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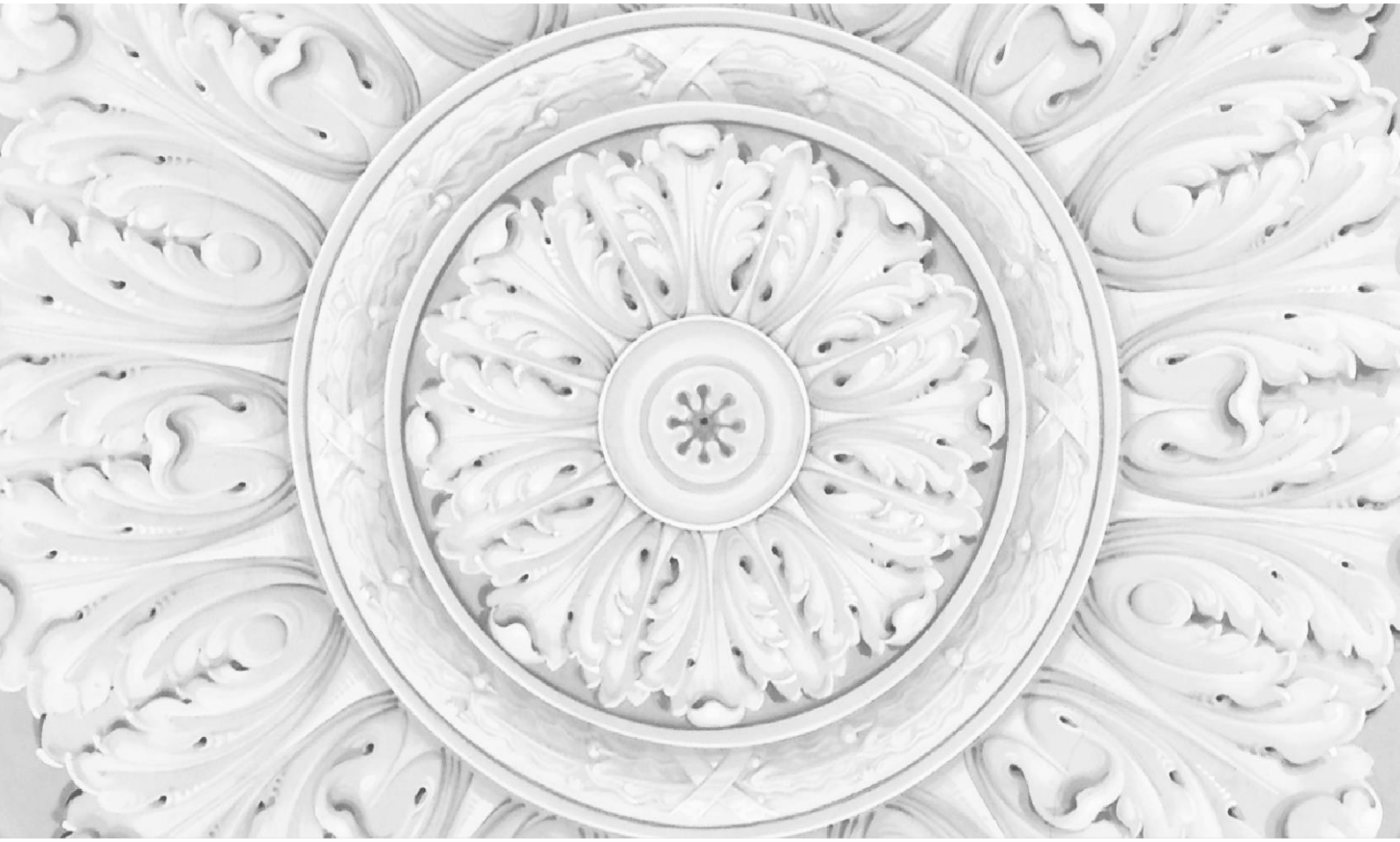
The Central Bank of the Russian Federation



WORKING PAPER SERIES

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Effect of Banking Sector Resolution on Competition and Stability

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Abstract

We assess the effect of the banking sector resolution policy conducted by the Bank of Russia on competition and stability in the banking sector. We use the rate spread to measure competition and volatility in loan portfolio growth, set against volatility in growth of the banking sector's aggregate loan portfolio, to measure the system's stability.

Our findings are as follows:

- After the launch of the banking sector resolution, a significant break in competition, as measured by the rate spread, was observed only in household deposits maturing in one to three years and household and corporate loans maturing in more than three years. This kind of structural break, however, is associated with macroeconomic factors rather than the Bank of Russia's banking sector resolution. Other banking markets failed to see any significant change in competition after the launch of the banking sector resolution.
- After the launch of the Bank of Russia's banking sector resolution, growth in corporate and retail lending showed a decline in volatility. This decline was observed both in a cluster of banks characterised by relatively low overdue debt, and in banks characterised by relatively high levels.

Thereby, the reduction in the number of banks resulting from the Bank of Russia's banking sector resolution had no considerable negative effect of competition in the period under review. At the same time, lower volatility in lending growth boosted banking system stability. We estimate that banking sector stability has grown by 4% in retail lending and 41% in corporate lending.

Key terms: Russian banking sector, banking licence, banking sector resolution, competition, banking sector stability.

JEL classification: G28, G21, E43.

Contents

Introduction

In accordance with Article 45.1 of Federal Law №86-FZ, dated 10 July 2002, 'On the Central Bank of the Russian Federation (Bank of Russia)', the Bank of Russia, in collaboration with the Russian Government develops and implements policy for ensuring stability of the Russian financial market. This involves measures aimed at the banking sector resolution, foremost of which is the revocation of licences from banks violating Russian laws. The Bank of Russia revoked 332 licences from the beginning of 2013 to 1 June 2017. This policy resulted in higher concentration of assets in Russia's banking sector (Table 1), which is sometimes regarded as a negative trend.

Table 1. Concentration of assets in Russia's banking sector, %

	01.01.2013	01.01.2014	01.01.2015	01.01.2016	01.01.2017
share in assets of the top 5 banks, %	50.3	52.7	53.6	54.1	55.3
share in assets of the top 20 banks, %	69.8	71.7	75.1	75.7	78.1
share in assets of the top 50 banks, %	81.4	82.8	85.7	87	88.7
HHI (assests)	1104	1153	1156	1162	1221

Sources: Bank of Russia, authors' calculations.

However, according to research conducted by the World Bank (Beck, 2008), traditional measures of asset concentration only reflect market structure and do not give a clear indication of competition. For example, bank concentration may grow along with competition when the banking sector is being consolidated (Beck, 2008). Most importantly, the literature has not come to a conclusion on whether market structure determines bank behaviour (structure-conduct-performance hypothesis (Mason, 1939)) or market structure is the result of performance (efficient structure hypothesis (Demsetz, 1973)). In this way, structural measures alone (concentration ratios) do not give an accurate indication of the degree of competition and stability in the banking sector and their development over time. This necessitates analysis of a set of measures.

The aim of this study is to answer the question whether the banking sector resolution had an effect on competition and stability of the banking sector, and, if so, what exactly.[1] This paper is an attempt to use empirical data to quantify the policy's effect.

The first chapter of the research gives an overview of the relevant literature and methodology for measuring competition and stability. The second chapter describes measures used in our analysis of competition and stability in the Russian banking sector, as well as of the empirical base of the research. In the third chapter, we present the results of our empirical analysis.

1. Literature overview.

Competition and stability in the banking sector during the period of banking sector resolution is particularly important in light of scientific debate on the relationship between these measures.

[1]A theoretical model in the paper by Ponomarenko, A., Sinyakov, A. 'The Effect of Tighter Bank Supervision on the Structure of the Banking System: Insights Based on Agent-focused Modelling' shows that alongside a long-term positive effect on performance and resilience of the banking sector, the banking sector resolution may also result in a short-term reduction in competition, which under certain circumstances may influence the resilience of the banking sector.

According to the traditional view, competition may pose a threat to stability – the competition-fragility hypothesis. A number of theories indicate that a reduction in profits, caused by more intense competition, encourages banks to take on more risk in an attempt to restore profits or because of the reduced opportunity costs of bankruptcy (Smith,1984; Matutes and Vives, 2000). Others attribute the negative correlation between competition and stability to banks' high capacity to monitor borrowers' creditworthiness and/or create additional capital buffers, assuming that a bank has profits (market power), as well as to the regulator's more effective monitoring of concentrated markets (Allen and Gale, 2000; Boyd et al., 2004; Beck, 2008). A series of empirical studies have also confirmed the inverse relationship between competition and stability (Turk-Ariss, 2010; Fungáčová, 2013).

By contrast, Boyd and De Nicolo (2005) demonstrate that banks' increased market power (lower competition) launches the opposite mechanism that contributes to risk accumulation – the so-called competition-stability hypothesis. Banks with greater market power have higher profits due to increased bank margins. According to Stiglitz and Weiss, 1981, an increase in interest rates on loans leads to an increased borrower risk, that is, brings in more risky borrowers and/or leads to moral hazard issues among existing borrowers. As a result, less competitive markets turn out less stable. The empirically direct correlation between competition and stability was achieved in the works of Uhde and Heimeshoff, 2009; Schaeck et al., 2014.

A third group of studies proposes a nonlinear relationship between competition and stability in the banking sector. These studies provide theoretical and empirical explanation of both the competition-stability correlation and the competition-fragility dependency (Martinez-Miera and Repulo, 2010; Uhde A. and Heimeshoff U., 2013). Recent empirical research in this area has moved towards a division between individual and systemic risks (Leroy and Lucotte, 2017). The global financial crisis led to an appreciation of the importance of risk monitoring – not so much at the level of the individual as its systemic aspect – especially for regulators. In the aforementioned work, the authors came to the conclusion that higher competition among European banks increases individual risk (competition-fragility) but reduces systemic risk (competition-stability).

The most widely used measures of competition in empirical studies of the banking sector are the Lerner index (Lerner, 1934), the Boone indicator (Boone, 2008), the H-statistic (Panzar and Rosse, 1987) and the Herfindahl-Hirschman index. The Lerner index defines the level of market power as the ratio between monopolistic additions in the price of a product and the price of the product. The index ranges from 0 to 1, and the higher this value, the higher the market power of a bank. It is important to define what is considered as a bank's product. Empirical studies usually define a bank's product as its assets or the total of loans issued. The total of received deposits is used as a measure of a product much less frequently.

