

# The interaction between market power of Russian banks and their credit risk tolerance: A panel study<sup>1</sup>

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**Abstract.** This article presents an empirical analysis of the interaction between market power of Russian banks and their resistance to credit risk during 2004Q1–2011Q2. We employ individual concentration index of banks in different asset markets (structural measure) and the Lerner index (non-structural measure) as indicators of market power. We approximate banks' credit risks by the share of overdue loans in total loans – an indicator of loan portfolio quality within the Russian Accounting Standards (RAS). The main result implies that the consecutive increases of market power lead to considerable quality improvements of banks' loan portfolios, especially large ones, since intensive development of the credit market allows banks to filter out low-quality borrowers. Moreover, we found empirically the threshold separating the negative and positive effects of competition on credit risk. Since more than 90% of Russian banks operates below this threshold in the current macroeconomic environment we reject «competition–stability» hypothesis proposed by Boyd and De Nicolo (2005). From the policy perspectives our results suggests that Russian monetary authorities should stimulate banks' M&A activities since the banking sector still remains underconcentrated and banks have less bargaining power than borrowers, especially large corporate ones. Besides, as our results showed, while the after-crisis overdue loans ratio declines slowly to its pre-crisis level through persistency effect and, unfortunately, return-on-assets ratio (ROA) stopped growing and begins to stagnate, monetary authorities should promote development of fee-based markets with lesser banks' risk exposure and greater margins than in traditional interest-based markets.

**Key words:** competition; market power; Lerner index; Herfindahl–Hirschman index; credit risk; loan portfolio quality.

**JEL classification:** G21; G28; D22; D43; C23.

## 1. Introduction

The problem of measuring the influence of banks' market power to their appetite for credit risk is a part of a more general problem of estimating the relationship between competition and stability in banking

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sector. Market power is a reflection of the level of competition and it implies the ability of different banks to determine the prices of their products (loans, deposits, etc.) and to influence the prices of the products of its competitors. The higher such an ability, the lower the level of competition in banking sector, and vice versa. The problem is that it is a priori unknown how competition affects stability of banks – either positively or negatively? There is no consensus in the literature regarding this issue, see Berger et al. (2009), Tabak et al. (2012) among others. It is undoubtedly only that increased competition, particularly price competition, leads to lower interest rates on loans.

On the one hand, these lower interest rates on loans increase the availability of credit to ultimate borrowers – households and non-financial companies, which stimulates investment and consumption of goods and services, including domestic ones. The latter, of course, has a positive impact on growth rates of an economy. This is something close to the “competition–stability” hypothesis of Boyd and De Nicolo (2005).

But, on the other hand, lower interest rates on loans can lead to a noticeable declining in the profitability of banks if price of borrowed funds is constant or it reduces less intensively than price of loans does. Profitability reduction makes it more difficult for banks to re-capitalize and exacerbates the problem of capital deficits which imposes definite restrictions on business development and increases the instability of banks to various shocks, first of all, macroeconomic ones. This situation could have a negative impact on future economic growth. This is similar to the opposite view in literature on the relationship between competition and risk named “competition–fragility” hypothesis firstly proposed by Keeley (1990) and more recently developed by Allen and Gale (2004).

The presence of positive and negative aspects of increasing competition makes its consequences for banking sector stability very ambiguous in middle-term perspective. A more detailed analysis of these and related issues enables its connections with the contract theory. For example, the positive aspect of increased competition is associated with reduced risk of the adverse selection of borrowers, i.e. the adverse selection problem, because borrowers’ incentives to engage in riskier projects weakened in the face of falling interest rates and thus it becomes easier for borrowers to repay their debts to banks. The later increases quality of banks' loan portfolios. However, at the same time, the negative aspect of increasing competition exists and is generated by the moral hazard problem of banks managers, which – in contrast to the borrowers – have more incentive to engage in risky projects profitability of business decreases. Managers (agents) employed by the owners (principals) for a successful business and can lose their jobs if they typically report from period to period about declining profitability.

In these circumstances it becomes particularly important to compare the negative and positive aspects of banking competition. The results of such a comparison may affect, on the one hand, the development strategies of individual banks (micro level) and, on the other hand, the policy of monetary authorities, aimed at ensuring the stability of the banking sector (macro level). These issues are discussed in this study for the

case of the Russian banking system. There are a number of reasons of choosing Russian banks for examining the relationship between competition and risk. First of all, in 1990-s Russian economy suffered deep and dramatic recession through transition to market-based economic system which triggered a boost development of banking sector in 2000-s with two crises episodes (liquidity crisis caused by lack of confidence between banks in 2004 and systemic banking crisis in 2008-2009 as a result of the global economic crisis as well as a consequence of banks aggressive business strategies in domestic commercial loans markets). So it is of great importance to track changes in the competition and risk nexus in respect to recent crises to provide Russian monetary authorities with necessary recommendations concerning how to make the banking sector resilient to different shocks in future. Secondly, while there is a large body of empirical literature estimating the competition and risk nexus for the cases of U.S. and EU banking markets, there still remains a lack of estimates for the case of Russia.

The rest of the paper is organized as follows. Section 2 reviews the literature on the concepts of the relationship between competition and stability. Section 3 describes the methodology, database and the main hypotheses of the study. Section 4 presents the basic empirical results regarding the impact of market power of Russian banks on their appetite for credit risk as well as additional results providing robustness of our basic conclusions. These results are performed for the whole sample of banks (aggregate level) as well as for the samples of large and small banks separately (disaggregate level). Section 5 concludes the study.

## **2. Literature review**

There are two polar concepts in literature regarding the relationship between competition in the banking sector and its resistance to various shocks (stability). According to one of them, the traditional concept of "competition-fragility», increased competition erodes the market power of banks, see Keeley (1990). This leads, in particular, to reduce the profitability of banks, forcing them to take on more risk. Last increases the probability of bankruptcy of those banks (reduces stability).

On the contrary, according to the alternative concept – "competition-stability», an increase in competition leads to the fact that banks are less likely to affect the prices of their services (prices are increasingly dictated by the market). Because interest rates on loans are reduced, there is less risk of adverse selection of borrowers and, therefore, it reduces the risk of loan defaults. The latter improves the stability of the banking system as a whole, see Boyd and De Nicolo (2005).

Existing empirical studies examining the above mentioned hypotheses on panel data for banks (either one country or a set of countries) are divided into two sections which are roughly equal in their contribution to the literature (see Table 1). In the first of them, driven by the seminal article of Keeley (1990), the authors confirm the hypothesis of "competition- fragility". It was followed among others by Levy and Micco (2007)

on the banks of eight Latin American countries over the period of 1993-2002., Agoraki et al. (2011) on the banks of CEE countries over the period of 1998-2005.

Second section of studies is based on the influential study of Boyd and De Nicolo (2005), in contrast to the first one, finds quite compelling evidence on the relevance of the alternative hypothesis ("competition-stability"). Here, a contribution was made by Schaeck and Cihak (2008) on the banks of the European countries and the U.S. over the period of 1995-2005., Koetter and Poghosyan (2009) on the banks of Germany over the period of 1994-2004, and others.

