbank market and initiated withdrawals of private deposits. This led to an increased number of revoked licenses in 2005. Afterwards, in 2006 and 2007, CBR gradually revoked the licenses of banks that were outside of the deposit insurance system.

Even though the number of registered banks is high, the system is still dominated by a few large state-controlled banks. The five biggest banks account for about 40 % of the sector's total assets. Moreover, the proportion of state-controlled banks remains quite high, in contrast to the other transition countries. These banks account for almost half of 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 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.

IV. Data and methodology

IV.1 Data

We use quarterly bank-level data from the financial information agency Interfax. Our sample contains observations from the first quarter of 2001 to the first quarter of 2007, for data reasons. The list of failed banks is from www.banki.ru. As mentioned

before, the Russian banking industry is composed of a large number of banks, of which only a few are state-controlled, but the latter still dominate the market. Owing to this specific status and to the fact that the risk of failure does not mean the same thing for state-controlled and private banks, we excluded all the state-controlled banks from the sample. To ensure that a bank pursues lending activities, we include only banks with more than 5% of loans in total assets. Our final sample for estimation consists of over 20,000 bank quarter observations.

The focus of our research is to investigate the role of banks' market power in 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 accords with studies 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*), which measures 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: unlike earlier papers, we focus on the role of bank competition. Therefore, because the theoretical literature suggests that the channel of transmission is banks' risk-taking, we cannot include in the model risk-taking variables such as non-performing loans or equity-to-total assets ratios. Furthermore, as market power is related to profitability, we cannot consider profitability measures like return on assets.

We however include five control variables, in accord with literature on 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 via 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 finance 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 depositor discipline in the Russian banking markets (Ungan, Caner and Özyildirim,

2006; Karas, Pyle, Schoors, 2009). According to these, 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 for considering 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 is 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 incentive to rescue banks with higher shares of government bonds. Third, this ratio controls for the effects of the severe 1998 crisis, as holding a large share of government securities may indicate injuries suffered during a crisis in which the government defaulted on its bonds in August 1998. Therefore, the expected sign is ambiguous, as the first two factors argue for a negative impact on the probability of bank failure, while the latter one plumps for a positive role.

Finally, we also consider a dummy variable, equal to one if the bank's head office 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 yearly effects. Descriptive statistics for all the variables are reported separately for failed and non-failed banks in table 1.

IV.2 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 behavior and leads to higher bank profitability. According to this, competition can be measured by

concentration indices such as the market share of the largest banks, or by the Herfindahl-Hirschman index. These tools were widely applied until the 1990s.

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

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

The price here is the average price of bank production (proxied by total assets), i.e. 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 (ratio of personnel expenses to total assets)[2], w_2 the price of physical capital (ratio of other non-interest expenses to fixed assets), w_3 the price of borrowed funds (ratio of interest paid to total funding). Total cost is the sum of personnel expenses, other non-interest expenses and interest paid. The indices for each bank have been excluded from the presentation for the sake of simplicity. The estimated coefficients of the cost function are then used to compute the marginal cost (MC):

[2] As our dataset does not provide numbers of employees, we use this proxy variable for the price of labor, following Maudos and Fernandez de Guevara (2007).

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

Once marginal cost is estimated and price of output computed, we can calculate 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 follow with some robustness 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 of the occurrence of bank failure (e.g. Arena, 2008) and has been widely adopted in papers dealing with 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 explanatory variables for two reasons. First, accounting information can be very poor or even missing for failed banks. Second, market power can influence the occurrence of bank failure with a lag.

We test for several lags in our estimations. Following Lanine and Vander Vennet (2006), we include values of explanatory variables for 3, 6, 9 and 12 months before bank failure, as we have quarterly data.

Increasing the number of lags influences the composition of our sample in two ways. First, it reduces the number of observations, as we need to exclude certain observations at the beginning of our sample. For instance, with 12 months, we drop observations for the four quarters of 2001. Second, increasing the number of lags gives us a higher number of bank failures (see Table 1), as accounting data for some failed banks are not available for the quarters just before the failure. Therefore, by using four quarters instead of one, we can include 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 lagged values, which confirms that it does not depend on the number of months before 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 accords 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 markets.

We now turn to the analysis of control variables. We observe a negative sign for bank size, which is significant in most specifications. This result is in line with the "too big to fail" argument, according to which a big bank has 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 contrasts 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 failure. But our result was also obtained by Lanine and Vander Vennet (2006) in their investigation of Russian bank failures. This 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 (due to less lending) that they are far from taking excessive risk when granting more loans. This explanation accords with that of Männasoo and Mayes (2009), in their analysis of the determinants of bank distress in transition countries. They also obtain 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 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 greater confidence of depositors in the bank's health.

The share of government bonds in total assets is not significant in all the 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 government's incentive to rescue the bank. On the other hand, it may also mean greater injury from government defaulting on its securities in 1998. Studies that used this variable to explain the occurrence of bank failures in Russia also obtained contradictory results. Lanine and Vander Vennet (2006) obtain a significantly negative sign while Claeys and Schoors (2007) find a significantly positive coefficient. The differences in results may derive from the different periods studied. 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) study an earlier period, 1999 to 2002, the detrimental effects of the 1998 crisis are stronger in the latter study.

Finally, we observe that the dummy variable for Moscow location is significantly positive, which means that banks located in Moscow have higher probabilities of failure. This finding accords with the more frequent bank failures in the Moscow region than in other parts of Russia.

V.2 Robustness tests

We check the robustness of our results in different ways. To keep the testing within bounds, we limit the specifications to those with explanatory variables having four lags, except for the last case, which focuses 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 measured by the Herfindahl-Hirschman 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 over time is very modest and so 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. Table 3 displays the results for 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 so might be sensitive to non-economic motives in some cases. Therefore, in this robustness check the failed banks are those with a ratio of equity to total assets lower than 10 percent. In their investigation of the determinants of US 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 to total assets of less than two percent. In the case of Russian banks, the same value for this ratio would not be relevant, owing to the difference in prudential regulation. Regulation forces banks to maintain a bank equity capital adequacy ratio higher than 10% and for small banks (capital less than 5 mil. euros), the figure is 11%. We display the estimation results for 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 claim of Martinez-Meria and Repullo (2008) for 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 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 tests, 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 failure in Russia. The Russian banking industry provides an example of a very interesting emerging market which has experienced 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 banks' incentive for risk-taking and reduces the "buffer" against adverse shocks. The "competition-stability" view is for a positive relation, owing to the impact of competition on borrowers' moral hazard behavior (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 accord 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 enhance bank competition could increase the occurrence of bank failures. We do not claim that policies favoring bank competition should be abandoned but rather that they should be qualified. Indeed we stress the existence of a tradeoff between the benefits from lower banking prices (and notably of loan rates that may contribute to greater investment) and the losses from greater number of bank failures due to tighter competition. Our analysis can be extended in a number of ways. Additional case studies would 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, equal to 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, alternative measures of competition

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, equals to 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, alternative measure of bank failure

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, equal to one when the ratio of equity to assets is less 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 for a nonlinear relationship

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, equal to 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, alternative sets of control variables

Logit estimations are performed under the random effects assumption. The dependent variable is a dummy variable, bank failure, equal to 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, equal to 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

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