The essence of the H-statistic by Panzar and Rosse is to measure the extent to which change in factor costs affects a bank's income. This first requires an econometric estimation of the elasticity of the bank's interest (or total) income across three factor costs – the cost of borrowing, labour resources and others expenses. Then the estimated elasticity is summed up, which gives the H-statistic. If the given H-statistic is not positive, the market under review is monopolistic. The N-statistic ranges between 0 and 1 in the case of monopolistic competition, and is equal to zero in the case of perfect competition. However, as shown by Shaffer, 1982, the H-statistic can only be defined correctly for a banking system in the state of long-term equilibrium. In addition, in order to

draw conclusions about competition levels the conditions for a bank's constant elasticity of demand and technology in the Cobb-Douglas form must be observed.

The Boone indicator evaluates the extent to which efficiency gains (cost reduction) can increase a bank's market power (market share) or the ROA index. If the effect is negative, the more efficient banks can improve their own market position, and thus the system is more competitive.

As mentioned above, the structural measure of competition – the concentration index – does not serve as a good indicator of competition. At the same time, the Boone indicator and H-statistic are indirect measures of competition calculated on the basis of serious assumptions. In order to evaluate competition in the banking sector correctly, the Lerner index should also include a credit risk adjustment (Beck, 2008). Importantly, the empirical literature has not come to the consensus on the best indicator of competition. Moreover, sometimes different studies of the same country pertaining to the same period draw different conclusions about the level and dynamics of competition.

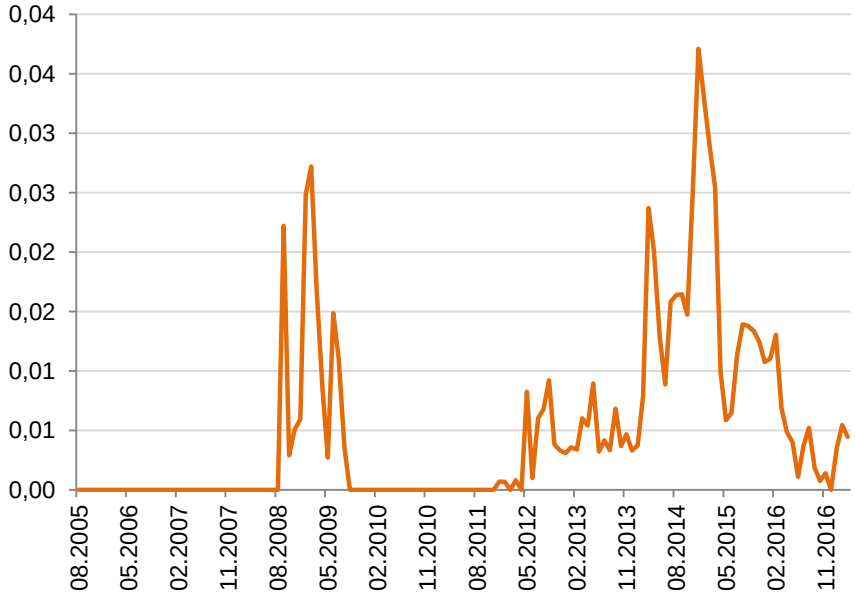
The proxy for stability most commonly used in empirical studies is the Z-index of stability as per Roy's methodology (Roy, 1952). The index is usually deemed the 'distance to default', because it measures how many standard deviations the profitability of a bank would have to decrease for its losses to exceed its capital (Boyd et al., 2006; Uhde and Heimeshoff, 2009; Turk-Ariss, 2010):

$$Z_{it} = \frac{\frac{E_{it}}{A_{it}} + \overline{ROA_{it}}}{\sigma_{ROA_{it}}},$$

where *i* is a bank, *t* is a month, *ROA* is the return-on-assets ratio, *E/T* is the capital-on-asset ratio, σ_{ROA} is one standard deviation of ROA.

Thereby, the Z-index reflects the probability of a bank's bankruptcy. However, risk evaluation of every bank's policy is not as important for financial stability as understanding the correlation between risk management policies of different banks – the concept of systemic risk. Leroy and Lucotte (2017) use the SRISK index as an indicator of systemic risk (Archarya et al. (2012), Brownlees and Engle (forthcoming)). It assesses the additional capital requirements of systemically important organisations in the event of a systemic financial crisis. This index suggests that systemic risk has been declining in Russia after a hike in late 2014 (Figure 1).

Figure 1. SRISK index, standardised by financial system assets.



Source: The volatility institute.

We will now focus on empirical studies of the Russian banking sector. Drobyshevsky and Pashchenko (2006) have shown the Russian banking market has both intensively-competitive and weakly-competitive segments. Moreover, the largest group of banks operates in the weakly-competitive segment. However, in the pre- and post-crisis periods of 2001-2007 and 2010-2013 competition increased slightly (Fungáčová, 2010; Mamonov, 2016). In the crisis period, on the other hand, competition weakened (Mamonov, 2016). Despite commonly-held stereotypes concerning the level of competition in the Russian market, competition in the 2000s was at about the same level as in developed countries (Fungáčová, 2010).

We would like to note that Russian researchers mostly apply non-structural competition assessment methods. Drobyshevsky and Pashchenko (2006) base their assessment on the model by Bresnahan and Barros and Modesto. Anisimova and Vernikov (2011) base their indices on the H-statistic. Mamonov (2016) employs a complex approach, calculating the Herfindahl-Hirschman index as well as the H-statistic, Boone indicator and the Lerner index.

2. Data and methodology.

2.1. Data and research period.

The empirical base of the study is formed by monthly reporting forms Nos. 128 and 129 covering information on weighted average interest rates and volumes of new deposits and loans, as well as data from monthly reporting form No. 101 on banks' key balance sheet indicators.

The research period is January 2010 to March 2017. We take October 2013 as the beginning of banking sector resolution. Significantly, there is no official starting date for the policy. It is generally accepted that the resolution was launched when Elvira Nabiullina took office of the Bank of Russia Governor in June 2013, and Federal law №86-FZ, dated 10 July 2002, 'On the Central Bank of the Russian Federation (Bank of Russia)' was supplemented with the chapter on the development of the financial market and maintenance of its operational stability in late 2013. As we see it, the systemic nature of the policy was revealed later – after the resounding licence withdrawal from Pushkino bank in September 2013 (at that time the bank held an abysmal record in insurance payouts) and from Master-Bank, a top 50 bank, in November 2013.

2.2. Measuring stability.

We employ a structural indicator – the share of banks which have a stable lending growth rate – as a measure of stability (banking sector stability, BSS):

$$\mathrm{BSS}_t = \frac{\text{number}^2 \text{ of banks with a stable growth rate}_t}{\text{total banks}_t},$$

where *t* is a month.

We consider banks to have a stable lending growth rate if its volatility no higher than the systemic rate.[3] We assume that banks with the most unstable growth rate accumulate excessive risks and thereby cause increased instability in the banking system and excessive credit growth (Rey, 2015). On the other hand, banks that demonstrate more stable growth of loan portfolio promote more stable credit growth in the economy.

In order to analyse the effect that the banking sector resolution has on the banking system, we divided the dynamics of BSS_t into two periods – 'before the policy launch' and 'after the policy launch' – and compared them. We consider that the policy was launched in October 2013. Mathematically, we have compared the empirical distribution of individual stability measures to assess the policy's effect on the economy.

[2] Weighted by bank size.

[3] $\text{Individual growth rate stability indicator}_{it} =$

$$= \frac{\text{12-month volatility of lending growth rate}_{it}}{\text{12-month volatility of total banking system's loan portfolio growth rate}_t},$$

where *i* is a bank, *t* is a month

If the ratio is less than one, the bank is 'more stable' than the system as a whole; if equal to one, the bank has the same level of stability; if more than one, the bank is 'less stable' than the system as a whole. Systemic volatility adjustment allows us to adjust individual volatility of lending growth rate for the influence of systemic factors (business cycles, oil prices, regulatory changes, etc.) so as to obtain the specific (idiosyncratic) volatility.

2.3. Measuring competition.

We understand competition as the rivalry between banks for new and/or existing customers. Significantly, contemporary studies focus on the analysis of competition in a country or a group of countries, whereas little attention is given to the analysis of competition in individual banking segments.

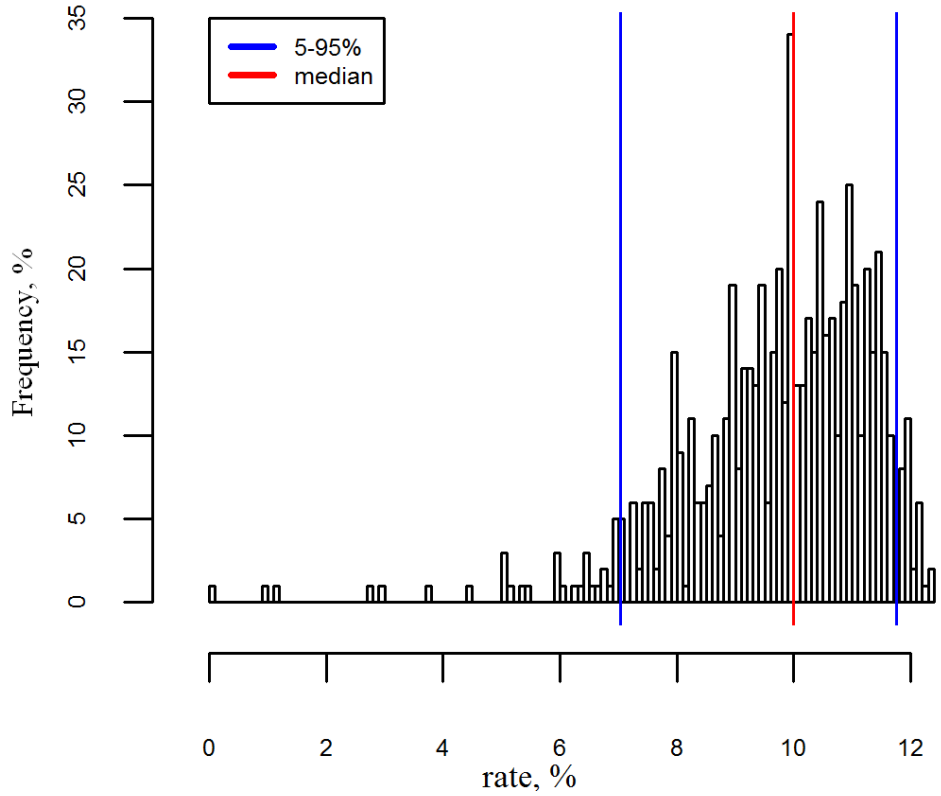
In conventional economic theory (Robinson, 1934), perfectly competitive markets have a standardised product and many identical market players who do not exert influence on its price. In this way, it is the market that sets the price that is equal for all market players and incorporates expenses only. In a monopoly, a single market player sets the price that incorporates a 'monopoly premium' alongside the cost (Lerner, 1934). Thus, the presence of identical market players and different prices for a standard product in the market can be interpreted as imperfect competition. According to this approach, the degree of price dispersion for similar products among identical market players approximates the level of competition.