In addition to these two sections of studies, in the last few years there has arisen a new sub-direction in the literature stimulating by Martinez-Miera and Repullo (2007, 2010), who broke one of important assumption of Boyd and De Nicolol (2005) about the presence of perfect correlation in loan defaults and showed that if such correlations are imperfect than the impact of competition on risk is U-shaped. So, this new – third – section of literature tests the presence of non-linear relationship between competition and stability. Such links have been found, in particular, in Berger et al. (2009) on the banks of 30 developed countries over the period of 1999-2005, and Tabak et al. (2012) on the banks of 10 countries in Latin America over the period of 2003-2008.

**Table 1.** Classification of studies on the relationship between competition and stability of banks

Relationship		
Linear	Non-linear	
competition-fragility	competition-stability	
<i>Keeley (1990)</i>	<i>Boyd, De Nicolo (2005)</i>	<i>Martinez-Miera, Repullo (2007, 2010)</i>
Hellmann, Murdock, Stiglitz (2000)	Boyd, De Nicolo, Jalal (2006)	Berger et al. (2009)
Hauswald, Marquez (2006)	De Nicolo, Loukoianova (2006)	Tabak et al. (2012)
Levy Yeyati, Micco (2007)	Schaeck, Cihak, Wolfe (2006)	
Jimenez et al. (2007)	Beck, Demirguc-Kunt, Levine (2006)	
De Jonghe, Vennet (2008)	Carletti, Hartmann, Spagnolo (2007)	
Agoraki et al. (2011)	Schaeck, Cihak (2007, 2008)	
Fungáčová, Weill (2011)	Koetter, Poghosyan (2009)	
Karminsky et al. (2012)	Мамонов (2010b)	

*Note.* Key studies in each of the three groups are shown in italics

As a measure of competition most authors use the Lerner index of banks market power, the Panzar-Ross H-statistics or the concentration index (see, for example, Beck (2008), Berger et al. (2009), Mamonov (2010) and others); as a measure of risk - the share of nonperforming loans in the loan portfolio (NPL, non-performing loan ratio).

Since banks are still substantially involved in traditional activities such as commercial lending and hence credit risk plays significant role in banking, many authors are focusing only on this type of bank risks

(Jimenez et. al (2007), Solntsev et al. (2010), among many others). However, banks are gradually evolving from pure credit organizations to multi-financial institutions, which increases the importance of other types of risks (currency, stock, etc.). As a consequence of the latter more and more authors use different kinds of indicators which reflect general risk – not just credit. Among these indicators one can find the level of financial leverage (approximated by the ratio of equity to total assets), the Z-scores (reflecting the number of standard deviations the ROA should fall to equity-to-assets ratio, i.e. the distance to insolvency, proposed by Roy (1952)). Here stand of Levy, Micco (2007), Berger et al. (2009), Tabak et al. (2012), etc.

To the best of our knowledge, there are just three studies which are directly or indirectly focuses on analysis of the relationship between competition and stability in the Russian banking sector. In one of them, Mamonov (2010), the author exploits the sample of 525 banks covering 85% of the total assets of the system over the period of 2004-2009 and concludes that the effect of competition on stability is positive. In contrast, in Fungáčová, Weill (2011) and Karminsky et al. (2012), the authors come to the opposite conclusion, using data covering all banks within the Russian banking sector over the period of 2001-2007 and 1998-2011, respectively. Perhaps these significant differences in the findings are related, first, to the different time interval analysis and, second, with different techniques used to assess the relationship of competition and stability. In the first case, the analysis was based on the H-statistic and Z-score for the whole banking sector (time series), in the second - evaluation of the influence of the Lerner index on the probability of bankruptcy at the panel banks.

### 3. Methodology, data and main hypotheses

#### 3.1. Methodology

In the current study, the emphasis was put on the Lerner index as a non-structural measures of competition between banks in the credit market and the share of overdue loans in total bank loans, reflecting their (in) tolerance for credit risk. As an extra - structural - measures of competition, ensuring the robustness of the empirical results, the concentration index used by individual banks in asset markets (see below).

The main measure of competition. Lerner Index is calculated as a percentage of the market value of allowances in the bank and reflects the pattern of pricing in the credit market in a changing time (in) effectiveness of management of banks:

$$LERNER_{it}^{LNS} = (r_{it}^{LNS} - MC_{it}^{LNS}) / r_{it}^{LNS} = \begin{cases} 0 - \text{совершенная конкуренция} \\ (0,1) - \text{монополистическая конкуренция} \\ 1 - \text{монополия} \end{cases} \quad (1)$$

where

$r_{it}^{LNS}$  — The average annual interest rate on loans to bank i in quarter t, measured as the ratio of the annual amount of interest income received by banks on outstanding loans to the average over the last year between the amount of the loan are:

$$r_{it}^{LNS} = (Interest\ Income)_{it}^{LNS} / \left( \frac{1}{5} \cdot \sum_{j=1}^5 LOANS_{i,t-j+1} \right) \quad (2)$$

$MC_{it}^{LNS}$  — marginal operating costs of additional issuance of ruble loans, calculated as the first derivative of the empirical function of transaction costs on bank loans i in quarter t:

$$MC_{it}^{LNS} = \partial \ln OC_{it} / \partial \ln LOANS_{it} \quad (3)$$

Function is specified in the operating costs translog form and estimated using maximum likelihood (ML) approach in the stochastic efficiency frontier (SFA, Stochastic Frontier Analysis):

$$\begin{aligned} \ln OC_{it} = & \beta_0 + \sum_{j=1}^2 \beta_j \cdot \ln Y_{it,j} + \frac{1}{2} \sum_{k=1}^2 \sum_{l=1}^2 \beta_{kl} \cdot \ln Y_{it,k} \cdot \ln Y_{it,l} + \sum_{m=1}^2 \gamma_m \cdot \ln P_{it,m} + \\ & + \frac{1}{2} \sum_{r=1}^2 \sum_{q=1}^2 \gamma_{rq} \cdot \ln P_{it,r} \cdot \ln P_{it,q} + \sum_{s=1}^2 \sum_{u=1}^2 \delta_{su} \cdot \ln Y_{it,s} \cdot \ln P_{it,u} + \phi_1 \cdot CorpBank_{it} + \\ & + \phi_2 \cdot RetailBank_{it} + \lambda_1 \cdot GovBank_{it} + \lambda_2 \cdot ForeignBank_{it} + \lambda_3 \cdot CapBank_{it} + v_i + u_{it} \end{aligned} \quad (4)$$

where  $Y_{it,1}$  и  $Y_{it,2}$  — loans and deposits, respectively;

$P_{it,1}$  and  $P_{it,2}$  — the cost of labor and capital, calculated as the ratio of personnel expenses and other (non-interest and non-labor costs) to total assets, respectively. Following (Berger, Hannan, 1998), we excluded the cost of borrowed funds (Average Funding Rate, AFR) from the regressors, since it can directly reflect the level of competition inherent in the various banks.

