Central Bank Liquidity Provision and Segmentation of Collateral Markets

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Abstract

Collateral frameworks operated by central banks are at the core of financial stability and monetary policy implementation. As the lender of last resort, a central bank protects itself from excessive credit risk with eligible collateral. However, the acceptability of assets in refinancing operations can distort asset pricing and concentrate liquidity-constrained banks in the segment of pledgeable debts. The empirical analysis of these effects is hampered by difficulties in identification: shifts in collateral frameworks usually coincide with changes in the credit risks of the debt issuers. In this paper, I address these challenges and trace the outcomes of the collateral policy amendment that took place in Russia in 2015. For identification, I build a novel dataset on Russian municipal credit markets and exploit the particularities of the institutional setup where multiple potential lenders compete for the same credit contracts in English auctions. In a difference-in-difference setting, I document the pricing effect of the collateral framework: as long as their liabilities are pledgeable under the updated refinancing program, the borrowers earn, on average, an interest rate discount of 0.8pp. I then analyze a simple mechanism of bank competition that drives the price differential. I first show that in the auctions allocating collateralizable contracts, it is liquidity-constrained banks who offer lower interest. I also demonstrate that short-in-liquidity banks affect pricing indirectly by competing more frequently for eligible assets. As a consequence, financially weak institutions win competition more often when they compete for collateralizable debts. The effects are robust to a wide range of tests, including a control for unobservable heterogeneity at the level of a loan contract. These results suggest that, by changing the network of borrower-lender relationships, collateral frameworks affect the pricing of eligible assets and bank concentration risks.

Keywords: central bank collateral framework, liquidity provision, financial stability, lender of last resort, asset liquidity

JEL classification: G01, G21, G28, E58

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1 Introduction

Liquidity provision mechanisms operated by the central banks are at the core of financial stability and monetary policy implementation. In most modern economies injection of high-powered money into the financial system occurs fully or partially via central bank lending to commercial banks against eligible collateral assets. Aimed at maintaining the money rate close to the required levels, liquidity injections directly affect the aggregate amount of central bank money as well as its distribution across the market participants.

It is generally accepted that segmented money markets can severely harm banks supply of credit to the real sector. Viewed from this perspective, central bank collateral framework that allows efficient distribution of liquidity in the money markets is an integral part of monetary and financial stability policy. What is less understood, however, is the reaction of the markets of pledgeable assets on the shifts in the collateral policies. This paper demonstrates that a somewhat standard aspect of central bank operations — collateral framework — may alter bank competition and credit supply and, hence, can materially affect asset pricing and concentration of lenders in the segment of collateralizable assets.

In spite of its importance to monetary systems, collateral framework analysis frequently stays outside of academic attention. The scarcity of the required data as well as the general difficulty of empirical identification of the relevant effects are, presumably, the main reasons for a lack of applied research in this field. Relative opacity and versatility of existing collateral frameworks present additional problems for empirical studies. In this paper, I try to address these challenges by tracing the consequences of collateral policy change that took place Russia in February 2015. Faced with shrinking collateral base comprised of marketable securities, the Bank of Russia (BoR) announced a list of entities — regional and local governments — whose non-marketable debts were said to constitute eligible collateral in the refinancing operations. I show that the policy induced significant fragmentation of the underlying credit markets and drove a wedge between the borrowers of different eligibility status. To demonstrate this, I first use difference-in-difference setup and show that the BoR decision created a gap in the costs of credit of the two types of borrowers. In contrast to the non-eligible claims, collateralizable debts received an additional 0.8pp discount after the introduction of the policy.

Second, I provide further evidence that the above-mentioned interest rate gap is not driven by confounding factors, in particular, changes in the borrower credit risks. To do this I explore the details of the institutional setup which allows to observe the interest rates offered by *all* the lenders competing for the *same* loan contract. Accounting for unobservable loan heterogeneity, I demonstrate that in the eligible collateral segment the most attractive loan conditions were offered by the banks that strongly depended on the central bank funding or had high rates of marketable collateral utilization. As a consequence, the constrained banks won competition more frequently. Hence, the policy changed the distribution of borrower-lender match, significantly affected the concentration of "weak" lenders in the eligible collateral segment and contributed to the build-up of bank concentration risks.

I next recast the analysis of the credit market segmentation in terms of commonality of borrowers of the competing banks. This approach allows me to quantify the collateral policy effects on market competition from the perspective of network analysis. I show that short-in-liquidity lenders became more central to the competition in the eligible collateral segment as funding constraints crowded out the traditional factors of bank sorting. As a consequence, even when the constrained banks were not to win the competition, their intensified competitive pressure mattered for the determination of the final interest rate and, hence, for the division of economic surplus between the borrower and the winning lender. Effectively, the collateral framework reallocated competition across the market segments and acted as a redistribution mechanism allowing eligible borrowers to enjoy an interest rate subsidy.

These findings contribute to the literature on assets liquidity, money and the effects of interventions in the financial markets. Liquidity provision during a systemic crisis is one of the central topics of theoretical banking. Bhattacharya et al. (1985) point out that liquidity provision is a public good and, thus, can be subject to under-provision by the private sector. Central bank interventions favoring illiquid collateral may further exacerbate the free-rider problem and, as a result, affect the allocation efficiency of the economy. Rochet and Vives (Rochet (2009):Ch. 2) recast Bagehot principle in a model of bank runs within a "global game" approach and show that solvency and liquidity regulation can solve coordination failure — a fundamental driver of bank fragility. Emergency liquidity provision can complement these measures to minimize the social costs of the liquidity crisis. Freixas, Parigi, and Rochet (Rochet (2009):Ch. 3) find that the lender of last resort may be important to the economy even in the absence of contagion risks, albeit, this conclusion depends on the monitoring role of the banks and the quality of market discipline. Bindseil (2013) in a simple model relates liquidity provision to asset fire sales and notes that central bank collateral framework acts as a monetary policy tool, especially when the regulator faces the zero lower bound. This paper contributes to this literature by quantifying the costs of liquidity provision in the form of asset market segmentation and build-up of bank concentration risks.

There is a vast literature on the impact of bank collateral and liquidity constraints on the real sector (Bernanke and Gertler (1989), Kiyotaki and Moore (1997), Khwaja and Mian (2008), Iyer et al. (2013) to name a few), as well as on the spillovers of money market shocks to other financial markets (Nyborg and Östberg (2014), Brunnermeier and Pedersen (2009)). Bindseil, González, and Tabakis (2009) and BIS (2013) provide a comprehensive overview of central bank risk management practices, in particular, on collateral policy. However, with a few exceptions, the empirical literature on the effect of liquidity provision on the collateral markets is rather scarce.

Bindseil, Corsi, et al. (2017) acknowledge the importance of collateral frameworks in central bank activity by noting that "[it] is important not only for risk protection and the feasibility of central bank credit operations but also for financial conditions, financial stability and the transmission mechanism of monetary policy, in particular in stress situations". The authors outline market neutrality as one of the main principles underlying well-functioning collateral framework and note that "a collateral framework should not lead to the preferential treatment of distinct asset classes,

issuers or sectors and should avoid market distortion (implying that, e.g., individual issuers or sectors benefit unduly from eligibility requirements)". In this paper, I provide empirical evidence suggesting that a collateral framework distorts asset prices when the banking sector faces material liquidity risks.

Nyborg (2017) presents a detailed description of the ECB collateral framework and argues that it may impair market discipline and encourage overproduction of illiquid assets. Fecht et al. (2016) document existence of systemic arbitrage whereby weaker banks shift part of their credit risk exposure to the central bank by borrowing from it against low-quality collateral. Drechsler et al. (2016) document risk shifting of weakly capitalized banks that relied on the LOLR funding during the European sovereign debt crisis. Perhaps, the closest paper in terms of the questions I try to address is by Van Bekkum, Gabarro, and Irani (2016) where authors examine a change in the ECB collateral policy and document its impact on bank risk-taking in the Netherlands. I contribute to their discussion by exploring granularity of the data that allows me to isolate the role of credit supply. I further argue that the predominance of price or quantity effect is likely to be highly dependent on the elasticity of credit demand. Given that within a particular borrower class the demand is rather insensitive to the interest rate, the largest effects are likely to be observed in the rate differential and not on the quantity side. In other words, the perspective of "over-pricing" of collateralizable assets may be a more precise description of the asset markets rather than "over-production" of illiquid collateral.

The view that collateral frameworks may materially distort private markets is not without criticism. Thus, Bindseil and Laeven (2017) argue that this view "is misguided, and misses the bigger picture of the role of the lender of last resort". They argue that since the central bank is never liquidity constrained it should act as a natural counterparty to banks in crisis times. To protect the central bank from credit risks, the lending must be sufficiently collateralized. Even though this liquidity insurance may distort the incentives of banks to store liquidity *ex-ante*, these costs may be mitigated with an adequate regulation and disincentives to the central bank credit.

In this paper, I document another, in a way, a more basic effect of the collateral policy. It is true that a central bank is not constrained in the amount of high-powered money it can create to meet the demand of the private sector. However, as a risk-averse institution, the bank may still be "constrained" by the amount of credit risk it is willing or capable to accept on its balance sheet when lending to commercial banks. A collateral framework is a measure to cope with this risk, i.e. to preserve central bank capital and, hence, its independence. Then, even if liquidity regulation is optimal *ex-ante*, it may have redistributive consequences *ex-post*, when markets value some assets more than the others because of their collateralizability in the central bank refinancing operations. Relatedly, the collateral framework may affect bank sorting in different segments of the credit market and, thus, funnel bank liquidity risks on a small number of pledgeable issuers. If the latter include entities in a weak financial position, the collateral policy may force matching of liquidity constrained lenders with economically vulnerable borrowers and, thus, generate additional systemic risks.

In the theory of money, the recent developments of the new monetarist approach by Lagos and Wright provide search-theoretic foundations of the liquidity premium attached to the assets performing functions of money in trade (Kiyotaki and Wright (1993), Lagos and Rocheteau (2009)). In this framework asset liquidity ("moneyness") arises endogenously as a response to the underlying search frictions (Nosal and Rocheteau (2011)). The liquidity premium is larger for the assets that provide easier access to the means of debt settlement — central bank money in the context of this paper. In this paper, I quantify the discussed liquidity structure of asset yields induced by monetary policy via the pledgeability of financial claims.

The rest of the paper is organized as follows. In section 2 I describe institutional setting and discuss identification strategy. Section 3 is devoted to data description with the details of data construction provided in Appendix A. The main results are presented in Section 4. Section 5 concludes.

2 Institutional Setting and Identification

Central bank collateral framework is likely to affect the primary asset markets in a specific setting. First, banks have to value publicly supplied liquidity on top of the privately obtained funds which, in its turn, may happen when the sector faces the risks of systemic liquidity crisis (high demand for collateral). Second, the volume of collateral base must be sufficiently limited for this excess liquidity demand to result in a measurable price wedge rather than in an expansion of asset list utilized as collateral (low supply of collateral and its substitues). Finally, the institutional setup has to allow for high level of bank competition to generate actual price variation across collateralizable and non-collateralizable assets and, hence, segment the asset markets. These are exactly the conditions that characterize the situation in the Russian money and municipal credit markets in the end of 2014–beginning of 2015 — the central period of study of this paper.

Until 2015 the Russian banking sector heavily relied on foreign funding. The largest russian banks would try to exploit unusually low interest rates in the European markets and attract credit abroad. Over the next few months, the funding structure changed dramatically with the Bank of Russia becoming the center of financial activity. The reason was not in the financial sector itself. Pursuing its geopolitical interests, the Russian government was faced with an ever-increasing political and economic isolation. Soon after an unfortunate escalation of the political tension in July 2014, the country's leading economic partners — including the EU and the US governments — imposed and reinforced a series of sanctions on the local economic agents. The sanctions, among other things, included a prohibition to "buy or sell new bonds, equity or similar financial instruments with a maturity exceeding 30 days, issued by five major state-owned Russian banks", as well as a ban on provision of "loans [of the same maturity] to the entities described above" (EU (2016)). Although the Russian banking sector traditionally was a net exporter of capital and, thus, in principle could finance its debt repayments by selling off its foreign assets, the uncertainty about *immediate* refinancing needs spurred counter-party risks and brought forward expectations of the BoR as the main intermediary in the refinancing process.

The BoR assumed an even more important role in the second half of 2014 when the price of oil — the main export good of the Russian economy — collapsed to the levels unseen since the 2008–2009 crisis. Faced with an increased risk of ruble depreciation, BoR abandoned its policy of managed FX rate float (that, essentially, capped daily volatility in FX markets without targeting any particular level of the exchange rate), and left the local currency in the regime of free float. During the year 2014 ruble lost about half of its value against the US dollar — a noticeable contribution to the banks' refinancing needs directly linked to their dollar denominated debts.

By the end of the year, the BoR was using all available mechanisms of liquidity provision to address country's quaking money markets. First, in a series of adjustments of its collateral framework, the BoR inflated the collateral base of marketable securities; this was done both on the extensive margin — by including new securities in the list of assets eligible for refinancing under standard repo arrangements, as well as on the intensive one — by dwarfing the haircuts. Having a considerable amount of foreign reserves, the Bank also set up FX repo mechanisms to lend the much-needed dollar liquidity to commercial banks on the short- and medium-term basis. The FX liquidity risks were partially transferred to the Bank's balance sheet via FX swaps. Finally, the Bank opened up (though, never used in practice) unsecured lending programs. Fig. 1 plots some of the macro variables illustrating the economic conditions of that period.

[Figure 1 about here.]

Expansion of liquidity supply by the Central Bank put an immense pressure on the collateral function of marketable securities. The fragility of money markets can be illustrated with a case of Rosneft, the country's largest oil extracting and refining company, issuing bonds with the face value of $11.5bn. in the midst of December run on the ruble. The deal was announced and completely booked on the same day, and the next day the BoR included the newly issued bonds in the eligible collateral list. The opacity of the deal and the fear that the new collateral would be available to a very limited set of market players fostered more panic in the wholesale and retail FX markets. BoR replied by drastically increasing the key rate from 10.5% to 17% over the following night, which cut the market value of pledgeable securities even further. The country met its winter holidays with arid money markets.