In relation to the banking sector, this means that intensification in competition will be accompanied by a shrinking spread in prices for similar products among identical market players. For example, on the liability side banks compete for depositors, aiming to draw them in with more favourable interest rates. This will push deposit rates up. This increase in the maximum interest rate on deposits is limited by other sources of liabilities (e.g., Bank of Russia repo rate). As a result, more intense competition for liabilities reduces interest rate spread. Similarly, on the asset side, banks will cut interest rates in an attempt to draw in borrowers of acceptable risk level. The reduction of the minimum interest rate is limited by return on other products (e.g., Bank of Russia deposit auction rate). As a result, the intensification in competition reduces the lending rate spread.

Following this logic, as a measure of competition we have used rate dispersion (maximum rate less minimum rate)[4] of each line of a bank's business: household and corporate deposits, and corporate and retail loans. Importantly, bank sometimes report zero or near-zero monthly rates on new deposits in their statements (with a non-zero volume of new deposits). This 'paradox' can be found in reports dated before May 2016 when most of these banks had their licences revoked. It is impossible to check if these data are erroneous (and may be corrected) or correspond to reality. Nevertheless, we consider these 'errors' to be concentrated at the tails of the rate distributions. Given the above, we have decided to cut the tails of the distribution and focus the analysis on the movement of the spread between the rates corresponding to 5% and 95% of the distribution for each month under review (Figure 2).

[4] We have taken the interest rate corresponding to the 95% percentile of the interest rate distribution as the maximum interest rate, and that corresponding to the 5% percentile of the distribution as the minimum interest rate, in response to the necessity to remove 'errors' in reporting, which we consider to be concentrated at the tails of the distribution.

Figure 2. Bar chart of the distribution of weighted average interest rates on 1-3 year household deposits in January 2013



Source: authors' calculations.

To ensure greater homogeneity of products within each line of business, competition was analysed based on products of similar maturity. We have selected the products which make up the largest share of deposits and loans in the banking system. Significantly, we analysed competition based on ruble loans and deposits only. In our opinion, interest rates on FX loans and deposits may inaccurately reflect the levels of competition in these segments due to a range of macroprudential policy measures and geopolitical factors. Ultimately, the following instruments were selected:

- Household ruble deposits for 91 to 180 days, for 181 days to one year, from one to three years (75% of household deposits in the banking system as of 1 April 2017);
- Corporate ruble deposits for 31 to 90 days and for more than three years (41% of corporate deposits in the banking system as of 1 April 2017);
- Household ruble loans for one to three years and for more than three years (81% of retail loans in the banking system as of 1 April 2017);
- Corporate ruble loans for one to three years and for more than 3 years (76% of corporate loans in the banking system as of 1 April 2017).

According to Ross' arbitrage pricing theory (Ross S., 1976), interest rates reflect the risk-free return and a combination of market-determined risks: individual (specific) risk, systemic risk and other types of risk. Thus, if identical banks[5] with equivalent assets carry out transactions in a competitive market, market prices of these transactions will tend to converge. In order to make

[5] Banks with identical risk profiles.

these 'price'-rates equivalent, we have adjusted them for the influence of bank-specific and systemic risks.[6]

We assume that the nature of competition in the market segment concerned with transactions with individuals differs from that found in the segment of transactions undertaken with legal entities. Individuals largely choose banks by the deposit rate they offer.[7] This means that individuals have no 'tie' to a bank on the basis of prior experience; it also means that so-called national champions lack 'privileges' (Vernikov, 2013).

Individuals' preference for the bank offering the highest interest rate on deposits / lowest interest rate on loans out of the available options assumes geographical differentiation of banking services markets (a person from Kaliningrad will not travel to Irkutsk for the sake of opening an account with a higher interest rate). Since the data we have used are aggregated at the level of the actual address of the parent organisation, we cannot evaluate competition in every region due to the lack of information on banks' regional branches. However, we can check the robustness of conclusions drawn from aggregated data against the analysis of data from dominant regions. In one of the markets under examination, we have evaluated competition trends on the basis of both aggregated data and data from five Russian regions[8] in which medium-sized and large transactions were characteristic for the segment of banking services under consideration. Findings obtained on the basis of aggregated data do not contradict findings based on analysis of competition trends in regional markets.[9]

Companies choose banks based on both interest rates offered and the bank's size. We can logically assume that the size of a bank is a significant factor for legal entities (small banks are unable to finance major investment projects). Furthermore, when choosing a bank legal entities may prioritise minimising the risk of loss of funds, which, to a certain extent, is a function of the bank's size. Thus, in analysing competition trends in the segment of transactions undertaken with legal entities, we have standardised interest rates based on the size of a bank's loan portfolio.

As a result, in accordance with conventional economic theory (Robinson, 1934; Lerner, 1934) and the arbitrage pricing theory (Ross, 1976), to ensure uniformity of banks and uniformity of interest rates in the analysis of competition in the household transaction segment, we analysed movements of interest rate spread adjusted for systemic and bank-specific risks. In the corporate segment interest rate spreads used in the analysis have been adjusted for systemic and specific risks, as well as for bank size.[10] We have interpreted the reduction in the spread of interest rates as increased competition in the given segment of banking services.

[6] A bank's specific risk is approximated by the share of overdue debt in their portfolio. Systemic risk is approximated by the movement of Russian 5-year CDS (Russia CDS USD SR 5Y D14 Corp).
[7] Including the deposit insurance program offered.
[8] Significantly, a bank is deemed to belong to a given region on the basis of the post code of its physical address, as indicated on the website cbr.ru in the Credit Institutions section, and on the basis of data on the addresses of banks executing payments and settlements through the Bank of Russia's payment system. We understand that in this case most of the major banks will be registered in Moscow and St. Petersburg. On the other hand, the narrowing rate spread between regional banks (located outside Moscow and Petersburg) will prove sufficient to draw a conclusion about growing competition.
[9] Authors may present the results upon request.
[10] A bank's size means its average volume of assets for the past year, adjusted for inflation for the purpose of interannual comparisons.

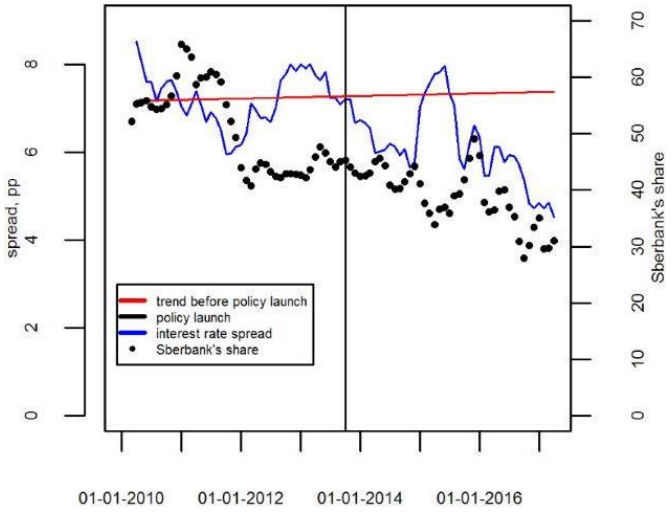
3. Empirical results.

3.1. Effect of banking sector resolution on competition.

After the policy of banking sector resolution was launched, a significant break[11] in the dynamics of competition, as measured by the size of the interest rate spread, was registered only in household deposits for one to three years (Figure 3), household loans for more than three years (Figure 4) and corporate loans for more than three years (Figure 5).

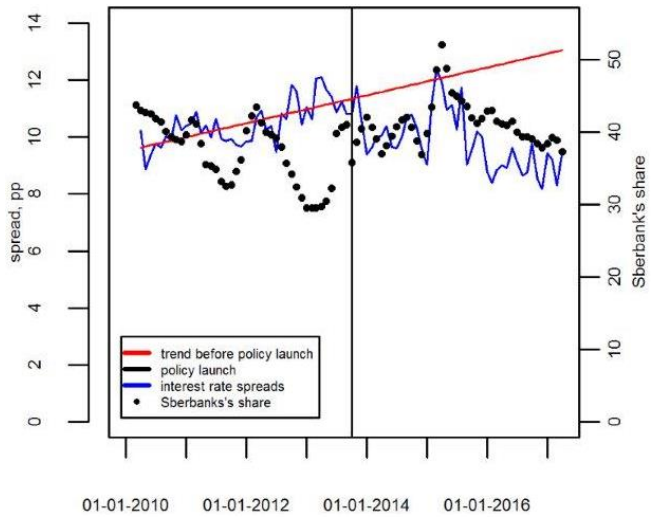
However, further econometric analysis showed that in all cases a structural break was linked to other (predominantly macroeconomic) factors rather than the Bank of Russia's policy of banking sector resolution. Thus, the break in the dynamics of interest rate spreads on deposits maturing in one to three years proves to be insignificant when adjusted for oil prices (Figures 14-15). The break in corporate loans maturing in more than three years identified in December 2014 proves to be insignificant either (Figures 18-19). At the same time, the break in the dynamics of interest rates on household loans maturing in more than three years remains significant, oil prices and banking sector resolution factored in (Figures 16-17).