$CorpBank_{it}$  ( $RetailBank_{it}$ ) — dummy variable equal to 1 if in the bank i in quarter t dominated corporate (retail) strategy, 0 - otherwise. Moreover, if the share of loans to non-financial enterprises in the total loan portfolio of more than 80%, then we will assume that in the bank's prevailing corporate strategy, and if the same weight in the portfolio of loans owned by the public - the dominant retail strategy;

$GovBank_{it}$ ,  $ForeignBank_{it}$  и  $CapBank_{it}$  — dummy variables — indicators of institutional and regional ownership of the bank i in quarter t, taking the value 1 if the bank is public, owned by foreign credit institution or a private capital (with its headquarters in Moscow and St. Petersburg);

$v_i + u_{it}$  — regression error, which consists of the random component  $u_{it} \sim i.i.d.(0, \sigma_u^2)$  and inefficiency term  $v_i \sim N^+(0, \sigma_v^2)$ .

Different specifications of the cost function and the detailed description of the results of evaluation of efficiency of banks are left out of the study. Among the works on assessing the effectiveness of Russian banks allocated Golovan (2006), Pavlyuk (2006), Golovan et al (2008), Aivazian et al (2008), Nazin (2010), Peresetsky (2010), etc. In addition we mention Fungachova, Solanko (2010), comparing the efficiency of financial intermediation of the Russian and foreign banking systems within non-econometric approach.

*Additional measure of competition. Individual index of market concentration of assets<sup>3</sup>  $HHI_{it}^A$*   
involvement of a bank  $i$  in these markets in quarter  $t$ :

$$HHI_{it}^A = \sum_{j=1}^4 d_{it}^{(j)} \cdot HHI_t^{(j)} = \begin{cases} 0 - \text{совершенная конкуренция} \\ (0,1) - \text{монополистическая конкуренция} \\ 1 - \text{монополия} \end{cases} \quad (5)$$

where  $j=1..4$  — types of asset markets: the market of retail loans, corporate loans interbank loans, securities;

$HHI_t^{(j)}$  — aggregate (system-wide) concentration index Herfindahl-Hirschman market asset  $j$ ;

$d_{it}^{(j)}$  — share of asset  $j$  in the total assets of the bank  $i$  in quarter  $t$ .

*The equation of the relationship of competition and stability.* Constructed indicators of competition are then used as the main covariates (separately) in the empirical equation stability control, other factors:

$$OL\ ratio_{it} = \alpha_0 + \xi \cdot OL\ ratio_{i,t-1} + \beta_1 \cdot COMPET_{i,t-p} + \beta_2 \cdot COMPET_{i,t-p}^2 + \sum_{j=1}^{K_1} \gamma_j BSF_{i,t-m,j} + \sum_{j=1}^{K_2} \delta_j MACRO_{t-n,j} + \varepsilon_{it} \quad (6)$$

where  $OL\ ratio_{it}$  — overdue loan ratio;

$\xi$  — factor reflecting the degree of inertia of the variable  $OL\ ratio_{it}$ ;

$COMPET_{it} = \{LERNER_{it}^{LNS}, HHI_{it}^A\}$  — set of two available measures of competition that are included in the regressors of equation (6). To test the presence of nonlinear coupling, proposed in Martinez-Miera and Repullo (2010), between competition and stability in the regressors also included squared variable  $COMPET_{it}$ . The square of competition left in the final version of the equation only if the estimated optimum point of the parabola divides the sample of banks in correlated proportions. For definiteness, as the threshold was set upper or lower 5th percentile of the variable  $COMPET_{it}$ ;

$p=1..4$  — possible set of time lags for  $COMPET_{it}$  taking into account quarterly structure of data in use (see next section). Following Berger (1995), lag 0 was excluded from consideration because of the endogeneity between risk and market power;

$BSF_{i,t-m}$  — a set of  $K_1$  control variables, reflecting the scale and profile of the business strategy of the bank  $i$  in quarter  $(t-m)$ ,  $m=0..4$ . With few exceptions (see below) in the current study uses a lag of four quarters, by analogy with the literature on moral hazard (hazard rate literature, see, for example, Koetter, Poghosyan (2009)), because between the decision by management (bank change parameters of business strategy), and the result of such a decision (to changes in credit risk of the bank) may take a while.

<sup>3</sup> Analogous measure was firstly proposed in Berger and Hannan (1998).

$MACRO_{t-n}$  — a set of  $K_2$  control factors that reflect macroeconomic conditions. Note that using a lag of 0 blocks for variables that reflect macroeconomic conditions, does not lead to the problem of endogeneity in the panel, the objects of which are at micro- rather than at macro-level - the banks in our case. Obviously, the credit risk of each individual bank can not influence the dynamics of the exchange rate, the rate of production, etc. However, this does not exclude the possibility that some of the macro factors exert their influence on the credit risk of banks not immediately, but over time.

$\varepsilon_{it} \sim i.i.d.(0, \sigma_\varepsilon^2)$  — regression error.

Equation (6) the relationship of competition and stability was estimated in first differences with the one-step generalized method of moments (one-step difference GMM), developed by Arellano, Bond (1991) for equations containing lagged dependent variable as a regressor.

### 3.2. Data

This study uses monthly data current statement of accounts accounting banks (Form 101), and quarterly reports of banks income statement (Form 102), published with the permission of the banks to the public on the website of Bank of Russia in 2004. Formed from the first source data for active (loans to individuals and non-financial companies, is liquid assets, etc.) and passive (retail and corporate accounts and etc.) of the Bank. From a second source of data streams generated quarterly interest expenses of banks, staff costs and other non-interest and non-labor costs - in annual terms (the amount of sliding four quarters). These data allow us to approximate the value of costs and value of other (non-interest and non-labor) costs. In addition, the form of 102 data are used for operating expenses and total revenues for the calculation of the coefficient of performance of the widely used "cost-income» (cost-to-income ratio).

Usually forming panel banks were set as follows: if a bank constantly be reported on forms 101 and 102 in the period 2004 Q1 – 2011 Q2. He was included in the panel - otherwise excluded from the panel. This principle eliminates the formation of the panel banks that went bankrupt during the crisis of 2008-2009. (Or after) or who leave the market because of the lost competitiveness. Accounting for these banks to calculate indicators of competition and stability, as well as regression analysis can lead to significant distortions in the relationship. In this study, we try to analyze the changes in the indices of the stability constant of the Bank as occurring under the action of acquisition / loss of banks a competitive advantage in various markets for banking services.

As a result, the panel is composed of some 500 banks, which is stable for 85% of total assets of the banking system in each of the 30 quarters analyzed.



The descriptive statistics of all the indicators included in the panel are shown in Table. 2. Their analysis shows a high degree of heterogeneity in the panel of banks - and, for any and all indicators of the profile of business strategy.