Repo refinancing against marketable securities was not the only mechanism employed by the BoR. Warning market participants in its annual Financial Stability Review that the rate of collateral utilization could hit 80% in 2015, the Bank announced an expansion of the program of lending against *non-marketable* claims[1]. The latter included claims on state entities, as well as claims on the largest corporates that met the credit quality requirements established by the Bank. These claims generally fell into two categories: direct credit claims on the above-mentioned organizations, as well as claims on other nonfinancial firms guaranteed by the eligible entities. Under this mechanisms, the liquidity was distributed via regular auctions as well as auxiliary irregular

[1]The Bank did accept gold and other precious metals as collateral, but the share of the loans backed in this way was small.

auctions and permanent access liquidity arrangements. While the aim of the latter was to insure the market against the risks of systemic illiquidity, the former was used primarily to meet the demands of mid-term funding. By doing this BoR aimed to increase the efficacy of its main overnight refinancing operations, i.e. to keep the money market rate close to the key rate and to ensure free access to liquidity across all segments of money markets.

The Bank formulated and clarified its view on the collateral framework in its decree OD-406 issued on the February 24th, 2015 (CBR (2015)); the decree amended the earlier version of the law regulating liquidity provision. The document lists organizations — municipal and regional governments — whose debts were allowed to be pledged in the BoR under the refinancing arrangements backed by non-marketable assets. Originally the list contained sixty-five entities: 14 cities, 2 federal level cities, and 49 regions. The list was subsequently amended in July 2015 with another six organizations (1 city and 5 regions) (see Appendix B for the list of eligible issuers). The framework stipulated that any claim on these organizations (direct credit claims or guarantees to third parties) were pledgeable in the BoR with no extra significant checks and requirements. At the same time, claims on the other local governments were excluded from refinancing. The BoR also accepted debts of private organizations as collateral; however, these credit claims were to be thoroughly scrutinized for associated risks before any decision was taken on collateralizability of these contracts. While this did not completely exclude the chances of non-eligible debts being used in refinancing, in practice this was likely to create substantial costs and risks of not obtaining access to the central bank funds. Therefore, I compare the credit market outcomes for these two groups of local governments labeled as "eligible" and "non-eligible" issuers as specified in the BoR decree.

State entities of all levels in Russia are obliged to acquire goods and services via a procurement system which makes all contract details and related competition outcomes available for a general public. Most of the contracts are allocated via auctions or related mechanisms. Provision of credit by commercial banks is considered to be one of these services and it is allocated via English type auctions. Importantly, it is unlikely that the the collateral policy shift affected the *demanded* quantity of credit. In particular, with a few exceptions local and regional governments in Russia rely on private credit markets to finance their short- and mid-term deficits. The federal government policy of increasing social support funneled a large chunk of expenses on the local budgets; however, this was not accompanied by a commeasurable increase in the federal subsidies. The resulting local budget deficit generated a steady inelastic demand for external finance[2].

I employ the difference-in-difference setup to trace the effects of the collateral framework amendment on the regional and municipal public credit markets. I first analyze the overall market

[2]The contract level credit data is, in principle, available for the analysis (see the next section for a description of the public credit data and Appendix A for the details of its construction). Unfortunately, no disaggregated or structured data is available neither for the guarantees issued by the local governments nor for private credit markets, so I do not include these collateral segments in the analysis.

outcomes by estimating a model of the form

$$y_i = \beta d\{t \in P\} + \delta d\{t \in P, b \in E\} + x_{bt}\gamma + \theta_b + \epsilon_i, \quad (1)$$

where i indexes the credit contracts, $b = b(i)$ is a mapping of contracts to borrowers with E denoting a subset of issuers whose debts constitute eligible collateral in BoR, $t = t(i)$ is a mapping of contracts to their scheduled bidding dates with P denoting a set of auction dates ranging from the effective date of collateral amendment (February 26th, 2015) until the end of 2015 (the end of sample), θ_b is borrower fixed effect, and ϵ_i is unobserved error component of the credit market outcome y_i; $d\{\cdot\}$ indicates the true value of its argument[3].

As it was mentioned before, the BoR expanded the collateral base further in July 2015. I do not rely on this policy shift in the identification strategy due to a small number of the second wave contracts allocated during all three subsets of the auction dates. More importantly, it is very likely that the second wave amendment was expected by market participants long before it became effective, which, in its turn, could affect the competition in soon-to-be pledgeable debts *ex-ante*. Inclusion of these contracts in either "treatment" or "control" group would contaminate any of them and bias the estimate of the policy effect towards zero.

As in any difference-in-difference application, the object of interest is the estimate of δ coefficient that is thought to capture policy effects. I mostly focus on the price of credit (maturity-adjusted interest rates) determined in the bidding process of each contract: the winning and second bid interest rates serve as direct indicators of the liquidity premium that market assigns to collateralizable assets. When estimating δ via non-structural approach, one has to condition the estimates on the competition of multiple banks as it allows to (partially) reveal lenders valuations otherwise censored by reserve prices of the borrowers. Relatedly, in the following analysis, I do not treat as controls auction characteristics, in particular, the reserve rate (maximum interest rate admitted by a borrower). Any theoretical auction model considers reservation price to be endogenous and, in the simplest case, derives it as a solution to a nonlinear equation in the reserve value and distribution of buyer valuations. While the reserve rate clearly affects the number of auction participants and, as a consequence, the outcome price, it is assumed to be set up in the maximization of expected revenue (minimization of expected costs) and, thus, not predetermined with respect to auction outcomes.

To account for potential differences in the outcomes across heterogeneous contracts I include in the regression a vector of observables x_{bt} capturing borrower-related controls and general macroeconomic conditions. The most important reason to include controls is to try to account for differences in y_is stemming from factors confounded with "treatment" assignment. Thus, it is reasonable to assume that the BoR as an extremely risk-averse institution included in the eligi-

[3]Variable indexing is thought to highlight the structure of the data that is different from a typical panel data setup normally employed in the studies of policy effects. I.e. I do not observe bidding for the same contract i in multiple time periods but rather bidding for a set of contracts of the same borrower $b = b(i)$ throughout the sample period; also, occasionally a borrower may post several contracts on the same date t, so that in the full sample the set of $t = t(i)$ with $i \in \{i : b(i) = b\}$ does not necessarily span multiple dates.

ble collateral list only the issuers that had the lowest credit risks. The estimated δ, in this case, may capture the *changes* in the credit risk spread between the safe and less secure credit claims, i.e. widening credit risk premium which could happen independently on the Bank's policy decision. The concern is mitigated, at least partially, if the controls are informative on the borrower's creditworthiness.

Furthermore, I employ borrower fixed effects estimation to account for unobservable borrower-level heterogeneity. Some borrowers may be structurally less risky due to the strength of their local economies, or because of their role and importance in the budgetary system of Russia. Yet another issuer may implicitly rely on the guarantees provided by the federal government. Finally, one may raise concerns that, when amending the collateral policy, the BoR was implicitly targeting a subset of banks based on their existing claims on the public sector. Fixed effect estimator is consistent to the extent the decision of BoR on the eligibility list was based on these rather time-invariant features of the issuers.

To push identification one step further and to highlight the mechanism behind interest rate differential I focus on the within-contract variation of the competition outcomes and estimate the following equation:

$$y_{il} = \alpha r_l + \beta_p d\{t \in P\} r_l + \beta_e d\{b \in E\} r_l + \delta d\{t \in P, b \in E\} r_l + x_l \gamma + \phi_i + u_{il}, \quad (2)$$

where l indexes lenders, x_l is a row vector of bank controls, and ϕ_i is a contract fixed effect. The bank-level variable r_l is thought to capture the liquidity or collateral constraint of bank l when entering the post-amendment period. In this specification, the tripple interaction coefficient δ shows whether the constrained banks bid differently for the contracts that open an easier access to the central bank funds than for the non-eligible credit claims in comparison with the unconstrained ones (net of a similar difference in the pre-amendment period).

This specification highlights the role of bank competition for pledgeable assets. In principle, the constrained banks could decide not to compete for collateralizable assets *ex-ante* and to obtain the necessary liquidity in crisis times in the private markets via the unconstrained lenders. By doing so, the constrained banks would not have to incur the costs of competition, in particular, lower interest income. At the same, they might become more exposed to liquidity risks had their healthier competitors decided to cut interbank lending in crisis periods. The alternative option for the constrained lenders would be to bring the collateralizable assets on their balance sheet by competing for them more intensively with the unconstrained creditors *ex-ante*. The triple difference specification (2) is thought to capture these hypothesized changes in bank competition and market outcomes driven by bank liquidity constraints.

Introducing the contract fixed effect ϕ_i in the triple difference equation (2) eliminates any component of variation common to all potential lenders of a given contract i. This, arguably, mitigates most of the concerns about borrower-specific changes in creditworthiness that might be correlated with its inclusion in the eligible collateral list. That is, the contract fixed effects estimator is consistent if, conditional on the observables x_l, the liquidity constraint measure r_l is

not correlated with contract-specific risks beyond those that are common to all competitors (ϕ_i).

I next implement the analysis of bank sorting in the collateral markets. While the previous analysis is focused on the differences in bank behavior within an auction conditional on their participation, it remains salient about the selection of banks into particular market segments. The argument behind using the second bid in the eq. (1) as an indicator of actual valuations (preferences) for liquid contracts relies on auction theory. Here, instead, I use network perspective to analyze potential homophily in preferences (and, hence, credit supply) of constrained in liquidity banks. The latter may exhibit similar preferences for eligible collateral and, thus, sort into specific borrower markets more frequently than the unconstrained ones. If this selection is strong, sorting of specific lenders into some segments of the markets may severely affect redistribution of the borrower-lender match surplus — even in the cases when the constrained banks did not win the competition. That is, since liquidity value may re-channel competitive pressure towards the eligible debts markets, the unconstrained lenders would be forced to put aside a part of their surplus in order to outbid the constrained-in-liquidity banks. Although this competition would directly benefit the borrowers, the outcomes are quite likely to be the opposite in the markets of non-eligible collateral. In short, collateralizability may serve as an attractor for short-in-liquidity lenders, and by reallocating their competition it may also redistribute the economic surplus and funding risks among the ultimate debt issuers.

To formalize the idea of bank sorting within the difference-in-difference approach, I turn to a bank pair setup and estimate a model of the form

$$y_{lks} = \beta_s r_{lk} + x_{lk}\gamma_s + \alpha_{ls} + \alpha_{ks} + e_{lks}, \tag{3}$$

where l and k index a pair of banks, $r_{lk} = r(r_l, r_k)$ and $x_{lk} = x(x_l, x_k)$ are dyad-level measures of liquidity constraints and control variables, both symmetric in their arguments, and αs and e are bank fixed effects and an unobserved pair error. Index s runs over all potential combinations of the product of $d\{t \in P\}$ and $d\{b \in E\}$, i.e. s splits observations into four groups by the timing of the auctions and their collateral eligibility tag.

Since it is multiple bidder competition that allows the borrower to share the economic surplus, I am mainly interested in the *joint* participation of lenders in bidding for similar debtors. Hence, I define the outcome variable y_{lks} to be equal to 1 if banks l and k compete for at least one common borrower in a subperiod-segment s, and 0 otherwise. The quantity of interest is the double difference of βs, i.e.

$$\Delta_P \Delta_E \beta = \beta(t \in P, b \in E) - \beta(t \in P, b \notin E) - (\beta(t \notin P, b \in E) - \beta(t \notin P, b \notin E)).$$

This double difference contrasts the relationship between liquidity positions and bank sorting within the two segments of the markets (eligible and non-eligible claims), and compares this difference to a similar quantity of the pre-amendment period.

As before, the causal interpretation of $\Delta_P \Delta_E \beta$ hinges on the assumption of conditional mean

independence of e_{lks}. To ensure that this assumption is realistic, I include a set observables in the model and leave their effects across the subsamples s unconstrained. Furthermore, I eliminate unobservable s-specific heterogeneity at the level of bank pair components by including bank-l and bank-k fixed effects.

The importance of unobserved heterogeneity can be clearly seen in the context of "competition networks". Thus, one can stack y_{lks} together in one matrix Y_s, which, from the point of view of the networks theory, constitutes an adjacency matrix of a network of banks with each edge indicating lenders intention to compete for the *same* borrowers[4]. This specification allows for non-trivial network configurations where some banks tend to be more centric, i.e. compete more frequently with the rest, while other lenders participate in the market only occasionally. The fixed effects α_{ls} and α_{ks} allow the bank centrality to be related to the unobservable characteristics. These unobserved components would directly affect the connectivity degree of each bank (row or column totals of Y_s), while the distribution of connectivity within each row/column of Y_s is attributed to the observed r_{lk} and x_{lk}. The factors determining the probability of $y_{lks} = 1$ can be interpreted as the drivers of banks' tendency to sort in a segment s. By aligning the sorting factros with the shift in the collateral framework, one can trace the impact of the latter on the lenders' credit supply and market competition.

3 Data Description

To implement the analysis described in the previous section, I collect, structure and merge the data coming from three different sources: the Russian Procurement Information System, the bank balance sheet data files and macroeconomic statistics of the Central Bank of Russia, and municipal and regional database of the Russian Federation State Statistics Service. With the exception of the data coming from the Central Bank, none of these databases are provided in the format readily available for statistical analysis; I devote Appendix A to a detailed description of the data construction and cleaning.

The main dataset is built using the Procurement Information System data files. The procurement law in Russia instructs the public borrowers — financial departments of regional and municipal governments — to attract credit funds via auctions. With a few exceptions, these auctions are held in the English-type open format, where bidders compete along the only admitted margin: the interest rate[5].

The competition process consists of three steps:

1. Announcement of the auction, including full disclosure of loan contract specification: the demanded volume of credit, maturity, repayment schedule, and the maximum interest rate

[4]This network of banks is itself a modified projection of bipartite network of lenders and borrowers onto the network of the former. The unmodified projection would assign the number of common borrowers to y_{lks} — I use this definition as the robustness check.