Figure 3. Interest rate spread* for household deposits maturing in one to three years, pp



Source: authors' calculations.

Figure 4. Interest rate spread* for household loans maturing in more than three years, pp

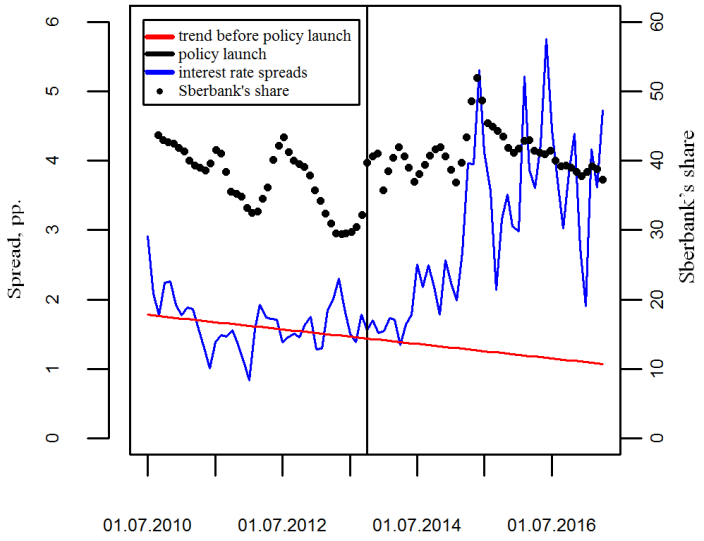


Source: authors' calculations.

*Note: interest rate spread adjusted for systemic and specific risks.

[11] The Chow test identifies structural break in household deposits maturing in one to three years in August 2015 (p-value = 0.0000), structural break in household loans maturing in more than three years in July 2015 (p-value = 0.0000), and structural break in corporate loans maturing in more than three years in December 2014 (p-value = 0.0000).

Figure 5. Interest rate spread for corporate loans maturing in more than three years, pp**



Source: authors' calculations.

**Note: interest rate spread adjusted for systemic and specific risks, and for bank size.

For dynamics of the interest rate spread for the remaining instruments and formal tests of the break significance refer to Appendix 2.

In this way, no potential short-term decrease in competition mentioned in the paper by Ponomarenko, A., Sinyakov, A. 'The Effect of Tighter Bank Supervision on the Structure of the Banking System: Insights Based on Agent-focused Modelling' was identified to accompany the long-term positive impact in the period under review.

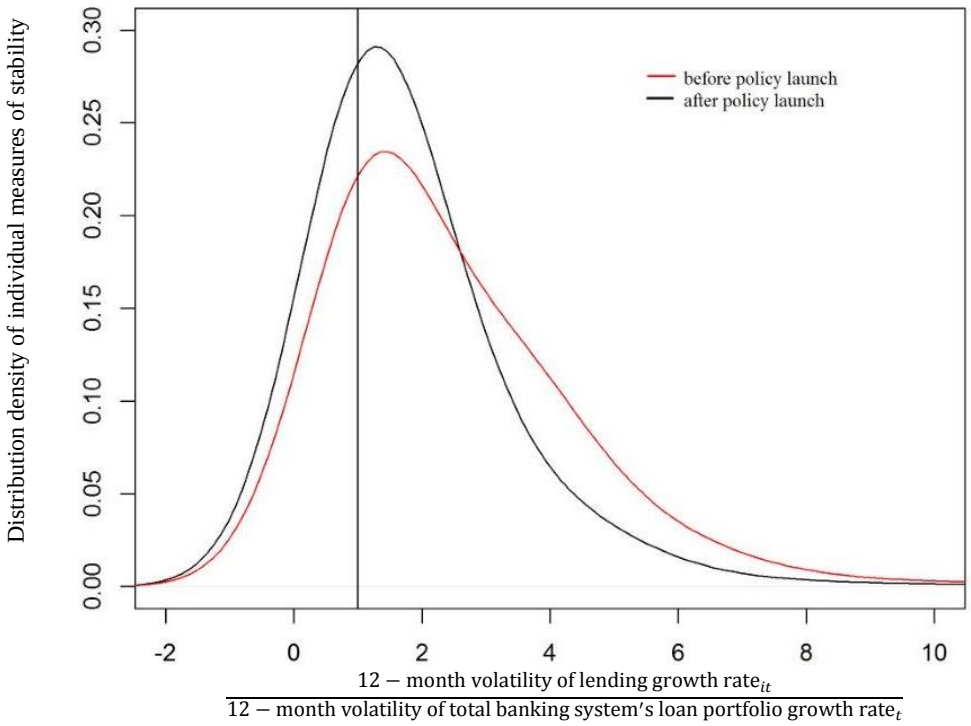
3.2. Effect of banking sector resolution on stability.

The empirical distribution of individual measures for stability of the growth rate and the BSS pointed to the convergence of both retail and corporate loan portfolio growth rate, characteristic for the period after the launch of banking sector resolution (Figures 6-7). The effect was more pronounced in the corporate lending segment. According to our estimates, systemic stability[12] increased by 3.7% in retail lending and 41% in corporate lending.

[12] Systemic stability is defined as follows:

1) Individual volatility is correlative to systemic volatility. If the ratio is less than one, the bank in question is more stable than the system as a whole. If the ratio equals one, the bank is as stable as the system as a whole; and if less than one, the bank is less stable than the system as a whole. The vertical line in Figure 6 corresponds to the level of systemic volatility.
2) The stability of the system is equal to the sum of individual stability measures that are less than one, that is, those located to the left of the vertical line in Figure 6.

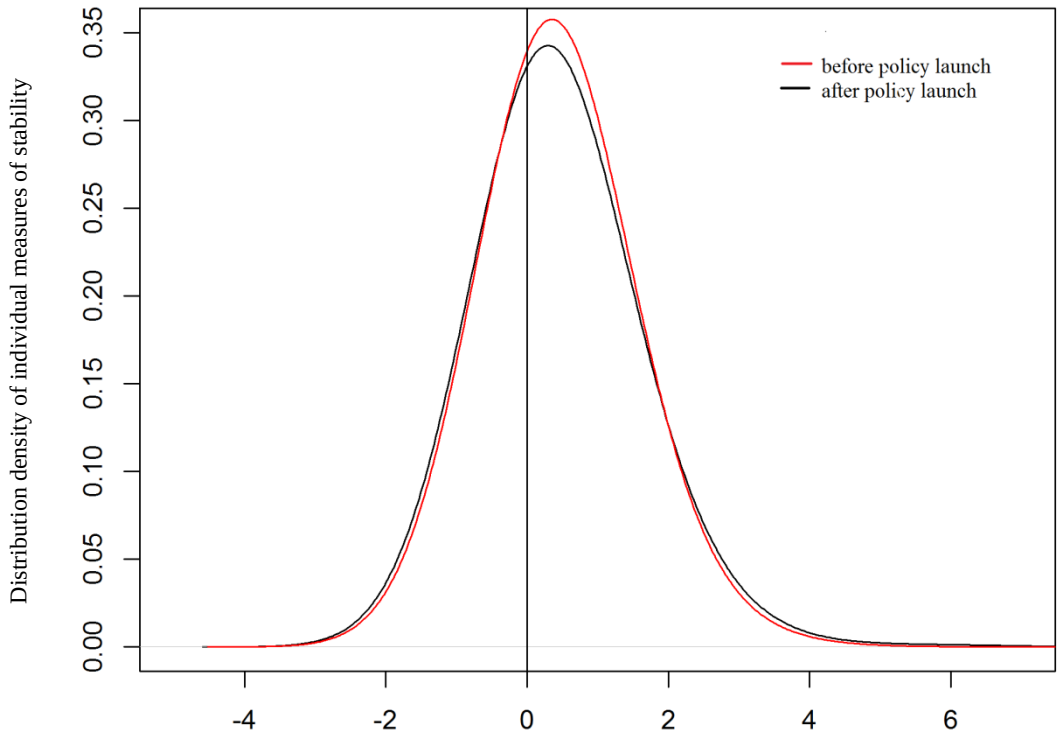
Figure 6. Distribution of individual measures* of stability for the corporate loan portfolio before and after the policy launch



Source: authors' calculations.

*Note: the figure reflects the density of distribution of the ratio of the 12-month volatility of the monthly growth rate of a bank's loan portfolio to the 12-month volatility of the monthly growth rate of the banking system's total loan portfolio. Leftward movement relative to one indicates stability growth. The area under the curve to the left of one indicates the banking sector stability (BSS). In Figure 6, the area under the black curve (after policy implementation) up to one equals 0.301; the area under the red curve (before policy implementation) up to one equals 0.213.

Figure 7. Distribution of individual measures* of stability for the retail loan portfolio before and after the policy launch

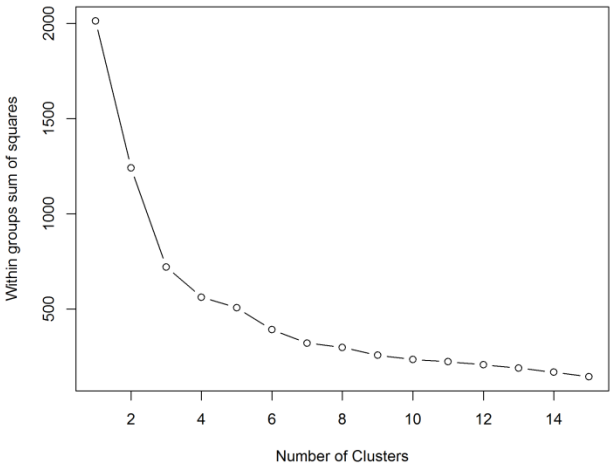


$$\frac{12-\text{month volatility of lending growth rate}_{it}}{12-\text{month volatility of total banking system's loan portfolio growth rate}_{t}}$$

Source: authors' calculations.