Table 2. Descriptive statistics

Variable	Obs.	Mean	Standard deviation	Min	Max
Overdue loans / Total loans	13602	0.03	0.05	0.00	0.99
Lerner index	12001	0.66	0.17	0.00	0.95
Individual bank concentration index in markets for assets HHI <sub>A</sub>	15631	0.12	0.03	0.01	0.38
Cost-to-income ratio <sup>a</sup>	15482	0.41	0.17	0.05	1.13
Total loans / Total assets	15362	0.54	0.18	0.03	0.90
Return-on-assets ratio (ROA)	13222	0.02	0.02	0.00	0.14
Liquid assets / Total assets	15482	0.16	0.14	0.01	0.85
Earning assets / Earning liabilities <sup>b</sup>	15355	0.03	0.05	0.01	0.93
Structure of funds <sup>c</sup>	15187	0.51	0.23	0.00	0.95
Bank's share on credit market	15518	0.00	0.02	0.00	0.44
Non-interest income / Interest income <sup>b</sup>	15470	0.04	0.04	0.00	0.38
GDP growth rate (y-o-y)	30	1.04	0.05	0.89	1.09
Volatility of official exchange rate <sup>b</sup>	30	0.01	0.01	0.00	0.03
Real lending rate	30	0.00	0.03	-0.04	0.07

Note:

<sup>a</sup> revaluation of foreign currency, securities and precious metals as well as backups of possible loan losses were excluded from the nominator and denominator of the variable

<sup>b</sup> indicator was further divided into 100 for comparable scale factor estimates

<sup>c</sup> the ratio of term deposits to total accounts and term deposits of households and non-financial enterprises

Source: Bank of Russia database <http://www.cbr.ru/credit/forms.asp>, the author's calculation

Special attention should be a comparative analysis of the distributions of banks on the Lerner index and the concentration of individual index Herfindahl-Hirschman Index - both indicators approximating competition in this study. Despite the fact that the densities of both distributions are shifted to the right (ie, toward higher values), the distribution of the Lerner index is inherent in a heavier left tail - and, after the crisis, we see only its further weight increase. This weighting is due, on the one hand, the increased sensitivity of demand for credit to its cost in terms of lower economic growth, resulting in the banks can not prevent a substantial increase in rates for the offered credit - for the sake of market share. On the other hand, as shown in Mamonov (2011), after the crisis, a decrease in the efficiency of small banks, which is reflected in the increase of their marginal costs.

In contrast, the concentration tails of the distribution of the index does not change significantly after the crisis, while its density - have soared. So, if earlier at 1214 points HHIA were about 130 banks, now they are - almost twice as much.

As a result, we can conclude that the Lerner index and the index HHIA reflect different aspects of the competition.

This conclusion is also supported by an analysis of the consistency of both indices changes that occurred after the crisis - and, at the level of banks among the top 30, and the level of the whole sample. Calculations presented in Table. Appendix A1, suggests that the change in both indices was codirectional only half of the 30 largest banks. Some of them (Sberbank, VTB 24, etc.) have been able to optimize costs (which led to an increase in the Lerner index) and to increase the share of the market (which is reflected in the increase in the index HHIA). Other banks have been able to solve either one of the two problems (optimization of costs or retention of market share), or neither. The data in Table A2 in Appendix, first, extend these findings to the level of the whole sample - the proportion of the agreed changes of both indices was 51%. Second, the correlation between the two indices was significant at the 5% level only after the crisis, and only at the level of the whole sample. However, the correlation scale is not big - only 0.099.

### 3.3. Related hypotheses

As the key was chosen hypothesis about the negative effects of competition on stability (the concept of "competition-fragility") of the Russian banks. This hypothesis comes from the primary (statistical) analysis of the dynamics Lerner index (an indicator of reduction of competition) and the share of non-performing loans to total loans (the (in)stability measure).

Thus, the median value of the Lerner index, measured on the basis of (1) - (4), start to decline in Q3. 2008, that is in the first quarter of the deployment of crisis processes in the banking sector, thus symbolizing the increased competition in the credit market. Already in the 4th quarter. 2008, ie, quarter later, there was a reduction in the profitability of assets (ROA) of banks amid growing competition. This, in turn, encourage banks to take additional risks (explicit or implicit prolongation previously issued loans, loans to repay previous loans taken, etc.) in order to prevent further reduce ROA and maintain relationships with existing clients. These risks are beginning to appear in the same 4 square. In 2008, when he began a full-scale observed increase in the share of overdue loans in total loans.

As a next step, we formulate additional research hypotheses for each indicator from the both sets of bank-specific factors (BSF) or macroeconomic factors (MACRO).

We use the following eight indicators as a set of bank-specific factors (BSF).

1. Loan burden on the bank's assets should have a nonlinear effect on credit risk. There is an optimal share of loans in assets - the point at which the bank has a steady stream of interest payments on loans from a relatively high-quality borrowers, which involves intensive development of the credit market. This optimal point is such a bank has an opportunity to diversify their assets, which, in turn, suggests its involvement in the other (non-credit) markets. As soon as the bank crosses this optimum point, it becomes more and more

exposed to credit risk because the increase in market share is becoming increasingly extensive, suggesting declining standards in the quality of newly issued bank loans.

2. The scale of the bank, approximated its share in the credit market, allows the introduction of modern technology screening borrowers, which should reduce the credit risk.

3. Increasing the profitability of the bank assets (ROA), on the one hand, leads to an increase in brand value of the bank, reducing the incentive of managers to take additional risks, see Keeley (1990). On the other hand, the increase ROA may be a reflection of increased aggressiveness in the credit market that could affect the stability of the bank's credit risk. Which of the two effects dominates in the Russian banking system - an empirical question.

4. Efficiency of operating costs, similar to a commercial credits-to-assets ratio, has a nonlinear effect on the stability of banks, for the review see Berger and DeYoung (1997). In case of Russian practice very high efficiency can mean insufficient cost of screening borrowers, increasing credit risk (the "skimping" hypothesis). However, too low efficiency can also lead to increased credit risk (the hypothesis of "inefficient management").

5. When banks increase their shares of liquid assets in total assets their involvement in the credit market and, therefore, banks exposure to credit risk may be reduced.

6. Increase of the ratio between earning assets and earning liabilities leads to more credit risk exposure, because it can mean a more extensive transformation of funds to loans.

7. Improving the relationship between non-interest and interest income reflects the greater involvement of banks in non-credit markets and therefore negatively correlated with the credit risk.

8. Increasing the share of term deposits in total accounts and term deposits rises the incentives of managers to take additional credit risk (i.e. to increase interest rates on loans), to be able in the future to repay their debts to deposit holders.

We use three indicators as a proxy for the macroeconomic environment (MACRO). First, because the credit risk pro-cyclical (grows during recessions and decreases in periods of expansion), we control the overall state of the economy with the growth rate of real GDP (quarter compared to the same quarter of the previous year). Second, higher exchange rate volatility affects the situation of those borrowers whose debt is denominated in foreign currency and, therefore, leads to an increase in credit risk. Third, the increase in real interest rates on loans in the banking system is a reflection of the deterioration of macroeconomic conditions and therefore leads to higher credit risks.

## 4. Results

### 4.1. Basic results

Results of the evaluation of (6) with the Lerner index as an indicator of competition confirms our central hypothesis about the negative impact of competition on the stability of banks to credit risk (see the reference model M1 in Table. 3). Thus, increasing the Lerner index with a lag of about four quarters translates into lower value of overdue loans in the loan portfolio. One possible explanation is that as the market power of the bank, reflected in the growing Lerner index, the bank is increasingly able to control the quality of the borrower, selecting the best and most filtering out the worst of them. Establishing a close relationship with the first allows the bank to reduce its marginal cost, ie, improve efficiency, by sequential optimization cost screening borrowers.

The conclusion that the negative impact of the Lerner index for credit risk is resistant to expansion specification - the addition of other factors, reflecting the profile business strategy (see model M2-M4 in Table. 3). However, the attempt to identify the nonlinear effect of market power on credit risk was not a success: in the model M4 shows that the introduction of the square Lerner index does not lead to statistically significant results. Predicting the nonlinear model of competition and communication stability, proposed in Martinez-Miera, Repullo (2010), have not been confirmed by the Russian data in our study.