[5]Tröge (2013) analyses bank competition from the auction-theoretic perspective, in particular, lender bidding strategy with common value component. I argue, however, that conditional on observables, the independent private values assumption is reasonable in the context of this paper due to the public nature of the ultimate borrowers.

(reserve rate) allowed by the borrower. The reserve rate is determined by reference to analogous auctions that have been held in the past or to the ongoing credit market rates. Although the law offers general guidance on the reserve rate determination, the final decision is at the borrower's discretion.

2. Applications collection and admission. At this step, the potential lenders apply for bidding by sending to the auction organizer the necessary documentation. The organizer checks the documents for consistency and, in case all the requirements are satisfied, confirms bank's participation. The application procedure ends by the date prespecified at Step 1 when the organizer announces the intermediate results (the number of admitted applicants) without disclosing the identities of potential lenders.

3. Bidding and contract allocation. The actual auction is held on a date specified in its documentation if more than one potential lenders were admitted for bidding. At this stage, banks are allowed to offer interest rates one after another in a decreasing order (potentially multiple times), with all the bids being open to the participants. The winner is determined in the event when during a fixed time interval no competitor is willing to outbid the last offered rate. After the ultimate bids have been checked by the organizer, the winner and other participants of the auction are de-anonymized in the final protocol. The bidding normally takes minutes, while the whole process from auction announcement to contract allocation takes slightly less than a month.

The allocation process may stop at any stage before it reaches Step 3. Hence, occasionally, no bidders apply for an announced auction, in which case the borrower may review the loan conditions and try to attract lenders in the next round. In another typical outcome, the process stops at Step 2, when at most one lender applies and passes the checks. In that case, the contract is allocated to the only lender at the reserve rate. Since in this paper I focus on pricing, I mostly consider auctions with at least one potential lender and only briefly analyze the contracts that did not manage to attract any banks. These three types of outcomes span more than 96% of the auction results in 2014–2015[6].

The Procurement Information System started to disseminate the auction documentation in a machine readable format in the middle of 2014. However, not the all electronic platforms hosting the auction process were able to comply with the new data dissemination standard until the end of 2014. To extend the sample to the beginning of 2014, as well as to cover auction outcomes that were not reported under the new data standards, I collect the unformatted protocols manually. Furthermore, even under the new format, auction documentation does not provide structured data on the contract characteristics. The related data field specified in the structured format is the reserve (maximum) price. However, it is always reported in absolute monetary terms which makes

[6]The other potential outcomes include: one or many applicants at Stage 2 with none of them passing the documentation checks (no contract allocation); multiple bidders at the Stage 3 with none of them posting any offers (the contract is allocated to the first applied bank); multiple bidders at the Stage 3 with none of them passing the results checks (no contract allocation); auction cancellation by the organizer; refusal of the winner to sign the contract etc.

it impossible to deduce the actual interest rates without knowing loan volumes and maturities. To fill in this gap I collect the information on reserve rates, loan volumes and maturities from contract specifications manually. To ensure integrity of the data, I cross-check the final data set with a sample of auctions collected by a private consulting firm and find no important differences.

The other two import sources of information are the data files of the Central Bank of Russia and the Russian Federation State Statistics Service. The BoR publishes disaggregated bank balance sheets on a monthly basis, with each bank file covering more than seven hundred accounts split by the currency value, beginning- and end-of-period stocks, as well as monthly credit and debit flows. I aggregate this data following a scheme similar to the one used by the BoR (See Appendix A for details). I match banks data with the auctions outcomes by the lender tax ids.

The information on borrowers finance is provided by the Russian Federation State Statistics Service. The relevant data is contained in two databases — Socio-Economic Conditions of Subjects of the Russian Federation (regional data), and Database of Municipal Entities. The variables that I focus on are thought to capture borrower's credit risk, hence I collect the data on budgets income and deficit, as well as on dependence on other budgets in their income structure. Unfortunately, other potentially relevant variables are not well represented in the database. Appendix A describes the steps I take to clean the borrower's data file. I take the standard code of municipalities and territories provided by the Statistics Service as the identificator of the borrowers.

In sections 4.1 and 4.2, the main dependent variable is the interest rate offered by banks when competing for the auctions. The raw auctions data provides absolute monetary values of reserve prices and bids; after amending this dataset with hand collected contract characteristics I calculate the bids in the form of interest rates. I adjust the reserve and final bid rates for the term premium by subtracting the risk-free yield of similar maturity available to the market participants in the market for federal government bonds. This adjustment eliminates approximately 60% of the variation in bids related to changes in the economy-wide term structure of interest rates. Hence, I focus the analysis on the term-premium-adjusted interest rates, similar to risk adjustment in the stock pricing literature.

The within-auction analysis of section 4.2 relies on a properly defined measure of bank liquidity constraints (r_l in eq. (2)). To proceed, I define r_l to be the ratio of bank funding provided by the BoR to the total money market funds attracted by the lender (denoted as "cCB funds" in the output tables[7]). Central bank funds represent bank's total borrowing from the BoR under different refinancing mechanisms; the denominator sums all the money-market liabilities of the bank to other banks (mostly repo and unsecured borrowing) and to the BoR. Since the regulator funding is generally more expensive than the one obtained in the private money markets, the composition of bank's short term borrowing tilted to the central bank funds represents a good measure of liquidity constraint as it provides a clear signal of a bank shortage of privately supplied liquidity.

As a robustness exercise, I use an alternative definition of r_l based on the structure of bank's liquid assets. Namely, I use a ratio of bank's securities encumbered under its repo borrowings to

[7] I use prefix c to denote continous variables and d for indicators.

the total value of securities on bank's balance sheet. Presumably, this measure is less precise as not all securities held by a bank can be collateralized in the private or central bank markets of liquidity. Also, the disclosed information is not granular enough to separate the encumbered part of some types of the assets, in particular, promissory notes. Other variable definitions are provided in Table 1.

[Table 1 about here.]

To prepare the auction data for estimation, I restrict the original sample in the following way. I first drop all the auctions where at least one participant had a miscoded application date with the application being recorded to happen later than the actual bidding date. I next drop the contracts with multiple bidders where only one (lowest) bid was recorded. Similarly, I exclude all the multiple bidder auctions that have at least one participant rank missing. Finally, to balance the sample across the time periods and eligible and non-eligible groups, I keep only those borrowers that had at least one contract allocated in both pre- and post-policy periods and exclude from estimation the subsample of municipalities with the population lower than ten thousand people.

The cleaned dataset is comprised of 5041 loan contracts issued by 362 borrowers. The descriptive statistics of contract characteristics are reported in Table 2. Out of all contracts, 75% end up attracting at least one lender; almost half of these successful auctions result in a competition between multiple banks. A typical reserve rate offers about 5.4% premium to the risk-free rate, and successful auctions tend to admit higher reserve rates (6.3%). An average borrower sells 13.9 contracts (median 5) and meets 3.6 banks competing for its debts. The banks are way more concentrated: an average institution of 66[8] banks ever participating in the market competes for 99 contracts, while the median one bids only for 8. This is a fair reflection of a more general concentration of credit markets in Russia. Similarly, borrower characteristics reflect a general tendency of local governments with strong credit demand to have budget deficits (-0.03) and be dependent on the subsidies from higher-level budgets (0.47).

[Table 2 about here.]

Table 3, top panel, reports summaries for the subsample of contracts used to estimate eq. (1). In auctions with multiple bidders with, on average, 2.7 banks competing for the same contract, borrowers receive 1.2pp of additional surplus in their interest rate payments. Second-to-minimum bids loose around 28bp to the winners — an indication that lenders do not tend to win the auctions by lowering their bids too discontinuously. Note also that the bids have relatively small variation — a critical factor to take into account when estimating economic significance of the effects. A similar summary of the sample of bids used in the estimation of eq. (2) is provided in bottom panel of Table 3.

[Table 3 about here.]

[8] I exclude from the estimations of Sections 4.2 and 4.3 one bank that was closed during 2015 due to insolvency.

Table 4 reports estimates of a linear probability model of selection of debt issuers in the eligible collateral list. The table confirms that the borrowers were selected based on their credit quality characteristics. Thus, entities with higher income and lower budget dependence, as well as regional as opposed to municipal governments were more likely to be accepted by the regulator in its refinancing operations. At the same time, the decision to include borrowers in the eligible list seems to be orthogonal to the characteristics of the actual lenders to municipalities. These results illustrate the importance of accounting for confounding factors, in particular, unobservable ones, when estimating the effect of the central bank policy on bank credit supply.

[Table 4 about here.]

4 Results

4.1 Interest rate differential

In this section I present the first results on credit contract pricing and its dependence on collateral eligibility. Fig. 2 illustrates the point on the interest rate spread attributed to the policy. During the pre-amendment period the difference in market pricing of eligible and non-eligble contracts was effectively zero. Collateral policy amendment, however, widened the spread by approximately 0.9pp and pushed it further to the negative zone. The graph also demonstrates that the acutest period of expected liquidity shortages was in the first half of 2015, with the second wave of policy amendment partially alleviating the constraints. Nevertheless, in estimations I use the whole 2015 period; if anything, this makes the results more conservative when compared to the restricted one-year period around the policy amendment. The following regressions capture the spread dynamics in a difference-in-difference setup.

[Figure 2 about here.]

Table 5 reports OLS and fixed effects estimates of the eq. (1) for a subsample of contracts that attracted more than one lender. The dependent variable is the winning bid, i.e. the actual interest rate assigned to the contract. The four columns demonstrate the robustness of the main effect when controlling for different sources of observable and unobservable heterogeneity.

To preserve conservative inference I use cluster-robust variance estimation. The Russian budgetary system is hierarchical: municipal budget incomes may rely on the transfers from the higher level budget of the region where the municipality is located. Also, smaller cities may be subject to similar economic shocks common to all municipalities of a larger geographic areas. To account for this dependence I cluster the standard errors by geographical region[9]. This clustering allows for the errors to be conditionally correlated across time, borrowers and contracts as long as observations belong to the same region.

[Table 5 about here.]

[9]Population of an average region in Russia is around 1.7 million people.

Column 1, effectively, compares the average outcome variable across the four subsamples. The coefficient on the interaction of *d*Post and *d*Eligible is negative and statistically significant at conventional levels. The estimated effect is around -0.8pp. The model as simple as this one explains 19% of variation in the interest rates.

Adding macro economic control doubles the explained variation and increases the precision of the main effect estimate. Economically and statistically, the most important macro control is the money market rate, with the estimated elasticity of 0.7. According to these results, the policy generated a gap between the two segments of the collateral market with the eligible collateral claims priced at 0.9pp discount — a noticeable effect relative to both average (4.1pp) and standard deviation (1.5pp) of the adjusted rates.

This result is robust to the inclusion of borrower-level controls, with higher income, smaller deficits and external dependence contributing to lower cost of credit; regions are charged the interest rate that is, on average, 1.7pp lower than the ones of the municipalities. The budgetary data, however, is quite noisy, hence, its contribution to the explained variation is relatively small. Importantly, allowing for unobservable borrower-level heterogeneity potentially correlated with eligibility status (column 4) does not change substantially the estimate: the point estimate of the policy effect is around 0.7pp and it remains statistically different from zero at 1% significance level[10]. The table illustrates that eligibility induced a substantial wedge in credit pricing accounting for more than half of variation in the observed interest rate premiums.

Table 6, with the similar structure, reports estimates of the eq. (1) but with the second-to-minimum bid as the dependent variable. While the previous table describes final *prices*, it provides rather indirect evidence on the *valuations* (minimum required interest rates) of the lenders. The winner's bid is an upper bound of the bank's valuation: the minimum rate required by the winning bank is not observed since no competitors are willing to outbid it. In a way, valuations of the winners are censored (Paarsch, Hong, et al. (2006)). The second-to-minimum bid is less subject to this censoring issue: the fact that a bank was ranked as the second indicates that its required rate is not higher than its final bid and, at the same time, not lower than the bid of the winner. In a simple clock model of an English auction with independent private values (Milgrom and Weber (1982)), the optimal bidder's strategy with continuous price is to drop out from the competition as soon as the price reaches bidder's valuation. From this perspective, the non-winning bids are exactly equal to the valuations of the bidders. In reality, however, the prices do not change continuously but rather adjust discretely when bidders update their offers; the actual valuations then are likely to be in the interval bounded by bidders last offer and the bid of the winning lender. As the second-to-minimum bids are the closest ones to the winning prices, the estimated effects in Table 6 can be thought of as an upper bound, while those of Table 5 — a lower bound on the average value of the central bank liquidity insurance (this is conecptually close to the incomplete data estimator of Haile and Tamer (2003)).

[10]Budget statistics has very low within-borrower variation; as a consequence, borrower fixed effect estimates of the coefficients on these variables are not very stable.

[Table 6 about here.]

The second-to-minimum bid results are qualitatively similar to the winning bid outcomes. Furthermore, the point estimates of the valuation interval bounds are close to each other spanning less than 3bp. Given sampling uncertainty, it is safe to claim that the previous estimate 0.8pp remains a good indicator of the value of funding liquidity. Taking into account that the BoR was charging extra 25bp to the key rate on its loans backed by non-marketable assets (or even more at times when competition for central bank funds was high), the total cost of banks liquidity constraint (the interest rate the banks were willing to forego to obtain central bank funding via the analyzed mechanism) was likely around 1pp.

The derivation of the above estimates relies on the subsample of auctions with multiple banks competition. With no model structure behind, this was necessary to unveil valuations hidden in the observed prices: in an alternative outcome where only one bank offers a loan the observed rate is the reserve rate announced by the borrower. Auction theory suggests that even in the simplest setup the reserve price is a nonlinear function of seller's reserve value and the distribution of buyer's valuations. Thus, when simultaneously considering single and multiple bank outcomes in one simple linear model, one should be aware that the results characterize the observed prices rather than unobservable valuations. I report the estimates of the eq. (1) for the full sample of successful auctions in Table 7. Economically and statistically the results are close to the ones discussed above.

[Table 7 about here.]

I perform a series of robustness checks to ensure the stability of the results. First, I include the second dimension of errors clustering. Namely, I allow the errors to be correlated if the auctions take place during the same calendar week even if the borrowers do not belong to the same region. Similarly, one can make inference robust to a potential correlation of errors among the winning banks. Furthermore, I include additional macro economic controls (the rate of absorption of interbank credit by the core banks, the ruble depreciation rate) and, arguably, exogenous contract characteristics (required credit volumes and maturity). None of this changes the previous results in any significant manner.