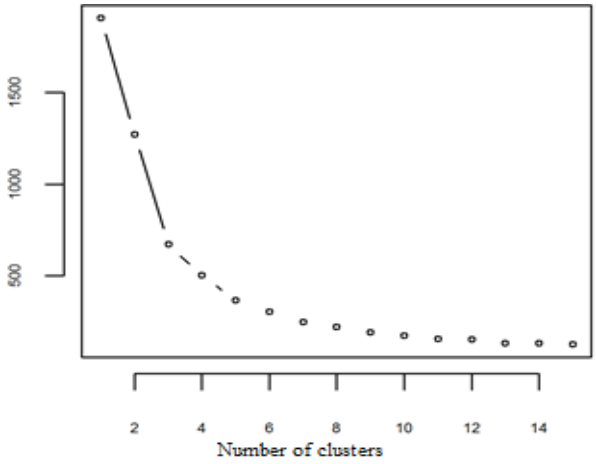
*Note: the figure reflects the density of distribution of the ratios of the 12-month volatility of the monthly growth rate of a bank's loan portfolio to the 12-month volatility of the monthly growth rate of the banking system's total loan portfolio. Leftward movement relative to one indicates stability growth. The area under the curve to the left of one indicates systemic stability. In Figure 7, the area under the black curve (after policy implementation) up to one equals 0.331; the area under the red curve (before policy implementation) up to one equals 0.319.

Figure 8. Dependence of error size on the number of clusters in corporate lending



Source: authors' calculations.

Figure 9. Dependence of error size on the number of clusters in retail lending



Source: authors' calculations.

In order to understand the sources of improvement in BSS measures we conducted a cluster analysis. For both corporate and retail loan portfolios clustering was carried out on the share of the respective loan portfolio in the bank's assets and on the proportion of overdue loans in the given loan portfolio. In both cases we employed the k-average method. We selected three clusters to meet the requirements of reasonable economic interpretation for each of the obtained clusters and to minimise the sum of the square of errors (Figures 8-9).

In both cases we obtained the following bank clusters:

- 'successfully specialised banks' – banks with a relatively high proportion of retail/corporate loans in their assets and relatively low proportion of overdue loans (cluster 1 in Figures 10-13).
- 'successfully non-specialised banks' – banks with a relatively low proportion of retail/corporate loans in their assets and relatively low proportion of overdue loans (cluster 2 in Figures 10-13).
- 'high-risk banks' – banks with a relatively low proportion of retail/corporate loans in their assets and relatively high proportion of overdue loans (cluster 3 in Figures 10-13).

Figure 10. Bank clusters in retail lending

Cluster No.	Share of loan portfolio in assets, %	Overdue loans, %	Number of banks
1	1.9	-0.3	149
2	-0.3	-0.3	701
3	-0.5	2.3	104

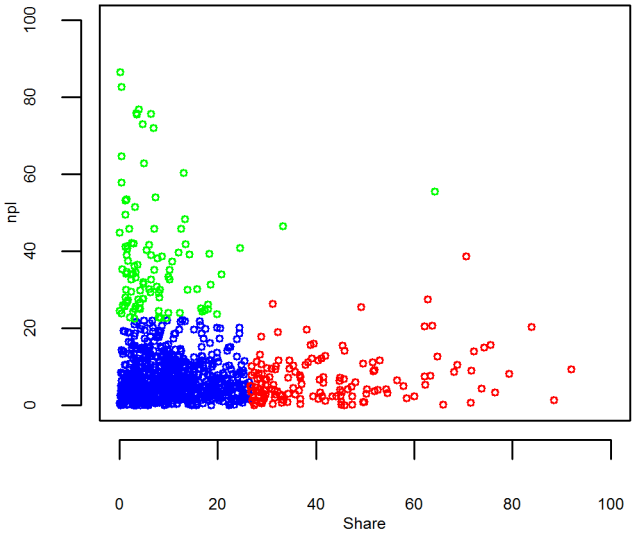
Source: authors' calculations.

Figure 11. Bank clusters in corporate lending

Cluster No.	Share of loan portfolio in assets, %	Overdue loans, %	Number of banks
1	0.8	-0.3	480
2	-0.8	-0.1	415
3	-0.4	3.0	67

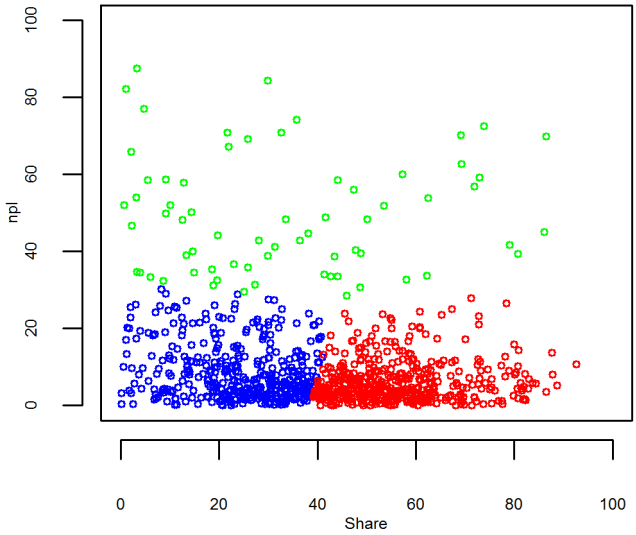
Source: authors' calculations.

Figure 12. Bank clusters in retail lending



Source: authors' calculations.

Figure 13. Bank clusters in corporate lending



Source: authors' calculations.

The distribution densities for individual measures of growth rate stability for all clusters of corporate and retail loans are given in Appendices 3 and 4. Significantly, the convergence of loan portfolio growth rates can be observed primarily in clusters characterised by a relatively low proportion of overdue loans in both corporate and retail lending. At the same time, in the clusters of banks characterised by a relatively high proportion of overdue loans, we can identify a division into two groups - those with a more stable rate of lending growth, and those for which the volatility of the loan portfolio growth rate remained high, often due to the size of the bank itself, after the policy launch.[13]

The regression analysis confirms that the banking sector resolution had a considerable positive effect on stability of corporate lending. The regression equations elaborated for evaluation of the policy's influence on the BSS within the above clusters show that a significant effect was achieved for the whole sector thanks to clusters 1 and 2 (Appendix 5). The effect of the policy was insignificant for cluster 3 in any of the model specifications.

Significantly, we have included our competition indicator in the model as one of the regressors. We have used the size of the rate spread for deposits maturing in one to three years and for loans maturing in more than three years, because these two product types constitute more than three quarters of the banks' total corporate loan portfolios. We obtained a positive sign in all the assessed models, which speaks in favour of the competition-fragility model. However, we believe

[13] The empirical distribution was calculated on the basis of individual measures of stability, weighted according to the bank size.

that this conclusion is preliminary and requires further verification – firstly, using alternative indicators for the measurement of competition and stability in the banking sector. The empirical literature has no consensus about the best indicator for measuring competition and stability, therefore the next step in this study is to test the obtained results for robustness.

Table 2. Regressor of BSS on dummy-variable of the banking sector resolution policy

Dependent variable = indicator of banking sector stability (RBS), calculated on a monthly basis from January 2011 to April 2017					
Variable	Proxy	β	t-statistic	β	t-statistic
Free member		1.37	2.61**	2.27	4.21***
Competition	log(rate spread for corporate loans maturing in 1-3 years)			0.13	4.23***
	log(rate spread for corporate loans maturing in more than 3 years)	0.06	2.61**		
BoR policy	Dummy (1=from October 2013 to present)	0.05	2.37**	0.04	2.27**
Oil	Δ log(oil)	-0.03	0.70	-0.05	-0.58
Portfolio structure	log(proportion of short-term lending)	-0.27	-2.24**	-0.48	-3.83***
F-statistic		11.73***		15.92***	
R^2 – adjusted		0.36		0.44	

Note: ***, ** and * – the significance of the coefficient at 1%, 5% and 10% respectively.

Conclusion

We have assessed the effect of the Bank of Russia's banking sector resolution policy on the dynamics of competition and volatility of lending in the banking sector. Our analysis shows that the break in the dynamics of competition, as measured by interest rate spread, is statistically insignificant for some banking services markets. At the same time, in the banking services markets where the deviation is significant, it can be attributed to factors unrelated to the Bank of Russia's policy. Furthermore, after the policy was launched the volatility of both corporate and retail lending decreased, both in clusters of banks characterised by a relatively low level of overdue loans and clusters of banks characterised by a relatively high level of overdue loans. Thus, the Bank of Russia's banking sector resolution policy did not have a significant negative effect on competition in the period under review. At the same time, the volatility of lending growth rate decreased boosting stability of the banking system.

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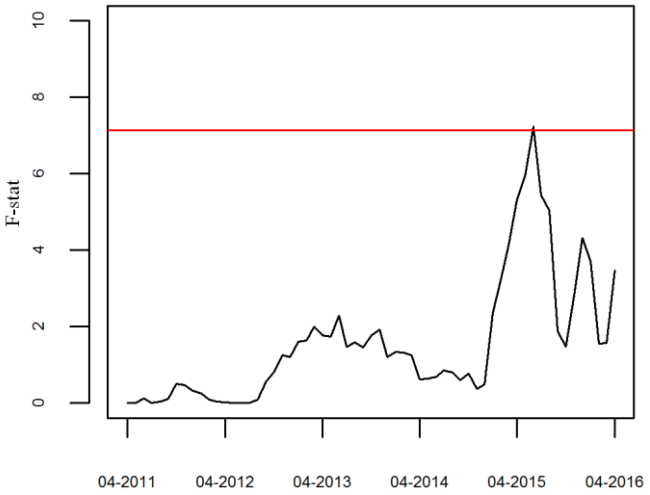
Appendices

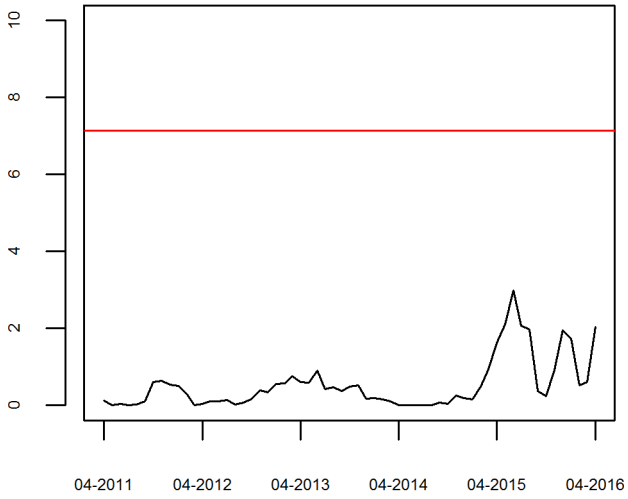
Appendix 1. Value of the F-statistic and critical level of significance when testing the break in interest rate spread dynamics…

Figure 14. … for household deposits maturing in 1-3 years



Source: authors' calculations.