Thus, on the one hand, we confirm the findings Fungáčová, Weill (2011) and Karminsky et al. (2012), that the growth of the Lerner index reduces the probability of bankruptcy of Russian banks. On the other hand, we add these two works, because we use as a measure of the stability of a binary indicator (0 - Bank operates, 1 - bank went bankrupt), and the level of credit risk, i.e. not a discrete dependent variable, and the continuous. In addition, we use an extra measure of competition to ensure the sustainability of conclusions (see below).

Another important difference between our study is that the assessment of the impact of market power on credit risk consistently significant only at 10% - and, in any of the linear models (M1-M3), whereas in both of the compared work performance relationship stronger - 1% level. On the one hand, it is obvious that this is caused by differences in the use of dependent variables. On the other hand, it suggests that the sample may be at least two different groups of banks with their unique patterns of communication of market power and credit risk. For one such group communication can be more severe than for the sample as a whole, for the other - less severe or do not exist.

To test this new hypothesis, we conducted two series of additional regressions, dividing our sample into two parts: a group of banks among the top 200 (large) and all other (small). Such a division is based on the fact that the big banks can compete not only in intra-or inter-regional level, but also at the transnational, which contributes to hardening of competition and the formation of leaders with high market power (e.g.

Sberbank). In contrast, small banks, mainly act on within-regional level, being focused on serving small group of loyal customers, that does not mean intense competition (local quasi-monopolies). If the big banks, realizing economies of scale, have to spend extra money on screening new borrowers, the smaller banks are able to save on the screening of as familiar with the business of its customers. Accordingly, it can be assumed that the credit risk of large banks is much more dependent on their market power than the credit risk of small banks - the market power of small banks.

Calculations show that this assumption is not consistent with the data (see Table. 4). Furthermore, for the banks from the top 200 rating factor is  $-0.076 - 0.059$ , which is more in absolute terms than for the sample as a whole (the effect is stronger), and is significant at the 5% level (see model M5.1 and M5.2). In contrast, other banks lost all communication: assessment by the Lerner index is indistinguishable from zero. This finding may have an impact on the policy of the Central Bank of the Russian Federation, it has undertaken under the prudential supervision of banks: the restrictive measures would be more effective for the big banks, while small banks to need a different approach.

Among other results, the most important are the following.

First, the credit risk is extremely inert — and, for banks among the top 200 this effect by about one third more than for small ones. Accordingly, the price of engaging in risky projects up to large banks 'resolution' nonperforming loans takes longer, with all the restrictions on business development.

Secondly, supported by non-linear impacts on the credit risk of the debt burden on assets. Optimal threshold estimated at 64-68%, depending on the specification. In the present loan burden on the median bank's assets is about 52%, i.e. pp 12-16 below the estimated threshold.

Third, the level of liquidity significantly affects the credit risk only small banks. This is explained by the fact that their combined share is liquid assets in total assets is still at an excessively high level (mean, 21%), in which the liquid assets and loans to a large extent mutually exclusive. In contrast, large banks liquidity is low (only 9%) and in the current state does not suggest such an extent mutually exclusive, as the smaller banks.

Fourth, increasing the share of the loan market has a positive effect on the quality of the loan portfolios of smaller banks, while for large banks effect is indistinguishable from zero: the big banks have reached, in a sense, optimal scale, while small banks should be encouraged to build their sizes. This conclusion suggests the potential benefits of mergers and acquisitions (M & A) of small banks in terms of their resistance to credit risk. Thus, our study is on the need to increase the concentration of positions of the Russian banking sector.

Fifth, the big banks are increasingly involved in the non-credit markets, resulting in increased ratio of non-interest and interest income and reduce exposure to credit risk. For smaller banks effect until zero. However, and their involvement in the non-credit markets - is only a matter of time. This shows the

necessity of monetary measures that promote the development of markets and the involvement of non-credit banks in them, see Mamonov et al. (2012).

Among the macroeconomic factors was confirmed, first, the positive effect of increasing the rate of economic growth in the quality of banks' loan portfolios. Second, reducing the volatility of the ruble makes more certain prospects repayment borrowers whose debt is denominated in foreign currency, which also has a positive impact on the quality of banks' portfolios. Third, the reduction in real interest rates on loans in the banking system as a whole, improving the quality of credit portfolios.

Table 3. The influence of the Lerner index for credit risk: full sample results

Independent variables		Dependent variable: Overdue loans / Total loans			
		M1 (basic)	M2	M3	M4
BSF	Overdue loans / Total loans (lag = 1 quarter)	0.508*** (0.146)	0.488*** (0.147)	0.464*** (0.151)	0.464*** (0.150)
	Lerner index (lag = 4 quarters)	-0.053* (0.030)	-0.056* (0.032)	-0.058* (0.033)	-0.070 (0.113)
	Lerner index squared (lag = 4 quarters)				0.011 (0.084)
	Total loans / Total assets	-0.214*** (0.063)	-0.234*** (0.067)	-0.231*** (0.066)	-0.231*** (0.066)
	Total loans / Total assets (squared)	0.172*** (0.054)	0.185*** (0.057)	0.181*** (0.057)	0.180*** (0.056)
	Return-on-assets ratio (ROA, lag = 4 quarters)	-0.233** (0.118)	-0.293** (0.145)	-0.419*** (0.160)	-0.417*** (0.156)
	Liquid assets / Total assets (lag = 4 quarters)		-0.019* (0.010)	-0.021** (0.010)	-0.021** (0.010)
	Earning assets / Earning liabilities <sup>a</sup> (lag = 4 quarters)		0.019 (0.038)	0.053 (0.052)	0.053 (0.052)
	Bank's share on credit market			-0.413* (0.250)	-0.409* (0.246)
	GDP growth rate (y-o-y) (lag = 1 quarter)	-0.069*** (0.014)	-0.070*** (0.015)	-0.072*** (0.015)	-0.072*** (0.015)
MACRO	Volatility of official exchange rate <sup>a</sup>	0.242*** (0.038)	0.257*** (0.041)	0.259*** (0.041)	0.259*** (0.040)
	Real lending rate	0.073** (0.029)	0.068** (0.028)	0.066** (0.028)	0.067** (0.031)
	Number of obs.	7947	7879	7879	7879
	Number of banks	483	482	482	482
	Number of instruments	444	444	440	440
	P-value, Hansen test	0.184	0.176	0.116	0.113
	P-values, Arellano-Bond test for AR(1) / AR(2)	0.001 / 0.272	0.001 / 0.351	0.000 / 0.357	0.003 / 0.359
	Inflection point for Total loans / Total assets «sample percentile»	0.62 «64»	0.63 «67»	0.64 «68»	0.64 «68»
	Inflection point for Lerner index «sample percentile»				3.06 «—»

Note: \*\*\*, \*\* and \* - an estimate is significantly different from zero at 1%, 5% and 10% level. Robust standard errors of estimated coefficients are reported in parentheses.