4.2 Within-contract outcomes

The results of the Section 4.1 indicate that the BoR policy of collateral amendment was followed by an increase in the spread of interest rates of eligible and non-eligible borrowers. One can still argue, however, that the effect was potentially driven by the changes in credit risks that are not captured well by the observables in the eq. (1). In other words, the eligibility status could be correlated with an unobservable time-varying component of borrowers creditworthiness which, in its turn, was reflected in credit pricing. If the BoR policy was based on some information related to these future changes in the credit risk, the observed interest rate differential might be

wrongly attributed to the regulator policy rather than to the natural market outcomes. In this section, I try to minimize these concerns by using within-contract variation. I demonstrate that these were the offers of constrained-in-liquidity banks that were likely to push the interest rates of the collateralizable contracts down to the levels unattainable to the non-eligible claims. As such, this specification also highlights the mechanism behind the price differential and contrasts it with alternative explanations.

The contract fixed effects estimator is not without drawbacks: because of nesting of contracts in borrowers, it does not allow to identify the average effect of the collateral amendment policy. However, to the extent that the quantity of credit risk in a particular contract is identical for all banks (or does not vary systematically with bank liquidity positions), the fixed effect estimator allows to analyze whether funding constraint is an important driver of bank competition beyond credit risk considerations. Furthermore, by relying on the within-contract variation of bids, one has to eliminate from the analysis 86% of the variation in the outcome variable (see Table 8). On the one hand, this mitigates most of the concerns about omitting unobservable contract characteristics potentially correlated with the liquidity constraints. However, this drastic measure on the source of used variation may also expose the analysis to the risk of amplification of measurement error. To address this issue, I perform a series of robustness checks as well as use different outcome variable (within-auction bidder rank) to demonstrate the consistency of liquidity constraint hypothesis across many specifications.

[Table 8 about here.]

The estimates of the eq. (2) are reported in Table 9 (left panel). I focus on the triple interaction coefficient where the two indicator variables *d*Post and *d*Eligible are interacted with a continuous proxy of bank liquidity constraint *c*CB funds. The latter is defined as a share of central bank funds in the total interbank borrowing of a lender and it is measured as of the end of January 2015 — right before the policy amendment. Since *c*CB funds is a bank-level variable, I introduce the second dimension of potential non-zero correlation of the errors, namely, I calculate standard errors under two-way clustering by borrower's region and lender id. This allows the inference to be robust to a non-zero correlation of observations corresponding to the same bank even if the lender is competing for borrowers of different regions (and different time periods).

If the hypothesis on bank liquidity constraint was *not* supported by the data, one would observe economically and statistically irrelevant (double difference) coefficient on the central bank funding. That is, bank credit supply decision would not be correlated with its sources of liquidity. One could even expect a positive correlation of *c*CB funds with the observed bids: banks that excessively rely on the central bank funding tend to have noticeably higher costs of funds and are likely to try to pass these costs on the borrowers. Hence, observing negative δ coefficient in the eq. (2) serves as strong evidence in favor of the liquidity constraint hypothesis.

In all specifications reported in Table 9 (left panel), the triple interaction coefficient of interest is indeed negative and statistically significant at conventional levels. The negative coefficient

indicates that, in comparison with the pre-amendment period, banks dependent on central bank funding offer lower interest rates to the eligible borrowers in contrast with the lenders unconstrained in their private money market funds. This behavior is relevant economically: an increase of one standard deviation in central bank funding corresponds to a discount of 0.3pp in posted bids, with the full potential effect estimated to be around −1.1pp.

[Table 9 about here.]

The first column of Table 9 relies on the borrower fixed effect estimation in the "expanded" dataset of all interest rate offers. By design, the estimates do not rely on the time-invariant borrower characteristics, including the levels of credit risk. I demean the bank control variables so that the coefficient on the interaction of *d*Post and *d*Eligible indicates the difference of bids between eligible and non-eligible contracts in the post-amendment period of an average bank with zero funding from the central bank. The coefficient is close to zero both economically and statistically; coupled with the relative effect of liquidity constraints on the pricing of eligible contracts, this result suggest that much of interest rate differential was driven solely by bank liquidity demand.

Importantly, the main results are robust to controlling for unobservable contract-specific heterogeneity common to all auction participants. Thus, column 2 reports contract fixed effect estimates that rely only on the within-contract variation. The estimator, effectively, relates banks liquidity with their bidding for the *same* contract offered by an eligible borrower and compares it with a similar relation for non-eligible claims. It then traces the change of this contrast over time around the collateral framework shift to net out the policy effect relative to the "normal" level of effects in the pre-amendment period. This estimator eliminates all unobservable pricing factors that are common to all the competitors for a particular contract, including potentially time-varying quantities of borrower credit risk. Furthermore, in column 3, I add bank fixed effects to account for unobservable time-invariant characteristics of the lenders that may potentially be correlated with their dependence on the central bank funds — the estimated effect is the same under this specification. It confirms that the result is not driven by particular lenders that may systematically rely on the central bank funding in their business model.

Lower bids in the eligible collateral markets offered by liquidity constrained banks are likely to affect the distribution of the winning lenders. To test this hypothesis, I run a similar set of specifications but with a winning indicator variable as the dependent variable. The right panel of Table 9 reports the estimates of the eq. (2) with y_{il} equal to one if a bank l is a winner in the auction i and zero otherwise. This linear probability model confirms that, in comparison with the similar contrast in the pre-amendment period, short-in-liquidity banks tend to win the auctions more frequently when they compete for eligible borrowers. According to the baseline specification, in comparison with those lenders who have zero funding from the regulator banks half funded by the BoR in their interbank borrowings are 37% more likely to win the eligible contracts than the non-eligible ones (net of the same contrast in the pre-amendment period).

To assess the robustness of these results I first employ a different proxy of liquidity constraint. Thus, I use the variable *c*Repo — the share of encumbered securities in the total securities holdings

of a bank — as a proxy for collateral utilization. Unfortunately, accounting standards in Russia do not allow to distinguish the part of the securities that is encumbered in the private money markets from the one involved in the refinancing operations of the BoR. Thus, one can expect the collateral utilization *c*Repo to be a noisier alternative of the liquidity constraint. The corresponding results on pricing and winning probabilities are reported in Table 10. The estimates confirm the previous conclusions on the importance of liquidity demand in interest rate determination: constrained in collateral banks offer lower rates to the eligible borrowers after the BoR "turns on" this collateralizability by its policy decision. The distribution of the winning lenders has a pattern similar to the one discussed above with constrained in collateral banks winning auctions more frequently if the underlying contracts may be collateralized in the refinancing operations.

[Table 10 about here.]

In the next robustness check, I change the dependent variable to bidder within-auction rank. The new definition eliminates the scale of interest rate offers but preserves the relative ranking of competitors within the same contract. By rules of contract allocation, bank bids provide the necessary input on the relative ranking of the lenders and, hence, allow to identify the bank with the lowest interest rate offer (rank). Modelling the actual rank of a lender may be less subject to amplification of the measurement error since, by definition, it preserves much of the within-auction variation. Table 11 reports the corresponding set of regressions. The results are consistent with the estimates described above: relative to the non-eligible contracts, banks relying on the public liquidity provision tend to have lower ranks more frequently than the unconstrained lenders when competing for collateralizable claims. These estimates suggest that regulator policy decision was a significant determinant of bank credit supply.

[Table 11 about here.]

Finally, I run a set of robustness checks to rule out potential alternative explanations that might result in similar patterns observed in the data. Hence, one can raise a concern that the effect was driven not that much by the collateral framework of the central bank, but rather by "political pressure" on commercial banks executed by the central government in an attempt to provide more credit to the favored regions and municipalities. The latter may include economically stronger areas since supporting them in crisis times is likely to generate larger externalities or political rents. Hence, the targets of "political support" and issuers of eligible collateral may be correlated. At the same time, financially weak banks may be more exposed to political influence as they are likely to be in a worse bargaining position. The combination of the two factors might result in a similar pattern in the observed data — cheaper credit funneled to a set of "chosen" borrowers by financially dependent banks.

To rule out this alternative explanation, I first note that if the government indeed had any intention to help to some regions, it was very likely to use the instruments over which it has the direct control: budget subsidies and transfers and, more importantly, intra-budget credit. The latter

acts as a cheap substitute of commercial credit for most of the public borrowers, hence, it is likely to be a more effective way of supporting "politically connected" regions in comparison with riskier and costlier intermediation via financially weak banks.

Nevertheless, to model this alternative hypothesis explicitly, I augment the within-contract estimation with additional controls acting at the level of liquidity constraints. Thus, I introduce additional double- and triple interactions of *d*Post and *d*Eligible with proxies of bank exposure to political pressure. Table 12 reports the estimates where the proxies are *d*State owned or *c*State credit. State ownership of a bank or its specialization in credit to public and state-owned organizations may act as indirect indicators of "political connections" of the lender. None of the additional interactions affect the economic and statistical relevance of bank liquidity constraint neither regarding the interest rate offers nor the probability of winning the contract.

[Table 12 about here.]

I then construct other proxies of bank exposure to political pressure using additional information. First, I employ income, property and investment reports of candidates in the Parliamentary elections in Russia in 2011. In the investment part of the reports, the 2051 candidates were to disclose all the deposits held in banks along with other financial assets. While most of the recorded deposits are commensurable with the participant's income, some reported savings were of a way greater magnitude. The latter could indicate an indirect affiliation of to-be-members-of-parliament with the financial institutions since keeping substantial savings in a bank without full coverage of deposit insurance requires a significant amount of trust to the bank owners and, probably, some form of control over its management.

To capture the idea that a bank funding its balance sheet with "politically charged" money could be more exposed to political pressure in crisis times, I use average (log of) deposit of all the candidates who reported non-zero accounts in this bank as a proxy for its political exposure. Similarly to Table 12, I introduce this additional control variable in double and triple interactions with *d*Post and *d*Eligible, and report the corresponding estimates in Table 13 (columns 1–2). The results suggest that politically connected banks, indeed, tried to offer lower interest rates in the segment of eligible contracts after the collateral policy amendment. However, the pressure was not strong enough to materially affect their winning behavior. Importantly, this additional interaction and its marginal significance do not alter any of the conclusions on the main measure of bank liquidity constraint.

[Table 13 about here.]

Finally, to partially account for private information available to the central bank and, hence, to better distinguish bank liquidity needs from its general financial strength I use a different dataset of BoR monitoring of commercial banks. Monitoring of banks in Russia is done via two types of audit checks — scheduled and non-scheduled. The latter is a reliable indicator of bank's weaker financial position as BoR typically uses this tool only when it has any evidence suggesting that the

bank may not comply with the financial regulation. Since accounting reports of a lender may not adequately reflect its weak economic state, the non-scheduled audit checks by BoR may convey additional "soft" information on the financial strength of a bank.

To introduce this measure in the regression analysis, I use a simple indicator equal to one if a bank was audited by BoR at least once during the years 2013–2014 on the non-scheduled basis. As before, I interact this variable with the *d*Post and *d*Eligible indicators and their interaction to net out the effects in the eligible contracts after the policy amendment (columns 3–4 of Table Table 13). If anything, the result suggests that the monitored banks tended to post higher rates for eligible contracts and won the competition less frequently (the latter conclusion is less precise statistically). The main effect of liquidity constraint, however, preserves its statistical precision and is even stronger economically.

4.3 Commonality of borrowers

The previous sections focused on pricing of credit contracts and remained salient about selection of banks into particular market segments. Sorting of specific lenders into eligible assets induced by the central bank collateral policy can have its own consequences. Hence, the summary statistics suggests that it is *joint* competition of at least two banks for a similar contract that results in surplus sharing. Thus, to the extent the regulator policy re-channels competition across the market segments, it is likely to affect the split of borrower-lender match surplus both in the eligible and non-eligible assets segments. In this section I analyze the differences in competition intensity across the credit market segments that were associated with the BoR collateral policy decision.

To do this, I move to the bank pair setup and estimate versions of the eq. (3), i.e. I model joint participation of bank-l and bank-k in a market segemnt s, where the latter is defined, as before, to index the four subsamples of the data: pre- and post-amendment periods vs. eligible and non-eligible credit claims. The dyadic setup is attractive as it allows to consider market competition from the point of view of network analysis. One can stack y_{lks} in a matrix Y_s that can be thought of as an adjacency matrix of a bank competition network. The elements of this matrix indicate "closeness" of banks to each other in terms of their attempts to compete for the *same* borrowers. By contrasting factors that matter for competition for common borrowers across market subsegments and sample periods, one can identify the drivers of market segmentation induced by the BoR collateral framework.

The OLS and FE estimates of the eq. (3)[11] are reported in Tables 14 and 15. Arguably, due to geographical spread of Russia, smaller banks in one region may be excluded from the competition with the local banks of the other parts of the country. Hence, I run the baseline specification on a subsample of bank pairs comprised of those lenders that compete at least in one common geographical region during the years 2014–2015. Given the data structure, I calculate the standard errors under dyadic clustering (Cameron and Miller (2014)). This makes inference robust to non-zero error correlation between any bank pairs that have at least one bank in common (including

[11] I also tried Graham's tetrad logit estimator (Graham (2017)) and obtained conceptually similar results.

correlation over time and market segments). As a byproduct of this calculation I also estimate the VCV of point estiamtes under two-way clustering (by bank-l and bank-k). The dyadic clustering is way more conservative with the resulting standard errors being at least twice as large as the ones calculated under the two-way clustering approach; this is well in line with simulation results of Aronow, Samii, and Assenova (2015).

Both tables indicate that the dependence on the central bank funding acts as a critical factor of bank sorting into eligible collateral markets when this collateralizability is announced by the regulator. Thus, after the policy amendment, a pair of banks with each bank owing half of its interbank liabilities to BoR is estimated to compete by 16pp more frequently for the eligible borrowers in contrast with a pair of banks where at least one competitor is free from the central bank funding (column 4).