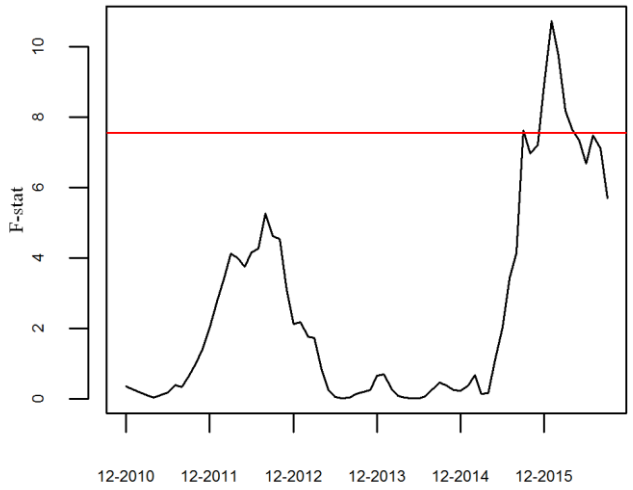
Figure 15. … for household deposits maturing in 1-3 years, adjusted for oil price movements



Source: authors' calculations.

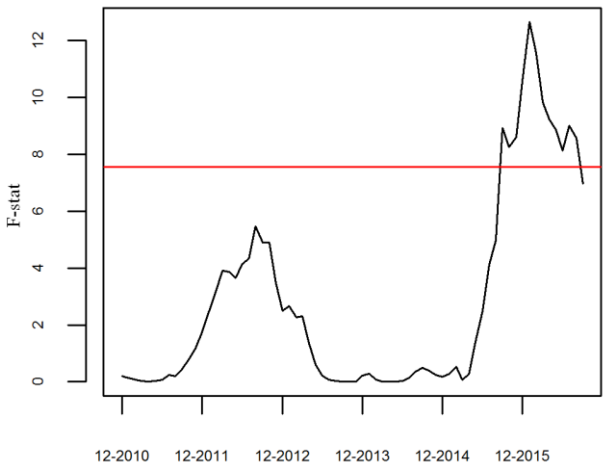
Note: the dynamics of interest rate spread were made stationary by taking the first differences. The tests include the residuals from AR(1) in Figure 14 and residuals from AR(1) and oil prices in Figure 15.

Figure 16. … for household deposits maturing in more than 3 years, adjusted for oil price movements



Source: authors' calculations.

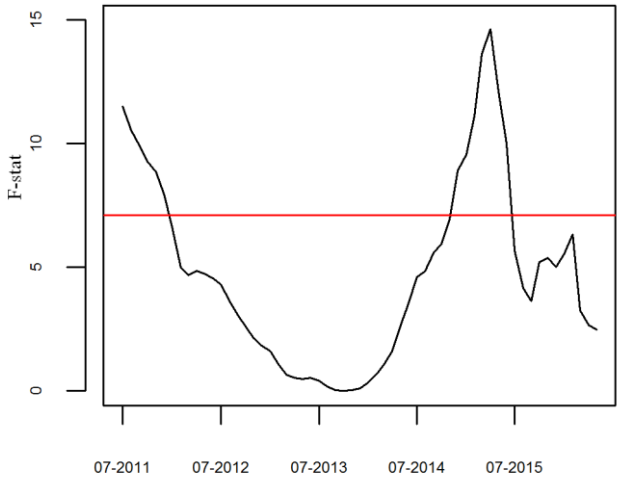
Figure 17. … for household deposits maturing in more than 3 years, adjusted for oil price movements and BoR policy



Source: authors' calculations.

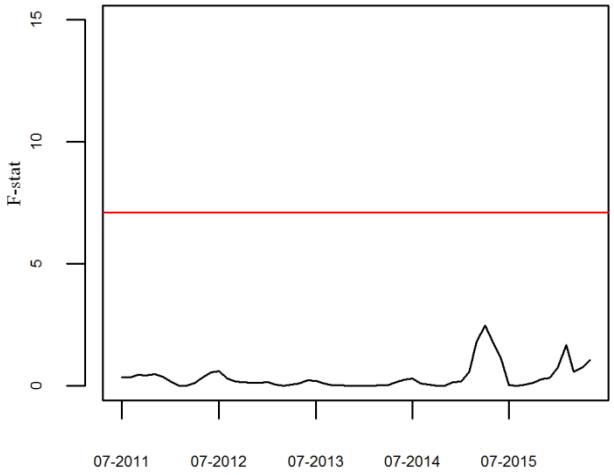
Note: the dynamics of interest rate spread before the break identified by the Chow test are stationary. The tests include the residuals from the regression of interest rate spread on oil prices (Figure 16), oil price and the policy dummy (Figure 17).

Figure 18. … for corporate loans maturing in more than 3 years



Source: authors' calculations.

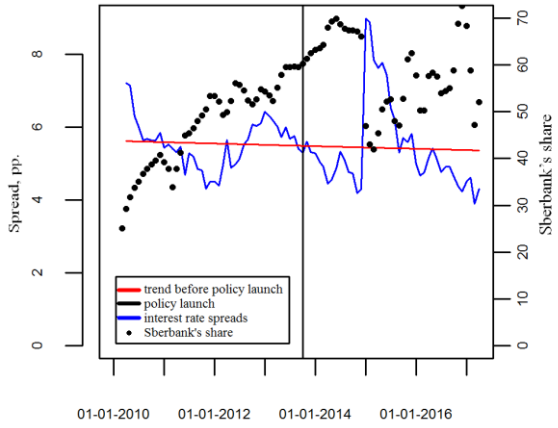
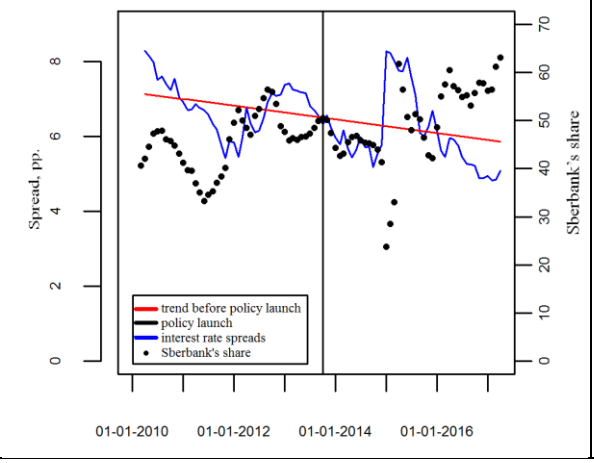
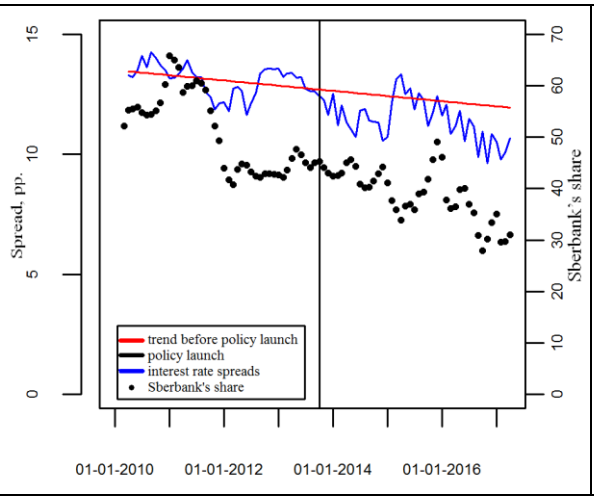
Figure 19. … for corporate loans maturing in more than 3 years, adjusted for oil price movements

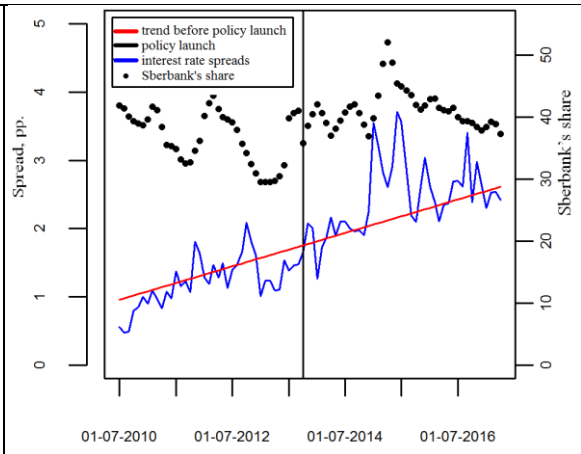
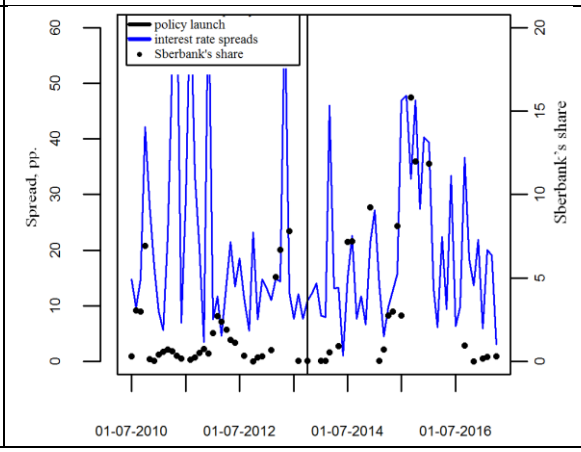
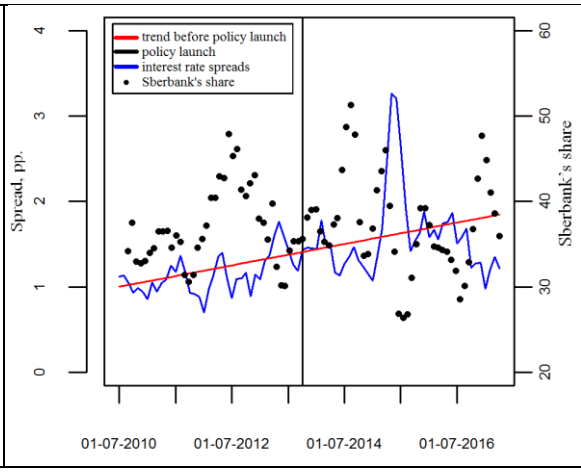


Source: authors' calculations.