<sup>a</sup> indicator was further divided into 100 for comparable scale factor estimates

Source: Bank of Russia database <http://www.cbr.ru/credit/forms.asp>, the author's calculation

Table 4. The influence of the Lerner index for credit risk: the differences between large and small banks

Independent variables		Dependent variable: Overdue loans / Total loans			
		Banks from top-200 (assets)		Banks from outside of top-200 (assets)	
		M5.1 (basic)	M5.2	M6.1 (basic)	M6.2
	Overdue loans / Total loans (lag = 1 quarter)	0.623*** (0.141)	0.488*** (0.093)	0.461*** (0.168)	0.347** (0.151)
	Overdue loans / Total loans (lag = 2 quarters)	0.116** (0.055)	0.153*** (0.054)		
	Lerner index (lag = 4 quarters)	-0.059** (0.024)	-0.076** (0.038)	-0.017 (0.031)	-0.028 (0.039)
	Liquid assets / Total assets (lag = 4 quarters)		-0.032 (0.042)		-0.032* (0.019)
BSF	Earning assets / Earning liabilities <sup>a</sup> (lag = 4 quarters)		0.194** (0.079)		-0.056 (0.056)
	Non-interest income / Interest income <sup>a</sup> (lag = 4 quarters)		-0.202* (0.106)		-0.084 (0.166)
	Structure of funds <sup>b</sup> (lag = 4 quarters)		0.025 (0.021)		0.045* (0.023)
	Bank's share on credit market		-0.910 (0.561)		-172.410*** (61.345)
	GDP growth rate (y-o-y) (lag = 1 quarter)	-0.079*** (0.011)	-0.066*** (0.016)	-0.049*** (0.014)	-0.036*** (0.011)
MACRO	Volatility of official exchange rate <sup>a</sup>	0.214*** (0.056)	0.154** (0.064)	0.192*** (0.064)	0.173** (0.072)
	Real lending rate	0.072** (0.036)	0.129*** (0.042)	0.083* (0.043)	0.099** (0.043)
	Number of obs.	3721	3668	4777	4630
	Number of banks	200	200	290	287
	Number of instruments	171	171	290	255
	P-value, Hansen test	0.105	0.121	0.512	0.252
	P-values, Arellano-Bond test for AR(1) / AR(2)	0.000 / 0.549	0.000 / 0.867	0.011 / 0.627	0.020 / 0.912

Note: \*\*\*, \*\* and \* - an estimate is significantly different from zero at 1%, 5% and 10% level. Robust standard errors of estimated coefficients are reported in parentheses.

<sup>a</sup> indicator was further divided into 100 for comparable scale factor estimates

<sup>b</sup> the ratio of term deposits to total accounts and term deposits of households and non-financial enterprises

Source: Bank of Russia database <http://www.cbr.ru/credit/forms.asp>, the author's calculation

From a technical point of view, we note that in all the equations presented in Table. 3-4, a set of tools to be used as part of the GMM-estimation of dynamic panel data, the test is relevant according to Hansen. This gives hope for solvency assessments. In addition, the components of the second-order autoregressive AR (2) in the remains of missing equations (evaluation). In both cases, at this point P-values above the threshold 0.1.

## 4.2. Robustness checks

To ensure the sustainability of the above result of the negative impact of competition on the stability of banks' credit risks, (6) was overpriced individual indices of concentration of banks in the asset markets  $HHI_A$  as a measure of competition instead of the Lerner index (see Table. 5 models M7-M10) . In this case, the lag was left of one year, as before. The composition of the control factors has undergone minor changes compared to the models M1-M4 instead ROA indicator was used cost-to-income, reflecting the effectiveness of the bank's operating costs. Replacement was carried out deliberately, as ROA and  $HHI_A$  may be related paradigm "structure - behavior - the result." In addition, we decided to use such banking factors such as liquidity and the ratio of paid assets / liabilities, only at the level of individual groups of banks (see below), as for the whole sample were insignificant.

In general, the specifications of the M7-M10 support our key hypothesis - identical to the model M1-M4. Increasing the concentration of the bank's asset markets allows it to filter out low-quality borrowers and thus improve the quality of the loan portfolio. However, there is one difference from the previous result: the square of the concentration index is significant in all specifications, and therefore has been left in the regressions, despite the fact that the right of the estimated minimum points of a quadratic function is an average of only 5-6% of the data - but with significant deviations in some quarters. This requires additional research. In the meantime, we can make a preliminary conclusion that there is a certain optimal threshold for increasing the level of involvement of banks in different asset markets - about 1500-1560 points on the concentration (as a basic model M8). Above this threshold concentration becomes excessive and starts a negative impact on the quality of the loan portfolio.

An important factor in the results of the analysis of the influence of two different measures of competition in the credit risk at the level of the whole sample (model M1-M4 and M7-M10 in Table. 3 and 4, respectively) is the fact that the estimates of all other control factors are similar picture. Thus, among the banking factors the greatest impact on the quality of loan portfolios is a credit load of assets - and, in both cases, the non-linear relationship and evaluation of the optimum point in the range of 64-68%. Estimates of the three macroeconomic factors in both cases are similar in magnitude and significance of 1% (at least - 5%) level.



However, the differences among the following: in the models M7-M10 revealed that the majority - at least 3/4 - Russian banks are in direct proportion to the impact of inefficiency credit risk. Thus, an increase of inefficiency (i.e. growth cost-to-income ratio) up to a threshold of 0.51-0.55 estimated negative impact on the quality of banks' loan portfolios, as predicted by the hypothesis of the "inefficient management". After this threshold, presumably, the inefficiency becomes so high that forces banks to curtail their activities in the credit market, which, in effect, means a reduction in the exposure to credit risk. However, we are wary of this conclusion, and note the need for further research in this direction.

Also, by analogy with the previous section, we conducted two series of additional regressions for large and small banks. Evaluation results support the above conclusion that the competition at a much higher impact on the credit risk of large than small banks. Thus, estimates for the concentration index and its square are significant at the 1% level for the banks from the top 200 and indistinguishable from zero for all the other players (see Table. 6, model M11-M12).

Table 5. The influence of the concentration index for credit risk: the full sample results