The tables also demonstrate that the importance of the liquidity constraint is economically and statistically close to zero in the pre-amendment periods. Furthermore, in the non-eligible collateral segment after policy amendment (column 2), the effect of central bank funding, if anything, is adverse: liquidity-constrained banks are less likely to compete for the same borrowers whose liabilities are not pledgeable in the central bank. Hence, relative to the non-eligible segment, the economic effect of liquidity constraints on bank competition is even more substantial when banks compete for pledgeable contracts. After the double differencing over time periods and eligibility segments, the estimated effect preserves its economic relevance and statistical precision. Under the assumption of conditional mean independence of the error, the change in the role of liquidity constraints can be directly attributed to the shifts in the collateral framework.

[Table 14 about here.]

[Table 15 about here.]

This result is robust to the inclusion of pair-components fixed effects specific to each of the four subsamples. To assess its further robustness, I first employ a different assumption on the kind of banks that can in principle compete with each other. Thus, instead of restricting the sample composition by the geographical attribute, I rerun the analysis on the sample of all potential bank pairs. The estimated effects are presented in Table 16 (columns 1–2): qualitatively and statistically the results are close to the baseline.

[Table 16 about here.]

As another robustness check, I employ a normalized quantity of potential common borrowers between the two banks as the dependent variable. To normalize the number of common borrowers, I use a simple geometric mean of the total number of potential borrowers of each bank. This definition captures the intensive margin of competition for the same borrowers rather than the extensive one used in the baseline regression. The results (Table 16 (columns 3–4)) are qualitatively and statistically analogous to the ones reported above suggesting that the previous conclusion on the importance of liquidity demand in bank credit supply is robust across different specifications.

5 Conclusions

The BoR policy of liquidity provision achieved its aim: money markets recuperated soon after the December 2014 collapse; the mid-term funding needs were satisfied with the BoR additional refinancing arrangements and — later in 2015 and 2016 — with the Treasury deposits. Stable money markets allowed the regulator to concentrate on its monetary policy and capitalization of banking system.

The measures that were undertaken by the BoR, however, were more costly for some economic agents than for the others. In this paper, I analyze one type of these costs, namely, segmentation of the market of public credit fostered by the supervisor collateral framework. I show that by labeling assets with "eligible collateral" tag the central bank rechanneled credit supply of the lenders that valued liquidity most. This created additional competitive pressure in the eligible assets segment and, eventually, a wedge in the interest rates paid by the two types of borrowers. Arguably, a part of this interest rate spread, however small, can be explained in terms of redistribution of funding risks coming with weaker lenders. In more general terms, the Bank collateral policy acted as a tax on credit supply to the non-eligible borrowers and subsidized the supply of credit to the eligible ones.

This paper is not aimed to support the claim that these were the largest costs faced by the Russian economy, or that the costs did not justify the ultimate aim of liquidity provision — ensuring financial stability. Its purpose is rather to highlight that the monetary authority actions may have unintended redistributive consequences and that one would require a credible cooperation with the fiscal office to partially neutralize them by politically-feasible tools. The paper also shows that a collateral framework affects the borrower-lender match and, hence, matters for allocation of risks in the financial system.

Collateral framework, at its core, is a risk-management system, and as such is aimed to protect the central bank from excessive credit risks and preserve its capital. Historically this was a clearly justified measure that shielded the central clearing houses — ancestors of most modern central banks — from unnecessary risks. The academic discussion of the economic nature of modern central bank capital is less decisive. If there is any agreement on why central banks need capital, then it is in the assertion of its ultimate importance to the monetary authority independence. In the context of this paper, a higher dependence of commercial banks on the finance of local authorities can be thought of some form of price of the central bank independence from the federal government. Whether this cost can be minimized in the environment of an endogenous collateral base is an interesting topic for further research.

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A Data construction

The data used in this paper comes from three sources: the Russian Procurement Information System, the bank balance sheet data files and macroeconomic statistics of the Central Bank of Russia, and municipal and regional database of the Russian Federation State Statistics Service. I use Python in data preparation as it provides a wide range of tools and packages for handling data.

A.1 The Russian Procurement Information System data files

The original procurement data is distributed via FTP[12] and structured in a system of XML files comprising in total more than 72 GB of archived files for the years 2014–2015.

To prepare the auction data, I first extract auction characteristics from the notification files and filter the contracts that contain the roots of the words "credit" or "loan" (in Russian) in their short textual description or are tagged with the "Financial intermediation industry" label (7675 files). I further check manually the filtered results and drop a few contracts that were mistakenly classified as credit auctions. I next collect all XML protocols on canceled notifications and filter them out from the list of credit auction notifications. In case if a notification was subsequently modified, I use its last valid version. I define "Customer Registration Number" and not the "Buyer Registration Number" as the borrower id as some contracts may be announced and auctioned by entities other than the final customers. After cleaning and dropping duplicates, the set of contracts contains 7218 files.

To collect the auction outcomes, I filter XML protocols by the purchase numbers corresponding to the credit contracts. Each of the three auction stages described in Section 3 is thought to have its own protocol (XML file) containing a structured description of the outcome. As in the case with auction notifications, I drop duplicates and canceled protocols and, if they had been modified earlier, I use the last valid versions of the files. The official data contains 7643 protocols documenting Stage 1 outcomes (2255 additional protocols for cases of single bidder applications), 5858 protocols on Stage 2, and 5659 Stage 3 protocols (with 27 additional files on single participant outcome). The Stage 2 and 3 protocols are matched by tuples of purchase number and journal number, with the latter identifying the bidders within the auctions. I amend this data with manually collected protocols that are missing from the official source due to transition in data dissemination standards (1787 records on 1262 contracts). I then group the auction outcomes into broad categories "No bidders", "One bidder", "Many bidders" and "Other/Not matched" comprising, correspondingly, 1880, 2555, 2369 and 320/94 contracts. The main three groups are defined by the failed auction flag in the Stage 1 protocol (no bidders), the presence of the single bidder protocol or corresponding failure flag in the Stage 2 file (one bidder), the presence of all three stages protocols and absence of any failure flags (many bidders).

The final step of auction data preparation includes a collection of loan contract characteristics. Each auction is linked to a set of documentation files in MS Word, Excel or PDF formats. These

[12] `ftp://zakupki.gov.ru/`

documents are not provided in a machine-readable format; and the information is not structured enough to be programmatically parsed. Hence, I collect the information on reserve rates, loan volumes, and maturities manually. In cases when reserve rate is not explicitly mentioned, I calculate it from the data on credit volume, maturity and absolute monetary value of interest payments using simple interest rate formula. To verify the validity of collected data, I cross-check it with a sample of auctions collected by a private consulting firm[13]. Since in some cases, there is not enough information to deduce the reserve rates, or auction documentation is missing whatsoever, the final set of auctions contains 6804 contracts (including non-standard auction outcomes).

A.2 The Bank Balance Sheet files

The BoR publishes disaggregated bank balance sheets and income statements on a monthly basis, with each bank file covering hundreds of accounts[14]. I aggregate this data following a scheme analogous to the one used by the BoR with adjustments standard in the Russian banking analytics practice[15]. This section describes bank aggregates used to construct lender characteristics in Table 1. Values in parenthesis indicate account number according to the Russian Bank Accounting Standards.

*c*CB Funds:

- Bank liabilities to the BoR: sum of
  - short-term liabilities (31201, 31202, 31203, 31210, 31213, 31214, 31215, 31216),
  - mid-term liabilities (31204, 31205, 31217, 31218),
  - long-term liabilities (31206, 31207, 31212, 31219, 31220, 31221, 31222),
  - overdue debts (31701, 31704, 31801, 31804),
  - other funding from BoR (32901).
- Bank total borrowing in the interbank market: sum of
  - bank liabilities to the BoR (as above),
  - all liabilities to the resident and non-resident banks (accounts starting with 313 or 314, 20313, 20314, 32901).

*c*Repo:

- Bank securities encumbered under repo agreements: sum of
  - encumbered bonds (50113, 50115, 50118, 50218, 50318),
  - encumbered stocks (50611, 50613, 50618, 50718),

[13] `http://trp.tomsk.ru`
[14] `http://cbr.ru/credit/forms.asp`
[15] `http://kuap.ru/methodics/`

- Bank total security holdings:
  - holdings of bonds and stocks (sum of active accounts starting with 50), notes (51) and mutual funds (60106, 60118),
  - net of provisions and re-evaluations (50114, 50213, 50219, 50312, 50319, 50507, 51210, 51310, 51410, 51510, 51610, 51710, 51810, 51910, 50719, 50809, 50120, 50220, 50620, 50720).

*c*Bank size: bank total assets calculated as the sum of all active accounts of balance sheet Section A net of provisions and re-evaluations.

*c*Capital:

- Bank accounting capital: sum of
  - main capital (10207, 10208, (10501), (10502), 10601, 10602, 10603, 10604, (10605), 10609, (10610), 10611, 10612, (10613), 10614, 10621, 10701, 10702, 10703, 10704, (11101)),
  - profit from previous years (10801, (10901), 70302, (70402), (70502), 70701, 70702, 70703, 70704, 70705, (70706), (70707), (70708), (70709), (70710), (70711), 70713, (70714), 70715, (70716), 70801, (70802), (70712)),
  - current year profit (61306, (61406), 70301, (70401), (70501), 70601, 70602, 70603, 70604, 70605, (70606), (70607), (70608), (70609), (70610), (70611), 70613, (70614), 70615, (70616), (70612))
  - future period expenditures (61301, 61302, 61303, 61304, (61401), (61403))

*c*State credit:

- Credit to state-owned companies and state entities: sum of accounts starting with 44 or 46, net of provisions (44115, 44215, 44315, 44415, 44515, 44615, 44715, 44815, 44915, 45015, 46008, 46108, 46208, 46308, 46408, 46508, 46608, 46708, 46808, 46908)
- Total credit to organizations: sum of
  - credit to state-owned companies and state entities net of provisions (as above)
  - credit to resident and non-resident private companies (accounts starting with 45 or 47) net of provisions (45115, 45215, 45315, 47008, 47108, 47208, 45615, 47308)

*c*NPL:

- Non-performing loans: sum of
  - non-performing loans to organizations (45811, 45812, 45813, 45911, 45912, 45913, 40310, 40311, 45816, 45916, 45801, 45802, 45803, 45804, 45805, 45806, 45807, 45808, 45809, 45810, 45901, 45902, 45903, 45904, 45905, 45906, 45907, 45908, 45909, 45910)

- non-performing personal loans (45815, 45817, 45915, 45917)

- Total credit claims: sum of
  - credit to resident and non-resident private companies net of provisions (as above)
  - credit to state-owned companies and state entities net of provisions (as above)
  - personal credit (accounts starting with 455, 457, 45815, 45817, 45915, 45917) net of provisions (45515, 45715)
  - net of provision on non-performing loans (45818, 45918)

*c*Liquid assets:

- Liquid assets: sum of
  - money and money equivalents (20202, 20203, 20209, 20210, 20206, 20207, 20208, 20302, 20303, 20305, 20308, 20311, 20312, 20315, 20316, 20317, 20318, 20319, 20320, 20401, 20402, 20403)
  - accounts in the Central Bank (30102, 30104, 30106, 30224)
  - correspondent accounts in other banks (30114, 30119, 30110, 30118, 30125)
  - money in payments (30213, 30215, 30221, 30228, 30233, 30235, 30402, 30409, 30413, 30416, 30417, 30418, 30419, 30424, 30425, 30426) and stock exchange (47404)
  - net of provisions (20321, 30126, 30226, 30410, 30607)

- Bank total assets (as above)

*d*SIFI: systemically important institutions as defined in the BoR order 3737-Y[16].

A.3 The Russian Federation State Statistics Service

The two datasets used to construct borrower characteristics are the municipal and regional databases of the Russian Federation State Statistics Service. The regional data is collected in a series of publications on Socio-Economic Conditions of the Regions available at the Service website[17]. I merge regional level data with the auction data set by region name.

The municipal level data is provided in the Database of Municipality Characteristics[18], however, it is not available for a bulk download. To overcome this issue, I write a simple program to collect the necessary data from the Service website. For municipalities of the regions that did not have properly functioning pages on the Service website, I collect the information manually from the web pages of their regional offices.

[16] http://www.cbr.ru/press/PR/?file=20102015_100129ik2015-10-20T10_01_03.htm
[17] http://www.gks.ru/free_doc/new_site/region_stat/sep_region.html
[18] http://www.gks.ru/free_doc/new_site/bd_munst/munst.htm

The full original database does not contain all the budget characteristics for all the municipalities active in the credit market. That is, for some small borrowers the required information is present only in the aggregated form, where aggregation is done over a set of municipalities grouped into larger districts. The share of missing data is small with the number of borrower-years with empty records not exceeding 30 (out of 1519 records of the original data). To overcome this issue I impute the missing data from the average characteristics of higher-level districts. If, furthermore, a municipality is present in the data only in 2013 and not in 2014, I use the 2013 values as the proxy for the next year budget characteristics (11 values in total). Finally, I merge the Statistics Service data with the auction data set by borrower municipality id (OKTMO).

B List of issuers whose liabilities constitute eligible collateral

1st wave:

City of Moscow (not in sample), Moscow region, Saint-Petersburg, Khanty-Mansi Autonomous Okrug–Yugra, Tatarstan Republic, Kazan, Mordovia, Bashkortostan, Tumen region, Samara region, Samara, Kemerovskaya oblast, Izhevsk, Republic of Komi, Murmanskaya oblast, Sverdlovskaya oblast, Yamalo-Nenets Autonomous Okrug, Kransondarsky Krai, Republic of Saha (Yakutia), Lipeckaya oblast, Republic of Karelia, Irkutskaya oblast, Nizhegorodskaya oblast, Krasnoyarksy Krai, Vologodskaya oblast, Kaluzhskaya oblast, Magadanskaya oblast, Nizhny Novgorod, Novosibirsk, Novosibirskaya oblast, Tomskaya oblast, Tomsk, Tverskaya oblast, Kirovskaya oblast, Leningradskaya oblast (not in sample), Surgut (not in sample), Voronezhskaya oblast, Omskaya oblast, Orenburgskaya oblast, Astrahanskaya oblast (not in sample), Omsk, Republic of Chuvashiya, Tambovskaya oblast, Ufa, Belgorodskaya oblast, Altaisky Kray (not in sample), Udmurtiya Republic, Yaroslavskaya oblast, Ulyanovskaya oblast, Tulskaya oblast, Dzerzhinsk, Kostromskaya oblast, Republic of Mariy-El, Volzhsky, Volgograd, Volgogradskaya oblast, Stavropolsky Krai, Penzensakaya oblast, Republic of Hakasia, Ryazanskaya oblast, Krasnoyarsk.