Note: the dynamics of interest rate spread are stationary before the break identified by the Chow test. The tests include interest rate spread (Figure 18) and the residuals from the regression of interest rate spread on oil prices (Figure 19).

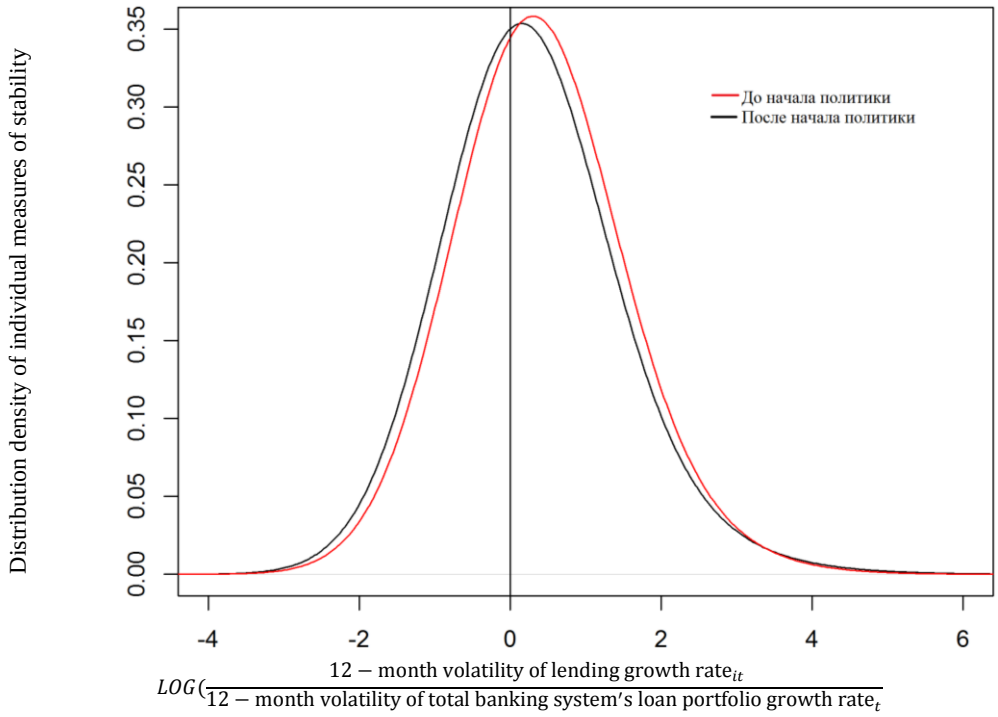
Appendix 2. Testing for a structural break in the interest rate spread

Market	Dynamics of interest rate spread	Conclusion
Household ruble deposits		
91-180 days		• The Chow test identifies a break in December 2015 (p-value: 0.004). • Unit root tests identify stationarity of the series at the 5% significance level before the break (PP test p-value: 0.02; ADF test p-value: 0.025). • Breakpoint unit root test with an exogenous break in December 2015 points to the insignificance of the break in the value of a constant.
181-360 days		• The Chow test identifies a break in January 2016 (p-value: 0.000). • Unit root tests before the break indicate non-stationarity of the series (PP test p-value: 0.07; ADF test p-value: 0.006). • The Chow test does not identify (p-value: 0.1855) a break in the stationary data (residuals from AR(1)).
Household ruble loans		
1-3 years		• Unit root tests indicate non-stationarity of the whole series (PP test p-value: 0.3592; ADF test – 0.2615). • The Chow test does not identify (p-value: 0.2789) a break in the stationary data (residuals from AR(1)).
Corporate ruble deposits		

31-90 days		• Unit root tests of the whole series indicate that the series is trend-stationary (PP test – p-value: 0.0016; ADF test – 0.0023) • The Chow test does not identify a break in the stationary (detrended) data (p-value: 0.2002).
more than 3 years		• Unit root tests indicate stationarity of the whole series (PP test – p-value: 0.0000; ADF test – p-value: 0.0000) • The Chow test does not identify a break in the initial data of the interest rate spread dynamics (p-value: 0.2129)
Corporate ruble loans		
1-3 years		• Unit root tests of the whole series indicate that the series is trend-stationary (PP test – p-value: 0.0322; ADF test – 0.0042) • The Chow test does not identify a break in the stationary (detrended) data (p-value: 0.1944)

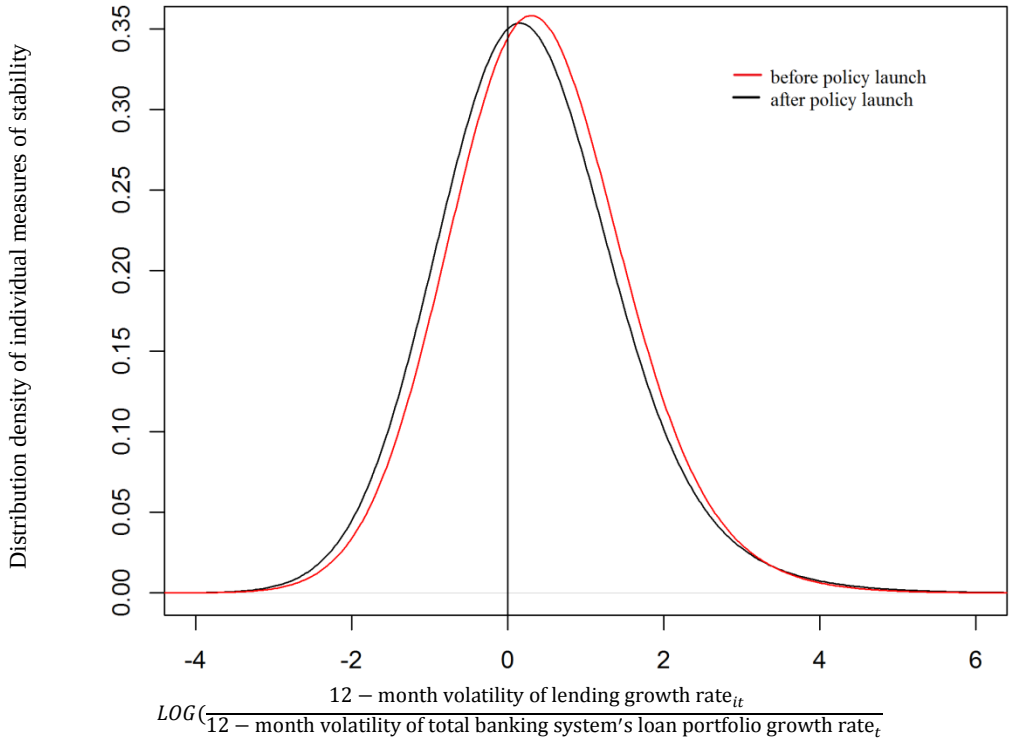
Appendix 3. Empirical distribution of measures of stability for bank clusters in retail lending.

Figure 20. Distribution of individual measures of stability for the retail loan portfolio before and after the policy launch in cluster 1



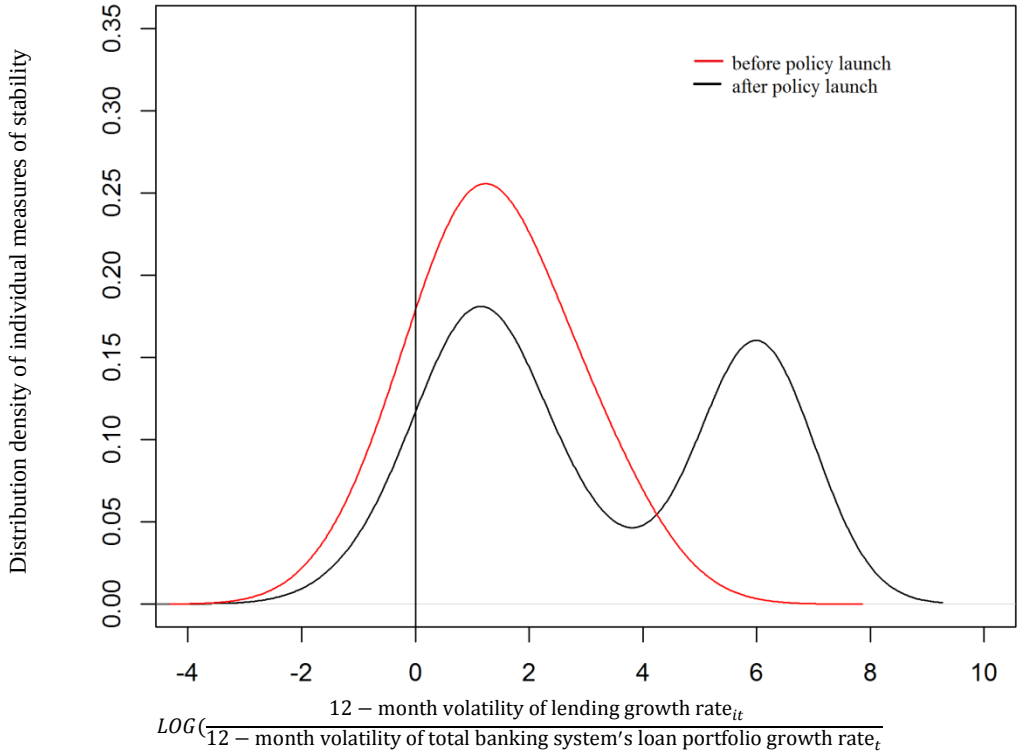
Source: authors' calculations.

Figure 21. Distribution of individual measures of stability for the retail loan portfolio before and after the policy launch in cluster 2



Source: authors' calculations..