Independent variables		Dependent variable: Overdue loans / Total loans			
		M7	M8 (basic)	M9	M10
BSF	Overdue loans / Total loans (lag = 1 quarter)	0.502*** (0.138)	0.511*** (0.132)	0.466*** (0.137)	0.454*** (0.141)
	Individual bank concentration index in markets for assets HHI <sub>A</sub> (lag = 4 quarters)	-0.616** (0.271)	-0.643** (0.283)	-0.688** (0.298)	-0.641** (0.305)
	Individual bank concentration index in markets for assets HHI <sub>A</sub> (lag = 4 quarters, squared)	1.975* (1.016)	2.100** (1.045)	2.054* (1.048)	1.859* (1.079)
	Total loans / Total assets	-0.367*** (0.119)	-0.382*** (0.117)	-0.384*** (0.116)	-0.393*** (0.116)
	Total loans / Total assets (squared)	0.290*** (0.098)	0.305*** (0.095)	0.303*** (0.094)	0.311*** (0.095)
	Cost-to-income ratio <sup>a</sup> (lag = 4 quarters)		0.172** (0.071)	0.173** (0.077)	0.131** (0.065)
	Cost-to-income ratio <sup>a</sup> (lag = 4 quarters, squared)		-0.156** (0.071)	-0.162** (0.078)	-0.129* (0.069)
	Structure of funds <sup>b</sup> (lag = 4 quarters)			0.037** (0.018)	0.042** (0.020)
	Bank's share on credit market				-0.441* (0.257)
	GDP growth rate (y-o-y) (lag = 1 quarter)	-0.054*** (0.009)	-0.040*** (0.010)	-0.045*** (0.010)	-0.049*** (0.010)
MACRO	Volatility of official exchange rate <sup>c</sup>	0.265*** (0.035)	0.237*** (0.036)	0.249*** (0.037)	0.257*** (0.036)
	Real lending rate	0.120*** (0.039)	0.117*** (0.039)	0.120*** (0.038)	0.125*** (0.040)
Number of obs.		10964	10813	10611	10611
Number of banks		499	499	497	497
Number of instruments		447	447	447	496
P-value, Hansen test		0.091	0.122	0.122	0.383
P-values, Arellano-Bond test for AR(1) / AR(2)		0.000 /	0.000 /	0.000 /	0.000 /
		0.394	0.477	0.626	0.658
Inflection point for Individual concentration index in markets for assets HHI <sub>A</sub> «sample percentile»		0.1559 «95»	0.1530 «94»	0.1674 «97»	0.1722 «97»
Inflection point for Total loans / Total assets «sample percentile»		0.63 «68»	0.63 «68»	0.63 «68»	0.63 «68»
Inflection point for Cost-to-income ratio «sample percentile»			0.55 «82»	0.54 «81»	0.51 «76»

Note: \*\*\*, \*\* and \* - an estimate is significantly different from zero at 1%, 5% and 10% level. Robust standard errors of estimated coefficients are reported in parentheses.

<sup>a</sup> revaluation of foreign currency, securities and precious metals as well as backups of possible loan losses were excluded from the nominator and denominator of the variable

<sup>b</sup> the ratio of term deposits to total accounts and term deposits of households and non-financial enterprises

<sup>c</sup> indicator was further divided into 100 for comparable scale factor estimates

Source: Bank of Russia database <http://www.cbr.ru/credit/forms.asp>, the author's calculation

Table 6. The influence of the concentration index for credit risk: the differences between large and small banks

Independent variables		Dependent variable: Overdue loans / Total loans			
		Banks from top-200 (assets)		Banks from outside of top-200 (assets)	
		M11.1 (basic)	M11.2	M12.1 (basic)	M12.2
BSF	Overdue loans / Total loans (lag = 1 quarter)	0.640*** (0.136)	0.475*** (0.086)	0.363** (0.148)	0.289** (0.126)
	Overdue loans / Total loans (лаг = 2 квартала)	0.106** (0.053)	0.161*** (0.051)		
	Individual bank concentration index in markets for assets HHI <sub>A</sub> (lag = 4 quarters)	-1.050*** (0.370)	-1.302*** (0.503)	-0.293 (0.617)	-0.168 (0.472)
	Individual bank concentration index in markets for assets HHI <sub>A</sub> (lag = 4 quarters, squared)	3.469*** (1.016)	4.625*** (1.787)	1.627 (2.356)	0.599 (1.789)
	Cost-to-income ratio <sup>a</sup> (lag = 4 quarters)		0.053 (0.060)		0.238** (0.121)
	Cost-to-income ratio <sup>a</sup> (lag = 4 quarters, squared)		-0.064 (0.058)		-0.195 (0.121)
	Liquid assets / Total assets (lag = 4 quarters)		-0.035 (0.037)		-0.034 (0.023)
	Earning assets / Earning liabilities <sup>b</sup> (lag = 4 quarters)		0.214*** (0.065)		-0.139* (0.081)
	Non-interest income / Interest income <sup>b</sup> (lag = 4 quarters)		-0.165* (0.093)		0.343 (0.218)
	Structure of funds <sup>c</sup> (lag = 4 quarters)		0.051** (0.023)		0.025 (0.024)
	Bank's share on credit market		-0.734* (0.423)		-100.960** (41.130)
	MACRO	GDP growth rate (y-o-y) (lag = 1 quarter)	-0.064*** (0.012)	-0.068*** (0.024)	-0.044*** (0.015)
Volatility of official exchange rate <sup>b</sup>		0.232*** (0.045)	0.143* (0.074)	0.202*** (0.071)	0.229*** (0.072)
Real lending rate		0.108** (0.030)	0.181*** (0.063)	0.110** (0.051)	0.075* (0.042)
Number of obs.		4693	4525	6354	5959
Number of banks		200	200	300	296
Number of instruments		196	200	270	254
P-value, Hansen test		0.319	0.349	0.188	0.209
P-values, Arellano-Bond test for AR(1) / AR(2)		0.000 / 0.770	0.000 / 0.468	0.014 / 0.618	0.006 / 0.914
Inflection point for Individual concentration index in markets for assets HHI <sub>A</sub> «sample percentile»		0.1514 «95»	0.1407 «91»	—	—
Inflection point for Cost-to-income ratio «sample percentile»			0.42 «73»		0.61 «85»

Note: \*\*\*, \*\* and \* - an estimate is significantly different from zero at 1%, 5% and 10% level. Robust standard errors of estimated coefficients are reported in parentheses.

<sup>a</sup> revaluation of foreign currency, securities and precious metals as well as backups of possible loan losses were excluded from the nominator and denominator of the variable

<sup>b</sup> indicator was further divided into 100 for comparable scale factor estimates

<sup>c</sup> the ratio of term deposits to total accounts and term deposits of households and non-financial enterprises

Source: Bank of Russia database <http://www.cbr.ru/credit/forms.asp>, the author's calculation

To conclude this section we present a comparison of the impact strength of both measures of competition in the credit risk at the level of the median bank. In this analysis, we used the following procedure: we asked each measure of competition (as well as all the other factors) of one standard deviation of the individual and by the estimated coefficients of the models M1, M3 (the Lerner index) and M7, M10 (concentration index) was calculated using the change in the share NPLs to total loans median bank. As the data presented in the Table A3 in Appendix, the reaction of overdue loans in total loans for the Lerner index increased one standard deviation (0.24 with an average of 0.59) is -0.014 - 0.013 with an average of 0.015. This is about 2.5 times stronger than the effect exerted increasing concentration (as one standard deviation, i.e. by 94 points, with an average 1186 points). It should be noted also that the effect of the Lerner index - the most powerful of all the other explanatory variables. This should result in a further study of the laws of dynamics Lerner index and the factors determining it, as in the analytic community, and in the bodies of the monetary authorities to ensure the stability of the Russian banking sector.

## 5. Conclusion

In this study we made an attempt to assess the impact of market power of Russian banks in their appetite for credit risk. For this purpose, first, a review of existing concepts such relationships, as well as empirical studies that test these relationships on data banks of various countries. It has been shown that in the literature there is no consensus regarding the positive or negative effects of competition between banks for their level of stability (risk appetite). The empirical results of different authors are reduced to two approximately equal in their contribution to block supporters of two alternative concepts of "competition-fragility" and "competition-stability".

Second, the scale has been formed, and something unique panel data on Russian banks, aggregated information forms a 101 (asset-liability structure) and 102 (the profit and loss account) for all banks to provide such statements in the period of 2004 Q1 – 2011 Q2. This base - in addition to standard measures of both forms - has also built our individual indices of concentration of assets in major markets (new for Russian studies measure of competition), as well as our estimated Lerner index, reflecting the degree of market power of each bank.