2nd wave:

Kurskaya oblast, Chelyabinskaya oblast, Smolenskaya oblast, Krasnodar, Vladimirskaya oblast, Permsky Krai, Primorsky Krai, Rostovskaya oblast, Sahalinskaya oblast, Kostroma.

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Figure 1: Macroeconomic conditions of collateral framework amendment

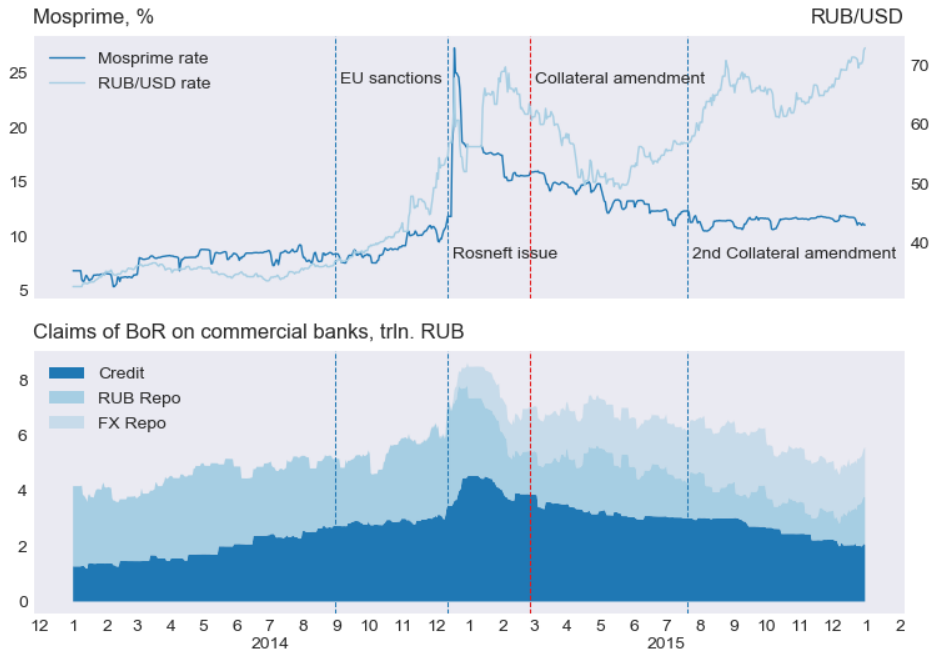
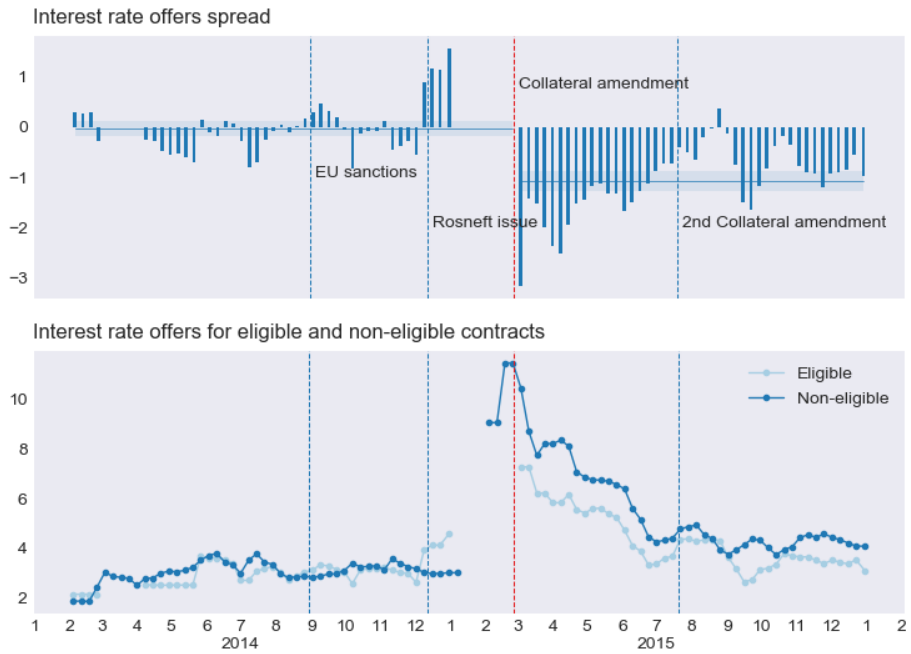


Figure 2: Interest rate offers by borrower type



Three-week moving average winning bids grouped by contract eligibility status (the bottom panel), and the spread between the two groups with pre- and post-amendment sample means (the top panel). Subsample of contracts with at least two potential lenders.

List of Tables

Table 1: Variable definitions

Notation	Description	Source
*d*Post	An indicator variable equal to one for auctions with the scheduled bidding date after the 26th of February 2015, and zero otherwise	
*d*Eligible	An indicator variable equal to one for borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise	CBR, Procurement System
*c*Reserve rate (unadj.)	The maximum interest rate allowed by the borrower in a loan contract	Procurement System*
*c*Reserve rate	The reserve rate net of the risk-free rate of the corresponding maturity	Procurement System*
*c*Interest rate (unadj.)	An interest rate offered by a lender for a particular loan contract	Procurement System*
*c*Interest rate	An interest rate net of the risk-free rate of the corresponding maturity	Procurement System*
*c*Face value	Loan volume required by the borrower, mln. RUB	Procurement System*
*c*Maturity	Loan maturity required by the borrower, years	Procurement System*
*d*Guarantee	An indicator variable equal to one for auctions requiring a third party guarantee of lender's liability to provide credit	Procurement System
*c*Budget income	Logarithm of budget income per person (thsd. RUB) corresponding to the budget represented by the borrower	State Statistics Service
*c*Budget deficit	The ratio of the borrower's budget income net of expenditures to its total income	State Statistics Service
*c*Budget dependence	The ratio of total subsidies, subventions, and transfers from other budgets to the borrower's budget income	State Statistics Service
*d*Region	An indicator variable equal to one if the borrower is a regional government, and zero if it is a municipal or city government	Procurement System
*c*CB funds	The ratio of bank's liabilities to the Central Bank of Russia to the total interbank borrowing of the bank	CBR
*c*Repo	The ratio of the value of securities encumbered under bank's repo agreements to the total value of security holdings of the bank	CBR
*c*Bank size	Logarithm of bank's total assets	CBR
*c*Capital	The ratio of bank capital to its total assets	CBR
*c*State credit	The ratio of bank's credit claims on the local and federal governments and state-owned firms to its total credit claims on organizations	CBR

Table 1: Variable definitions (continued)

Notation	Description	Source
*c*NPL	The share of non-performing loans in total credit claims of a bank	CBR
*c*Liquid assets	The share of liquid assets (reserves in the central bank, money and its equivalents, correspondent accounts) in bank's total assets	CBR
*d*State owned	An indicator variable of the state-owned banks	CBR
*c*SIFI	An indicator variable equal to one for systemically important financial institutions (as classified by the Bank of Russia), and zero otherwise	CBR
*d*Local	An indicator variable equal to one for banks that compete for borrowers of at most one region	
*d*Top-2 bank	An indicator variable equal to one for the top two banks that have the highest number of submitted bids throughout the whole sample period, and zero otherwise	
*c*Mosprime	Interbank money market rate on unsecured lending between high credit quality banks, pp	CBR
*c*CDS Russia	CDS premium on the public debt issued by the Russian Federation, pp	Bloomberg
*c*USD shortage	The spread between the interbank money rate RUONIA and the interest rate implied in the cross-currency swaps, pp	National Finance Association
*c*RUB/USD volatility	The realized volatility of the annualized daily RUB/USD rate changes, pp	Micex

* Hand collected from auction documentation.
All macro variables are averaged over the last 15 days preceeding to the auction bidding date.

Table 2: Summary statistics of contracts, borrowers and lenders

	Mean	Median	SD	Min	Max
Sample of contracts, $N = 5041$					
*c*Max admitted rate (unadj.)	14.87	13.95	4.24	7.83	36.00
*c*Max admitted rate	5.40	4.52	3.26	−3.12	27.51
*c*Face value	285.13	150.00	399.85	0.70	5000.00
*c*Maturity	1.92	1.50	1.14	0.08	9.92
*d*Guarantee	0.16	0.00	0.37	0.00	1.00
Subsample of contracts with 1+ bidders, $N = 3803$					
*c*Max admitted rate (unadj.)	14.98	14.00	3.94	7.98	36.00
*c*Max admitted rate	5.76	4.90	2.81	−1.24	27.51
*c*Face value	266.32	100.00	390.95	0.70	5000.00
*c*Maturity	1.87	1.25	1.14	0.25	9.92
*d*Guarantee	0.14	0.00	0.34	0.00	1.00
Subsample of contracts with 2+ bidders, $N = 1744$					
*c*Max admitted rate (unadj.)	15.52	15.00	3.41	8.90	26.50
*c*Max admitted rate	6.34	5.97	2.48	2.09	16.28
*c*Face value	257.40	100.00	355.60	0.70	4000.00
*c*Maturity	1.63	1.00	0.89	0.25	5.00
*d*Guarantee	0.11	0.00	0.31	0.00	1.00
Sample of borrowers, $N = 362$					
*c*Number of contracts[1]	13.93	5.00	23.27	1.00	186.00
*c*Number of banks[2]	3.62	3.00	1.94	1.00	14.00
*c*Budget income	8.90	9.72	2.20	3.38	11.77
*c*Budget deficit	−0.03	−0.03	0.07	−0.47	0.23
*c*Budget dependence	0.47	0.50	0.20	0.00	0.87
*d*Region	0.15	0.00	0.35	0.00	1.00
Sample of banks, $N = 66$					
*c*Number of contracts[3]	99.15	9.00	369.56	1.00	2704.00
*c*Number of borrowers[4]	21.11	3.00	59.74	1.00	345.00
*c*CB funds	0.39	0.37	0.39	0.00	1.00
*c*Repo	0.22	0.00	0.29	0.00	0.88
*c*Bank size	10.59	10.28	2.26	6.94	16.89
*c*Capital	0.12	0.11	0.06	0.02	0.32
*c*State credit	0.07	0.02	0.12	0.00	0.66
*c*NPL	0.05	0.04	0.04	0.00	0.24
*c*Liquid assets	0.15	0.13	0.10	0.02	0.61
*d*State owned	0.14	0.00	0.35	0.00	1.00
*d*SIFI	0.09	0.00	0.29	0.00	1.00
*d*Local	0.45	0.00	0.50	0.00	1.00
*d*Top-2	0.03	0.00	0.17	0.00	1.00

[1] Number of contracts offered by a borrower
[2] Number of banks competing for a borrower
[3] Number of contracts for which a bank competes
[4] Number of borrowers for which a bank competes

Table 3: Summary statistics of the samples used in estimation

	Mean	Median	SD	Min	Max
Subsample of contracts with 2+ bidders, $N = 1744$					
*c*1st Interest rate (unadj.)	13.30	13.02	2.36	7.87	26.07
*c*1st Interest rate	4.11	3.75	1.51	0.78	13.84
*c*2nd Interest rate	4.29	3.93	1.53	0.84	13.84
*c*Number of competing banks	2.72	2.00	0.90	2.00	6.00
*c*Budget income	7.92	9.68	2.88	3.49	12.17
*c*Budget deficit	−0.05	−0.04	0.07	−0.47	0.34
*c*Budget dependence	0.40	0.43	0.20	0.00	0.89
*d*Region	0.33	0.00	0.47	0.00	1.00
*c*Mosprime	11.12	11.62	1.97	6.00	17.56
*c*CDS Russia	3.23	3.43	0.59	1.76	5.83
*c*USD shortage	−0.02	−0.06	0.34	−1.60	1.05
*c*RUB/USD volatility	17.32	16.49	8.72	5.11	60.42
Subsample of bids for contracts with 2+ bidders, $N = 4521$					
*c*Interest rate	4.40	4.08	1.57	0.78	13.84
*c*CB funds	0.69	0.84	0.29	0.00	1.00
*c*Repo	0.52	0.62	0.27	0.00	0.88
*c*Bank size	13.99	12.83	2.52	6.94	16.89
*c*Capital	0.10	0.10	0.03	0.02	0.32
*c*State credit	0.08	0.06	0.12	0.00	0.66
*c*NPL	0.05	0.06	0.04	0.00	0.24
*c*Liquid assets	0.11	0.10	0.07	0.02	0.61
*d*State owned	0.49	0.00	0.50	0.00	1.00
*d*SIFI	0.47	0.00	0.50	0.00	1.00
*d*Local	0.02	0.00	0.15	0.00	1.00
*d*Top 2 bank	0.53	1.00	0.50	0.00	1.00

Number of borrowers is 288.