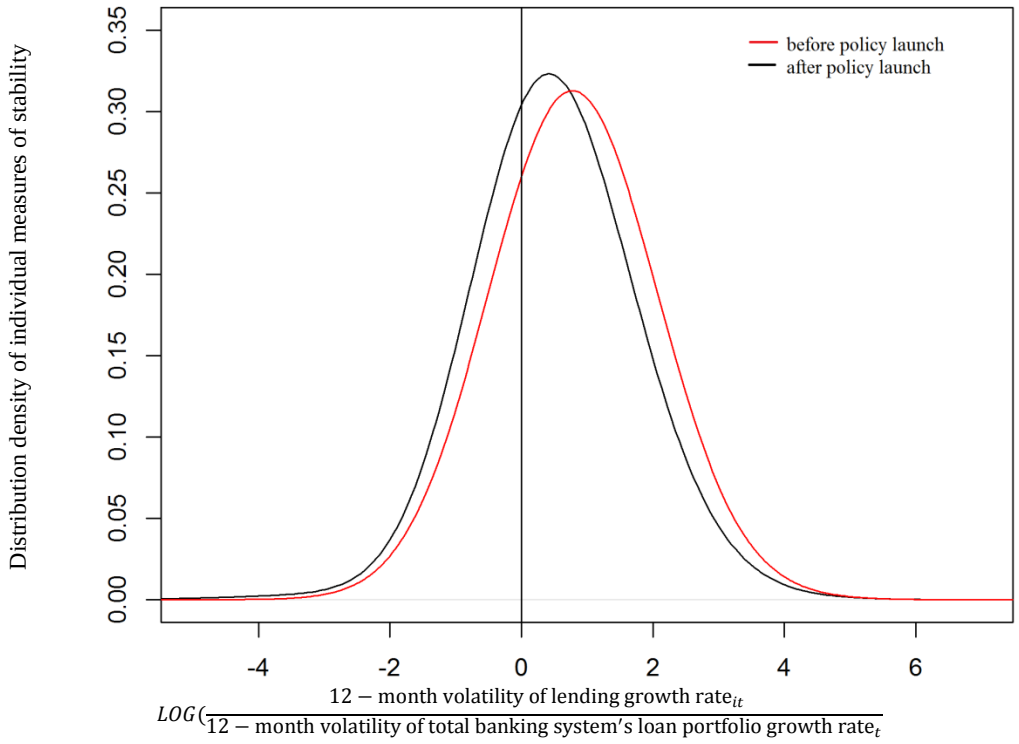
Figure 22. Distribution of individual measures of stability for the retail loan portfolio before and after the policy launch in cluster 3



Source: authors' calculations.

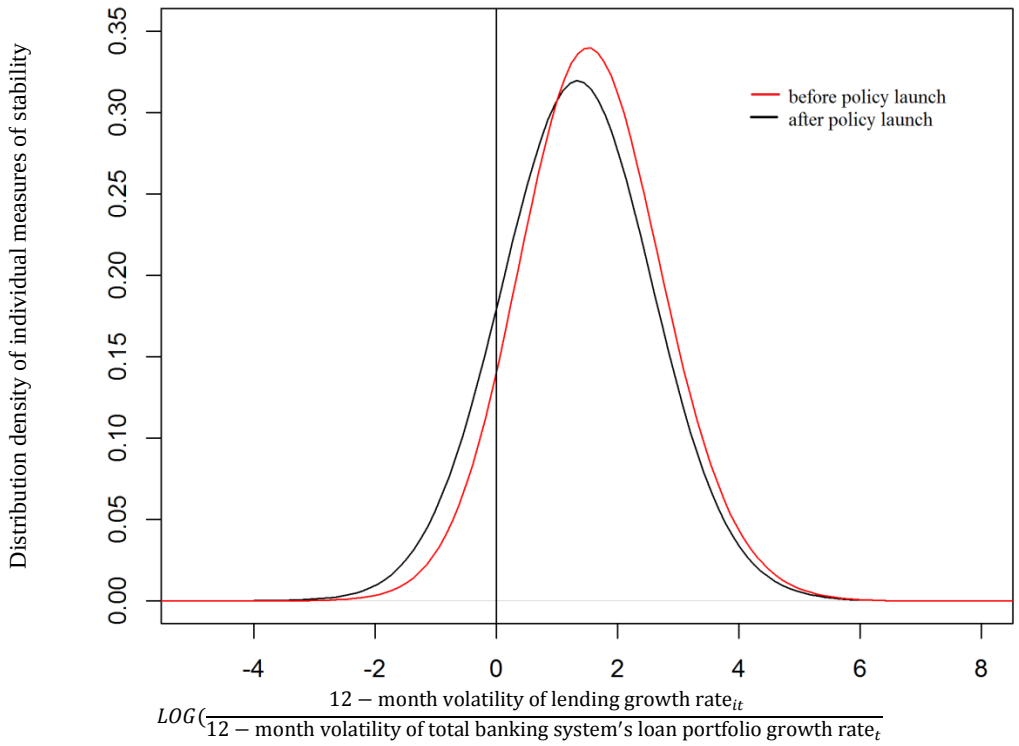
Appendix 4. Empirical distribution of measures of stability in bank clusters for the corporate loan portfolio.

Figure 23. Distribution of individual measures of stability for the corporate loan portfolio before and after the policy launch in cluster 1



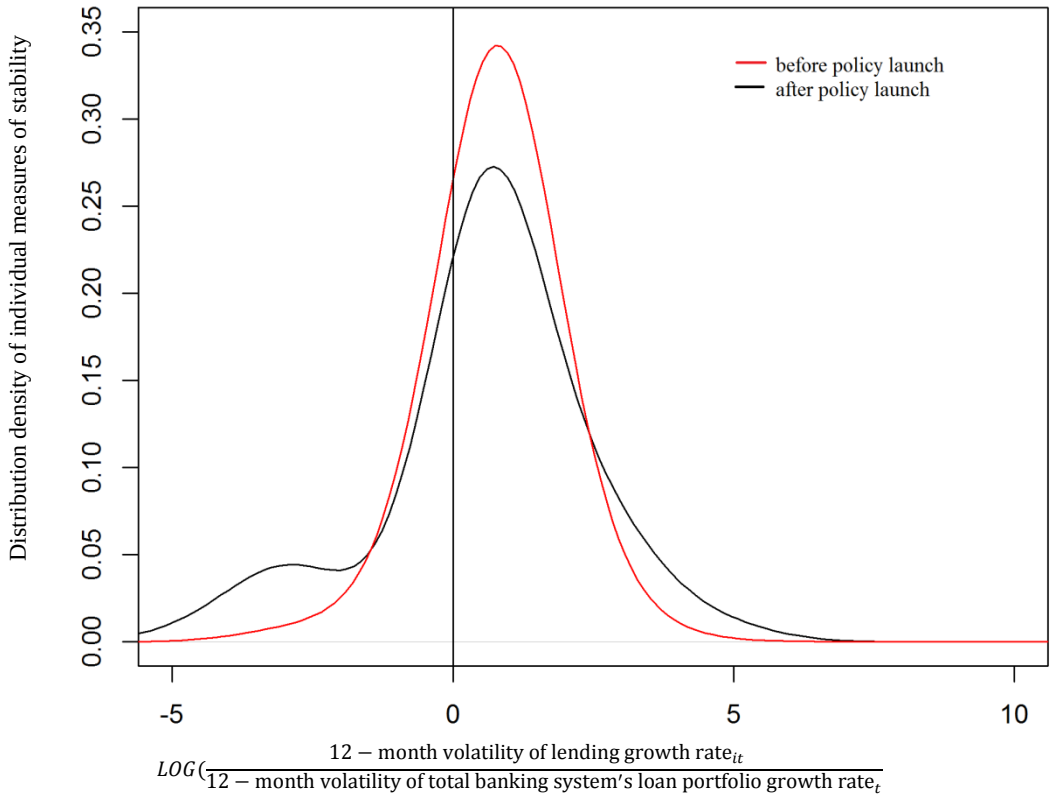
Source: authors' calculations.

Figure 24. Distribution of individual measures of stability for the corporate loan portfolio before and after the policy launch in cluster 2



Source: authors' calculations.

Figure 25. Distribution of individual measures of stability for the corporate loan portfolio before and after the policy launch in cluster 3



Source: authors' calculations.

Appendix 5. Regression analysis in clusters 1 and 2

Cluster 1: 'Successfully specialised banks'

Dependent variable = indicator of banking sector stability (BSS), calculated on a monthly basis from January 2011 to April 2017					
Variable	Proxy	β	t-statistic	β	t-statistic
Free member		2.46	4.078***	1.61	2.725***
Competition	log(rate spread for corporate loans maturing in 1-3 years)			0.05	2.218**
	log(rate spread for corporate loans maturing in more than 3 years)	0.13	3.882***		
BR policy	Dummy (1=from October 2013 to present)	0.03	1.497***	0.03	1.793*
Oil	Δ log(oil)	-0.03	-0.352	-0.02	-0.211
Portfolio structure	log(proportion of short-term lending)	-0.51	-3.672***	-0.32	-2.326**
F-statistic		11.49***		8.03***	
R^2 - adjusted		0.36		0.28	

Note: ***, ** and * – the significance of the coefficient is evaluated at 1%, 5% and 10% respectively.

Cluster 2: 'Successfully non-specialised banks'

Dependent variable = indicator of banking sector stability (BSS), calculated on a monthly basis from January 2011 to April 2017					
Variable	Proxy	β	t-statistic	β	t-statistic
Free member		0.72	2.73***	1.10	3.89***
Competition	log(rate spread for corporate loans maturing in 1-3 years)			0.06	3.902***
	log(rate spread for corporate loans maturing in more than 3 years)	0.04	3.50***		
BR policy	Dummy (1=from October 2013 to present)	0.03	3.372***	0.03	4.035***
Oil	Δ log(oil)	-0.05	-1.092	-0.04	-1.034
Portfolio structure	log(proportion of short-term lending)	-0.16	-2.675***	-0.25	-3.802***
F-statistic		21.58***		23.00***	
R^2 – adjusted		0.53		0.54	

Note: ***, ** and * – the significance of the coefficient is evaluated at 1%, 5% and 10% respectively.