Third, was conducted an empirical analysis of the impact constructed two measures of competition in the share of overdue loans in the total loan portfolio of Russian banks. The main result is that we support the proponents of "competition-fragility": the current macroeconomic situation in Russia at higher levels of competition, the positive effect exerted by the growth of the quality of the borrowers on the stability of banks (because of increased risks of adverse selection), will not be able neutralize the negative effect that arises due to the reduction of profitability of banks (entailing the growing problem of moral hazard, managers of banks). In all experiments, the threshold identified by Herfindahl-Hirshman index separating

the negative and positive impact on the extent of concentration of credit risk. Above this threshold (in the "competition-stability"), the level of competition is so low that further reductions and the corresponding increase in the local monopoly in the banking system are critical in terms of credit risk. However, it is shown that more than 90% of Russian banks have not yet reached that threshold (located in the "competition-fragility"). This suggests that banks have not yet reached the optimal debt burden on their assets and should increase lending to the economy. However, it is necessary to carry out a somewhat slower (not so economically dangerous) rate than 25-30% per year in real terms, as we have seen in 2011 and probably in 2012. Accordingly, the action of the monetary authorities to ensure the stability of the banking sector should first be directed to moderate restriction of credit expansion of banks and the development of other (non-credit) markets for banking services, involvement in that is not associated with risk-taking, and, secondly, promote consolidation of banks. As a consolidation of credit institutions, as shown by our analysis, will increase the positive impact of market power in the credit risk of banks.

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## Appendix

Table A1. Market power and concentration of banks among the top-30

№ in ranking by assets	Bank name	Lerner index (LI)		Individual bank concentration index in markets for assets HHI <sub>A</sub>		Coordination of changes of LI and HHI <sup>c</sup>
		Before crisis <sup>a</sup>	After crisis <sup>b</sup>	Before crisis <sup>a</sup>	After crisis <sup>b</sup>	
1	SBERBANK OF RUSSIA	0.84	0.86	0.1278	0.1253	1
2	VTB	0.71	0.66	0.1178	0.1178	1
3	GAZPROMBANK	0.55	0.53	0.1066	0.1235	1
4	Agricultural Bank	0.80	0.88	0.1105	0.1183	1
5	VTB 24	0.65	0.88	0.1201	0.0927	0
6	Alfa-Bank	0.78	0.71	0.1072	0.1197	0
7	BANK OF MOSCOW	0.79	0.83	0.1158	0.1209	1
8	UniCredit Bank	0.88	0.17	0.1112	0.1172	0
9	PROMSVYAZBANK	0.85	0.75	0.1189	0.1190	0
10	ROSBANK	0.85	0.75	0.1245	0.1175	1
11	URALSIB	0.78	0.66	0.1295	0.1281	0
12	TRANSCREDITBANK	0.72	0.82	0.1224	0.1242	1
13	NOMOS-BANK	0.61	0.72	0.1077	0.1141	1
14	MDM Bank	0.80	0.72	0.1256	0.1159	1
15	AK BARS	0.75	0.34	0.1152	0.1269	0
16	BANK RUSSIA	0.85	0.74	0.1194	0.1222	0
17	PETROCOMMERCE	0.71	0.75	0.1210	0.1182	0
18	CREDIT BANK OF MOSCOW	0.58	0.87	0.1142	0.1195	1
19	Bank ZENIT	0.64	0.79	0.1076	0.1174	1
20	Nordea Bank	0.50	0.75	0.1071	0.1171	1
21	VOZROJDENIE	0.66	0.79	0.1122	0.1186	1
22	TRUST	0.58	0.66	0.1320	0.1291	1
23	OTKRYTIE	0.51	0.67	0.1095	0.1217	1
24	ING Bank (Eurasia)	0.59	0.32	0.0978	0.1141	0
25	MTS-BANK	0.83	0.83	0.1086	0.1076	0
26	HOME CREDIT & FINANCE	0.40	0.64	0.1331	0.1110	0
27	Moscow Industrial Bank	0.77	0.73	0.1216	0.1260	0
28	DEUTSCHE BANK	0.12	0.65	0.1273	0.1586	1
29	BINBANK	0.80	0.79	0.1101	0.1226	1
30	OTP Bank	0.75	0.75	0.1280	0.1135	0

*Note:* we excluded Citibank (№ 17) and KIT Finance Investment Bank (№ 29) from the ranking due to lack of data

<sup>a</sup> average within the period 2006 Q1 – 2007 Q4

<sup>b</sup> average within the period 2010 Q1 – 2012 Q1

<sup>c</sup> equals to 1, if the both indices changed in the same direction after the crisis (coordinated change), 0 — if else (non-coordinated change)

*Source:* the author's calculation

Table A2. The relationship between the Lerner index (LI) and the individual index of concentration in asset markets (HHI<sub>A</sub>)

Data level	Number of banks	Корреляция индексов LI и HHI <sub>A</sub>		Share of coordinated changes in LI and HHI <sub>A</sub>
		Before crisis <sup>a</sup>	After crisis <sup>b</sup>	
The full sample	500	0.005 (0.045)	0.099** (0.045)	51%
Top-30	30	-0.049 (0.189)	-0.162 (0.186)	53%

Note: \*\*\*, \*\* and \* - an estimate is significantly different from zero at 1%, 5% and 10% level. Robust standard errors of estimated coefficients are reported in parentheses.

<sup>a</sup> average within the period 2006 Q1 – 2007 Q4

<sup>b</sup> average within the period 2010 Q1 – 2012 Q1

Source: the author's calculation

Table A3. Evaluation of the reaction of overdue loans in total loans by one standard deviation of the different models (for the median bank in the sample)

Variable	Time lag	Mean	Stand. Dev.	Model			
				M1 (LI)	M3 (LI)	M7 (HHI <sub>A</sub> )	M10 (HHI <sub>A</sub> )
Overdue loans / Total loans	1	0.0147	0.0103	0.0052	0.0048	0.0052	0.0047
Lerner Index	4	0.5906	0.2373	-0.0127	-0.0138		
Individual bank concentration index in markets for assets	4	0.1186	0.0094			-0.0056	-0.0059
Structure of funds	4	0.5311	0.0282				0.0012
Total loans / Total assets	0	0.5556	0.0358	-0.0074	-0.0080	-0.0127	-0.0137
<b>BSF</b> Cost-to-income ratio	4	0.3918	0.0231				0.0029
Bank's share on credit market	0	0.0001	0.0000		0.0000		0.0000
Earning assets / Earning liabilities	4	1.5039	0.0779		0.0000		
Liquid assets / Total assets	4	0.1136	0.0173		-0.0004		
Return-on-assets ratio (ROA)	4	0.0143	0.0063	-0.0015	-0.0026		
GDP growth rate (y-o-y)	1	1.0434	0.0540	-0.0037	-0.0039	-0.0029	-0.0027
<b>MACRO</b> Volatility of official exchange rate	0	0.5122	0.6469	0.0016	0.0017	0.0017	0.0017
Real lending rate	0	0.0041	0.0279	0.0020	0.0018	0.0034	0.0035

Source: the author's calculation