Table 4: Characteristics of the eligible debt issuers

	(1)	(2)	(3)	(4)
*c*Budget income	0.04***	0.04*	0.04***	0.04
	(0.01)	(0.02)	(0.01)	(0.02)
*c*Budget dependence	−0.29***	−0.27***	−0.27***	−0.22***
	(0.06)	(0.07)	(0.06)	(0.07)
*c*Budget deficit	−0.46**	−0.26	−0.45**	−0.30
	(0.19)	(0.18)	(0.19)	(0.19)
*d*Region	0.77***	0.84***	0.74***	0.80***
	(0.08)	(0.15)	(0.09)	(0.15)
*c*Auction success rate	−0.02	−0.01	0.08	0.05
	(0.08)	(0.09)	(0.09)	(0.10)
*c*CB funds			0.11	0.02
			(0.14)	(0.13)
*c*Bank size			0.01	0.02
			(0.03)	(0.03)
*c*Capital			0.89	−1.04
			(1.46)	(1.35)
*c*State credit			−0.31	−0.59
			(0.50)	(0.40)
*c*NPL			−0.75	−0.73
			(0.70)	(0.55)
*c*Liquid assets			−0.16	−0.52
			(1.15)	(0.99)
*c*State owned			−0.04	−0.11
			(0.15)	(0.13)
*c*SIFI			0.00	0.07
			(0.09)	(0.10)
*c*Local			−0.09	−0.10
			(0.10)	(0.15)
*c*Top-2 bank			−0.16**	−0.15*
			(0.08)	(0.08)
Constant	−0.21**		−0.43	
	(0.11)		(0.29)	
Region FE	*n*	*y*	*n*	*y*
R^2	0.48	0.69	0.49	0.70
# observations	362	362	362	362

The table reports the estimates of the linear probability model of borrowers selection in the list of eligible debt issuers. The dependent variable in all regressions (*d*Eligible) is equal to one for the borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. All bank variables are calculated as the weighted average of winning lender characteristics with weights proportional to the face value of auctioned debt contracts. Robust standard errors are in parenthesis.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Winning bids of auctions with multiple participants.

	Winning bid			
	(1)	(2)	(3)	(4)
*d*Post	1.56***	−0.93***	−0.95***	−1.43***
	(0.14)	(0.35)	(0.34)	(0.38)
*d*Eligible	−0.05	−0.06	0.12	
	(0.14)	(0.12)	(0.21)	
*d*Post × *d*Eligible	−0.80***	−0.88***	−0.80***	−0.66***
	(0.24)	(0.19)	(0.20)	(0.16)
*c*Mosprime		0.70***	0.68***	0.72***
		(0.07)	(0.07)	(0.08)
*c*CDS Russia		−0.10	−0.08	0.11
		(0.20)	(0.19)	(0.25)
*c*RUB/USD volatility		−0.00	−0.00	−0.01
		(0.01)	(0.01)	(0.01)
*c*Budget income			−0.29**	0.64**
			(0.11)	(0.24)
*c*Budget dependence			1.54***	1.15
			(0.53)	(1.38)
*c*Budget deficit			−0.36	0.00
			(1.21)	(1.32)
*d*Region			−1.67**	
			(0.69)	
Constant	3.16***	5.04***	5.52***	
	(0.13)	(0.26)	(0.35)	
Macro controls	*n*	*y*	*y*	*y*
Borrower controls	*n*	*n*	*y*	*y*
Borrower FE	*n*	*n*	*n*	*y*
R^2	0.19	0.41	0.43	0.69
# observations	1744	1744	1744	1649
# regions	67	67	67	63

The table reports OLS and FE estimates of versions of the eq. (1). The dependent variable is the winning interest rate net of the risk-free rate of the corresponding maturity. *d*Post is equal to one for auctions with bidding scheduled after the 26th February 2015 and zero otherwise. *d*Eligible is equal to one for the borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. See Table 1 for other variable definitions. Sample includes all auctions that have at least two participants in 2014–2015. Standard errors (in parenthesis) are clustered by borrower's region.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Second-to-minimum bids of auctions with multiple participants

	Second lowest bid			
	(1)	(2)	(3)	(4)
*d*Post	1.65***	−0.89***	−0.91***	−1.39***
	(0.14)	(0.33)	(0.33)	(0.36)
*d*Eligible	−0.07	−0.08	0.14	
	(0.14)	(0.12)	(0.20)	
*d*Post × *d*Eligible	−0.77***	−0.85***	−0.77***	−0.62***
	(0.23)	(0.20)	(0.21)	(0.17)
*c*Mosprime		0.69***	0.67***	0.73***
		(0.06)	(0.06)	(0.07)
*c*CDS Russia		−0.04	−0.03	0.11
		(0.20)	(0.19)	(0.25)
*c*RUB/USD volatility		−0.00	−0.00	−0.01
		(0.01)	(0.01)	(0.01)
*c*Budget income			−0.30**	0.53**
			(0.11)	(0.25)
*c*Budget dependence			1.58***	1.43
			(0.53)	(1.57)
*c*Budget deficit			−0.47	0.06
			(1.28)	(1.32)
*d*Region			−1.78**	
			(0.70)	
Constant	3.27***	5.18***	5.68***	
	(0.13)	(0.25)	(0.34)	
Macro controls	*n*	*y*	*y*	*y*
Borrower controls	*n*	*n*	*y*	*y*
Borrower FE	*n*	*n*	*n*	*y*
R^2	0.21	0.42	0.44	0.70
# observations	1744	1744	1744	1649
# regions	67	67	67	63

The table reports OLS and FE estimates of versions of the eq. (1). The dependent variable is the second to lowest interest rate net of the risk-free rate of the corresponding maturity. *d*Post is equal to one for auctions with bidding scheduled after the 26th February 2015 and zero otherwise. *d*Eligible is equal to one for the borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. See Table 1 for other variable definitions. Sample includes all auctions that have at least two participants in 2014–2015. Standard errors (in parenthesis) are clustered by borrower's region.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Winning bids of all auctions

	Winning bid			
	(1)	(2)	(3)	(4)
*d*Post	1.69***	−1.05**	−1.04**	−1.20***
	(0.24)	(0.44)	(0.43)	(0.37)
*d*Eligible	−0.21	−0.07	0.16	
	(0.31)	(0.18)	(0.23)	
*d*Post × *d*Eligible	−0.50	−0.83**	−0.84**	−1.06***
	(0.64)	(0.37)	(0.37)	(0.31)
*c*Mosprime		0.71***	0.71***	0.75***
		(0.14)	(0.14)	(0.12)
*c*CDS Russia		0.77**	0.77**	0.96***
		(0.29)	(0.29)	(0.29)
*c*RUB/USD volatility		−0.05***	−0.05***	−0.05***
		(0.01)	(0.01)	(0.01)
*c*Budget income			−0.33	−0.10
			(0.20)	(0.38)
*c*Budget dependence			0.76	−2.07*
			(0.71)	(1.20)
*c*Budget deficit			0.48	1.12
			(1.27)	(1.40)
*d*Region			−1.94*	
			(1.15)	
Constant	4.01***	5.46***	6.18***	
	(0.18)	(0.28)	(0.50)	
Macro controls	*n*	*y*	*y*	*y*
Borrower controls	*n*	*n*	*y*	*y*
Borrower FE	*n*	*n*	*n*	*y*
R^2	0.11	0.42	0.42	0.65
# observations	3803	3803	3803	3800
# regions	71	71	71	71

The table reports OLS and FE estimates of versions of the eq. (1). The dependent variable is the winning interest rate net of the risk-free rate of the corresponding maturity. *d*Post is equal to one for auctions with bidding scheduled after the 26th February 2015 and zero otherwise. *d*Eligible is equal to one for the borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. See Table 1 for other variable definitions. Sample includes all auctions that have at least one participant in 2014–2015. Standard errors (in parenthesis) are clustered by borrower's region.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Between- and within-auction variance decomposition

	SD			Share
Variable	Total	Between	Within	Within
*c*Interest rate	1.57	1.46	0.59	0.14
*c*Interest rate (rank)	0.93	0.46	0.80	0.75
*d*Winner	0.49	0.11	0.47	0.95
*c*CB funds	0.29	0.16	0.25	0.70
*c*Repo	0.27	0.15	0.23	0.71
*c*State credit	0.12	0.08	0.09	0.59
*c*Bank size	2.52	1.36	2.13	0.71
*c*Capital	0.03	0.02	0.02	0.61
*c*NPL	0.04	0.02	0.03	0.71
*d*State owned	0.50	0.27	0.42	0.70
*c*Liquid assets	0.07	0.04	0.05	0.61
*d*SIFI	0.50	0.26	0.42	0.72
*d*Local	0.15	0.09	0.12	0.63
*d*Top-2 bank	0.50	0.24	0.44	0.78

The between- and within auction variance decomposition of variables used in estimation of the eq. (2). The subsample of auctions with at least two bidders in 2014–2015. "Share" corresponds to share in total variance.

Table 9: Within auction bidding vs. central bank funding

	All bids					
	(1)	(2)	(3)	(4)	(5)	(6)
*d*Post	1.74***			−0.08		
	(0.32)			(0.13)		
*d*Post × *d*Eligible	0.03			−0.42***		
	(0.51)			(0.14)		
*c*CB funds	0.86***	0.33*		−0.47***	−0.50**	
	(0.32)	(0.19)		(0.15)	(0.21)	
*c*CB funds × *d*Post	−0.46	0.18	0.37	0.21	0.19	0.10
	(0.34)	(0.22)	(0.25)	(0.15)	(0.22)	(0.25)
*c*CB funds × *d*Eligible	−0.06	−0.01	−0.06	−0.22	−0.33	−0.46*
	(0.28)	(0.17)	(0.18)	(0.17)	(0.25)	(0.24)
*c*CB funds × *d*Post × *d*Eligible	−1.12*	−1.16**	−1.07***	0.56***	0.75***	0.79***
	(0.59)	(0.49)	(0.37)	(0.17)	(0.27)	(0.24)
Bank controls	*y*	*y*	*n*	*y*	*y*	*n*
Borrower FE	*y*	*n*	*n*	*y*	*n*	*n*
Contract FE	*n*	*y*	*y*	*n*	*y*	*y*
Lender FE	*n*	*n*	*y*	*n*	*n*	*y*
R^2	0.54	0.89	0.90	0.17	0.20	0.25
# observations	4515	4514	4500	4515	4514	4500
# contracts	1744	1743	1738	1744	1743	1738
# regions	67	67	66	67	67	66
# lenders	65	65	56	65	65	56

The table reports OLS and FE estimates of versions of eq. (2). In the left panel, the dependent variable *c*Interest rate is the interest rate offered by a bank for a particular contract, net of the risk-free rate of the corresponding maturity. In the right panel, the dependent variable *d*Winner is an indicator equal to one if a bank is a winner in a particular auction, and zero otherwise. *d*Post is equal to one for auctions with bidding scheduled after the 26th of February, 2015, and zero otherwise. *d*Eligible is equal to one for borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. *c*CB funds denotes the share of bank's funding from the Bank of Russia in its total money markets liabilities. Bank controls include: *c*Bank size, *c*Capital, *c*State credit, *c*NPL, *c*Liquid assets, *d*State owned, *d*SIFI, *d*Local, *d*Top-2 bank. See Table 1 for variable definitions. All bank characteristics are as of the end of January 2015. All control variables are demeaned. Sample includes all auctions that have at least two participants in 2014–2015. Constant is omitted from the outputs. Standard errors (in parenthesis) are two-way clustered by borrower's region and lender id.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Within auction bidding vs. securities encumbrance

	All bids					
	(1)	(2)	(3)	(4)	(5)	(6)
*d*Post	1.65***			0.03		
	(0.36)			(0.11)		
*d*Post × *d*Eligible	−0.39			−0.27**		
	(0.39)			(0.13)		
*c*Repo	0.68	0.22		−0.42*	−0.43	
	(0.67)	(0.34)		(0.23)	(0.28)	
*c*Repo × *d*Post	−0.37	0.18	0.32	0.03	−0.04	−0.05
	(0.48)	(0.19)	(0.19)	(0.18)	(0.24)	(0.24)
*c*Repo × *d*Eligible	−0.30	−0.20	−0.09	−0.21	−0.32	−0.47
	(0.47)	(0.23)	(0.25)	(0.26)	(0.31)	(0.34)
*c*Repo × *d*Post × *d*Eligible	−0.89	−1.23***	−1.21***	0.56**	0.74**	0.84**
	(0.59)	(0.32)	(0.30)	(0.25)	(0.32)	(0.33)
Bank controls	*y*	*y*	*y*	*y*	*y*	*y*
Borrower FE	*y*	*n*	*n*	*y*	*n*	*n*
Contract FE	*n*	*y*	*y*	*n*	*y*	*y*
Lender FE	*n*	*n*	*y*	*n*	*n*	*y*
R^2	0.54	0.89	0.90	0.17	0.20	0.25
# observations	4515	4514	4500	4515	4514	4500
# contracts	1744	1743	1738	1744	1743	1738
# regions	67	67	66	67	67	66
# lenders	65	65	56	65	65	56

The table reports OLS and FE estimates of versions of eq. (2). In the left panel, the dependent variable *c*Interest rate is the interest rate offered by a bank for a particular contract, net of the risk-free rate of the corresponding maturity. In the right panel, the dependent variable *d*Winner is an indicator equal to one if a bank is a winner in a particular auction, and zero otherwise. *d*Post is equal to one for auctions with bidding scheduled after the 26th of February, 2015, and zero otherwise. *d*Eligible is equal to one for borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. *c*Repo denotes the share of bank's securities encumbered under repo funding in its total securities holdings. Bank controls include: *c*Bank size, *c*Capital, *c*State credit, *c*NPL, *c*Liquid assets, *d*State owned, *d*SIFI, *d*Local, *d*Top-2 bank. See Table 1 for variable definitions. All bank characteristics are as of the end of January 2015. All control variables are demeaned. Sample includes all auctions that have at least two participants in 2014–2015. Constant is omitted from the outputs. Standard errors (in parenthesis) are two-way clustered by borrower's region and lender id.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Bidder ranks vs. central bank funding

	All bids		
	(1)	(2)	(3)
*d*Post	0.38		
	(0.23)		
*d*Post × *d*Eligible	0.70*		
	(0.36)		
*c*CB funds	1.02***	0.92***	
	(0.28)	(0.31)	
*c*CB funds × *d*Post	−0.47**	−0.19	0.11
	(0.23)	(0.30)	(0.35)
*c*CB funds × *d*Eligible	0.13	0.42	0.49
	(0.32)	(0.36)	(0.38)
*c*CB funds × *d*Post × *d*Eligible	−1.05**	−1.63***	−1.57***
	(0.47)	(0.56)	(0.44)
Bank controls	*y*	*y*	*n*
Contract FE	*n*	*y*	*y*
Lender FE	*n*	*n*	*y*
R^2	0.28	0.41	0.49
# observations	4471	4470	4457
# contracts	1744	1743	1738
# regions	67	67	66
# lenders	64	64	56

The table reports estimates of versions of eq. (2). The dependent variable in all columns is within-auction bidder rank with the lower values indicating lower bids (interest rates). *d*Post is equal to one for auctions with bidding scheduled after the 26th of February, 2015, and zero otherwise. *d*Eligible is equal to one for borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. *c*CB funds denotes the share of bank's funding from the Bank of Russia in its total money markets liabilities. Bank controls include: *c*Bank size, *c*Capital, *c*State credit, *c*NPL, *c*Liquid assets, *d*State owned, *d*SIFI, *d*Local, *d*Top-2 bank. See Table 1 for other variable definitions. All bank characteristics are as of the end of January 2015. All control variables are demeaned. The full sample includes all auctions that have at least two participants in 2014–2015. Standard errors (in parenthesis) are two-way clustered by borrower's region and lender id. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Within auction bidding vs. central bank funding: robustness

	*c*Int. rate	*d*Winner	*c*Int. rate	*d*Winner
	(1)	(2)	(3)	(4)
*c*CB funds	0.08	−0.03	0.34*	−0.36**
	(0.25)	(0.28)	(0.18)	(0.16)
*c*CB funds × *d*Eligible	0.12	−0.64	0.01	−0.52*
	(0.23)	(0.41)	(0.19)	(0.26)
*c*CB funds × *d*Post	0.47*	−0.32	0.16	−0.03
	(0.25)	(0.31)	(0.19)	(0.19)
*c*CB funds × *d*Post × *d*Eligible	−1.24***	1.08**	−1.15**	0.98***
	(0.44)	(0.44)	(0.46)	(0.31)
*d*State owned	0.03	−0.23	−0.16	0.14
	(0.12)	(0.19)	(0.15)	(0.10)
*d*State owned × *d*Post	−0.28**	0.41**		
	(0.11)	(0.20)		
*d*State owned × *d*Eligible	−0.05	0.19		
	(0.11)	(0.26)		
*d*State owned × *d*Post × *d*Eligible	0.23*	−0.19		
	(0.12)	(0.25)		
*c*State credit	−0.90**	0.53*	−0.98**	1.47***
	(0.43)	(0.27)	(0.38)	(0.42)
*c*State credit × *d*Post			−0.11	−1.22***
			(0.41)	(0.40)
*c*State credit × *d*Eligible			0.19	−0.67
			(0.34)	(0.65)
*c*State credit × *d*Post × *d*Eligible			0.27	0.91
			(0.97)	(0.82)
Bank controls	*y*	*y*	*y*	*y*
Contract FE	*y*	*y*	*y*	*y*
R^2	0.89	0.21	0.89	0.21
# observations	4514	4514	4514	4514
# contracts	1743	1743	1743	1743
# regions	67	67	67	67
# lenders	65	65	65	65

The table reports estimates of versions of eq. (2). The dependent variable in all columns is within-auction bidder rank with the lower values indicating lower bids (interest rates). *d*Post is equal to one for auctions with bidding scheduled after the 26th of February, 2015, and zero otherwise. *d*Eligible is equal to one for borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. *c*CB funds denotes the share of bank's funding from the Bank of Russia in its total money markets liabilities. Bank controls include: *c*Bank size, *c*Capital, *c*State credit, *c*NPL, *c*Liquid assets, *d*State owned, *d*SIFI, *d*Local, *d*Top-2 bank. See Table 1 for other variable definitions. All bank characteristics are as of the end of January 2015. All control variables are demeaned. The full sample includes all auctions that have at least two participants in 2014–2015. Standard errors (in parenthesis) are two-way clustered by borrower's region and lender id. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Within auction bidding vs. central bank funding: robustness (cont.)

	*c*Int. rate	*d*Winner	*c*Int. rate	*d*Winner
	(1)	(2)	(3)	(4)
*c*CB funds	0.17	−0.34*	0.52***	−0.44
	(0.21)	(0.18)	(0.20)	(0.31)
*c*CB funds × *d*Eligible	0.15	−0.39	0.15	−0.44
	(0.19)	(0.31)	(0.27)	(0.35)
*c*CB funds × *d*Post	−0.03	0.07	−0.04	0.13
	(0.12)	(0.22)	(0.16)	(0.35)
*c*CB funds × *d*Post × *d*Eligible	−0.99**	0.75**	−1.45***	0.86**
	(0.41)	(0.35)	(0.40)	(0.36)
*c*Pol. deposit	0.06	0.04		
	(0.04)	(0.03)		
*c*Pol. deposit × *d*Post	−0.01	−0.06*		
	(0.03)	(0.03)		
*c*Pol. deposit × *d*Eligible	0.02	−0.06		
	(0.02)	(0.04)		
*c*Pol. deposit × *d*Post × *d*Eligible	−0.11***	0.07		
	(0.04)	(0.04)		
*d*CB checks			−0.13	0.01
			(0.14)	(0.18)
*d*CB checks × *d*Post			0.09	0.05
			(0.13)	(0.19)
*d*CB checks × *d*Eligible			−0.10	0.15
			(0.11)	(0.20)
*d*CB checks × *d*Post × *d*Eligible			0.45***	−0.18
			(0.11)	(0.22)
Bank controls	*y*	*y*	*y*	*y*
Contract FE	*y*	*y*	*y*	*y*
R^2	0.89	0.21	0.89	0.20
# observations	4504	4504	4504	4504
# contracts	1738	1738	1738	1738
# regions	67	67	67	67
# lenders	64	64	64	64

The table reports estimates of versions of eq. (2). The dependent variable in all columns is within-auction bidder rank with the lower values indicating lower bids (interest rates). *d*Post is equal to one for auctions with bidding scheduled after the 26th of February, 2015, and zero otherwise. *d*Eligible is equal to one for borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. *c*CB funds denotes the share of bank's funding from the Bank of Russia in its total money markets liabilities. Bank controls include: *c*Bank size, *c*Capital, *c*State credit, *c*NPL, *c*Liquid assets, *d*State owned, *d*SIFI, *d*Local, *d*Top-2 bank. *c*Pol. deposit denotes the average (log of) deposit of candidates in the 2011 Parliamentary elections in a particular bank. *d*CB check is equal to one for banks that had non-scheduled audit checks by BoR in 2013–2014. See Table 1 for other variable definitions. All bank characteristics (apart from *c*Pol. deposit and *d*CB chekcs) are as of the end of January 2015. All control variables are demeaned. The full sample includes all auctions that have at least two participants in 2014–2015. Standard errors (in parenthesis) are two-way clustered by borrower's region and lender id. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Competition for common borrowers (OLS)

*c*Eligibile	0		1		$\Delta_P \Delta_E \beta$
*d*Post	0	1	0	1	
*c*CB funds	−0.07	−0.31**	0.04	0.32**	0.52**
	(0.06)	(0.15)	(0.07)	(0.15)	(0.21)
*c*State credit	1.43***	0.25	0.99***	−0.67	−0.48
	(0.21)	(0.70)	(0.28)	(0.53)	(0.58)
*c*Bank size	0.06***	0.05	0.05**	0.05**	0.01
	(0.02)	(0.05)	(0.02)	(0.02)	(0.04)
*c*Capital	0.66	−1.18	0.12	1.20	2.92
	(0.47)	(1.72)	(0.72)	(1.07)	(1.83)
*c*NPL	−0.26	−0.64	−0.82	−0.33	0.87
	(0.68)	(1.34)	(0.58)	(1.66)	(1.62)
*c*Liquid assets	0.45	−1.14	0.38	−0.02	1.19
	(0.32)	(1.18)	(0.36)	(1.30)	(1.50)
*d*State owned	0.06	−0.07	0.15*	−0.00	−0.02
	(0.08)	(0.12)	(0.09)	(0.11)	(0.14)
*d*SIFI	0.13	−0.02	0.19	0.35**	0.31**
	(0.14)	(0.21)	(0.14)	(0.14)	(0.12)
*d*Local	0.01	0.12	0.22	−0.21*	−0.53*
	(0.04)	(0.23)	(0.18)	(0.11)	(0.33)
*d*Top-2 bank	−0.14**	0.53***	−0.20***	0.36***	−0.11
	(0.06)	(0.13)	(0.07)	(0.14)	(0.15)
Constant	0.09***	0.47***	0.09***	0.31***	−0.16**
	(0.02)	(0.07)	(0.03)	(0.06)	(0.08)

The table reports OLS estimates of a version of the eq. (3) without bank fixed effects. The dependent variable is an indicator equal to one if both banks in a bank pair compete for at least one common borrower, and zero otherwise. *d*Post is equal to one for the subperiod after the 26th February 2015 and zero otherwise. *d*Eligible is equal to one for the subset of borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. Pair-level explanatory variables are calculated as a geometric mean of the corresponding bank-level variables (*c*Bank size is calculcated as an arithmentic mean of the logarithm of assets of the banks). All bank characteristics are as of the end of January 2015. See Table 1 for bank level variable definitions. Sample includes bank-pairs comprised of banks that compete at least once in the same geographical region during 2014–2015. All explanatory variables are centered within each subsample defined by combinations of *d*Eligible and *d*Post. Number of dyads is 620, total number of banks is 65; regression $R^2 = 0.23$. Standard errors (in parenthesis) are calculated under dyadic clustering.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 15: Competition for common borrowers (FE)

cEligible	0		1		$\Delta_P \Delta_E \beta$
dPost	0	1	0	1	
cCB funds	−0.06	−0.28	0.03	0.34**	0.53**
	(0.09)	(0.20)	(0.11)	(0.16)	(0.23)
cState credit	0.99**	−0.14	0.78	−1.02	−0.67
	(0.48)	(1.02)	(0.55)	(0.66)	(0.68)
cBank size	0.05	0.04	0.04	0.04	0.01
	(0.03)	(0.08)	(0.04)	(0.03)	(0.06)
cCapital	0.12	−1.84	−0.22	0.69	2.87
	(1.14)	(2.32)	(1.20)	(1.07)	(2.23)
cNPL	0.35	−0.17	−0.25	0.02	0.78
	(1.33)	(2.24)	(1.32)	(1.62)	(2.67)
cLiquid assets	0.67	−0.85	0.59	0.15	1.09
	(0.87)	(1.77)	(0.91)	(1.31)	(1.80)
dState owned	0.09	−0.04	0.19	0.04	−0.02
	(0.11)	(0.16)	(0.12)	(0.13)	(0.18)
dSIFI	0.13	0.02	0.24	0.42***	0.29
	(0.14)	(0.20)	(0.19)	(0.14)	(0.18)
dLocal	0.05	0.18	0.26	−0.15	−0.55
	(0.11)	(0.28)	(0.20)	(0.15)	(0.39)
dTop-2 bank	−0.12	0.45***	−0.05	0.46***	−0.06
	(0.20)	(0.17)	(0.18)	(0.11)	(0.30)

The table reports FE estimates of the eq. (3). The dependent variable is an indicator equal to one if both banks in a bank pair compete for at least one common borrower, and zero otherwise. dPost is equal to one for the subperiod after the 26th February 2015 and zero otherwise. dEligible is equal to one for the subset of borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. Pair-level explanatory variables are calculated as a geometric mean of the corresponding bank-level variables (cBank size is calculcated as an arithmentic mean of the logarithm of assets of the banks). All bank characteristics are as of the end of January 2015. See Table 1 for bank level variable definitions. Sample includes bank-pairs comprised of banks that compete at least once in the same geographical region during 2014–2015. Number of dyads is 620, total number of banks is 65; regression within-$R^2 = 0.08$. Standard errors (in parenthesis) are calculated under dyadic clustering.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 16: Competition for common borrowers, robustness

	All bank pairs		Number of borrowers	
	OLS	FE	OLS	FE
*c*CB funds	0.18**	0.19**	0.14**	0.14**
	(0.08)	(0.09)	(0.06)	(0.06)
*c*State credit	−0.27	−0.29	−0.26	−0.31**
	(0.29)	(0.31)	(0.16)	(0.16)
*c*Bank size	−0.02	−0.02	−0.00	−0.00
	(0.02)	(0.03)	(0.01)	(0.01)
*c*Capital	0.47	0.50	1.12**	1.01**
	(0.55)	(0.65)	(0.50)	(0.52)
*c*NPL	0.30	0.34	0.15	0.05
	(0.65)	(0.85)	(0.47)	(0.50)
*c*Liquid assets	0.26	0.31	−0.08	−0.13
	(0.28)	(0.33)	(0.43)	(0.39)
*d*State owned	−0.01	0.01	−0.03	−0.03
	(0.08)	(0.09)	(0.03)	(0.04)
*d*SIFI	0.29***	0.26***	0.08**	0.06
	(0.07)	(0.08)	(0.04)	(0.06)
*d*Local	0.02	0.02	−0.50**	−0.50**
	(0.03)	(0.03)	(0.21)	(0.22)
*d*Top-2 bank	0.01	0.08	0.15***	0.18***
	(0.09)	(0.11)	(0.04)	(0.06)
Constant	−0.05*		−0.00	
	(0.02)		(0.02)	
# dyads	2080	2080	620	620
R^2	0.17	0.11	0.16	0.10

The table reports the estimates of the eq. (3). The dependent variable in columns 1–2 is an indicator equal to one if both banks in a bank pair compete for at least one common borrower, and zero otherwise. The dependent variable in columns 3–4 is the total number of potential borrowers for which a couple of banks jointly compete, normalized by the geometric mean of the total number of potential borrowers of these banks. *d*Post is equal to one for the subperiod after the 26th February 2015 and zero otherwise. *d*Eligible is equal to one for the subset of borrowers whose debts are pledgeable in the Bank of Russia, and zero otherwise. Pair-level explanatory variables are calculated as a geometric mean of the corresponding bank-level variables (*c*Bank size is calculcated as an arithmentic mean of the logarithm of assets of the banks). All bank characteristics are as of the end of January 2015. See Table 1 for bank level variable definitions. The table only reports the double difference of coefficients over time periods and eligibility segments ($\Delta_P \Delta_E \beta$). Standard errors (in parenthesis) are calculated under dyadic clustering.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$