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Credit rationing in small firm-bank relationships

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ABSTRACT

I study credit rationing in small firm-bank relationships by using a unique data set of matched loan applications and contracts. I establish the degree of credit rationing by relating a firm's requested loan amount to the bank's granted amount. In line with theoretical predictions, credit rationing is higher for opaque than transparent firms at the beginning of their bank relationships and decreases over time for both. After testing for several alternative explanations, the results suggest that information and incentive problems explain the observed credit rationing and its dynamics.

1. Introduction

> *"The struggle small firm owners face to access finance to grow their operations is a global issue, affecting fast-growing emerging nations as much as developed countries."*
>
> - Financial Times, June 1, 2012

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The lack of access to finance for small and opaque firms receives significant attention not only from the media but also from academics and policy makers (see, e.g., Beck et al., 2008; World Bank, 2007; European Commission, 2011; IFC, 2011). Despite this common idea about the importance of the topic, the empirical evidence on one aspect of it – the extent of credit rationing due to asymmetric information – is scarce. Notable exceptions are Berger and Udell (1992) who use an indirect approach and Banerjee and Duflo (2014) who exploit policy changes in a directed lending program to study credit rationing. So far research has not explored more direct avenues that incorporate demand data to establish the actual extent of credit rationing and its dynamics during bank-firm relationships.

Credit rationing comes in two forms. Borrower rationing (type 1) means that some borrowers get no loan at all although they may have profitable investment projects and are indistinguishable from those borrowers who receive loans (e.g., Stiglitz and Weiss, 1981). Loan size rationing (type 2) means that, at the current interest rate, all borrowers are served but demand a larger loan amount than they finally receive from the bank (e.g., Jaffee and Russell, 1976). In practice, borrower rationing implies for banks to turn away for good some profitable clients with whom they would actually want to establish a relationship to make future business. Therefore, (initial) loan size rationing might be expected to play an important role for banks to deal with adverse selection and moral hazard problems in environments with high informational asymmetries, such as in lending to small firms. Direct evidence on loan size rationing is particularly scarce due to a lack of micro-level demand and supply data.

In this paper, I provide such direct evidence on the extent of loan size rationing by linking the firms' requested to the bank's granted loan amount. Therefore, this study fits with a growing literature that exploits information from loan applications. Puri et al. (2011b), Jimenez et al. (2012) and Berg and Kirschenmann (2015) use loan applications to separate loan supply from demand. Because the wedge between demand and supply is informative about the resolution of informational asymmetries over time, I investigate not only how the wedge relates to firm, loan, and relationship characteristics, but also how it evolves over sequential loan contracts. This dynamic aspect differentiates my study from Cheng and Degryse (2010) and Becchetti et al. (2011) who also observe requested and granted loan amounts.

My evidence comes from analyzing a unique panel data set from an emerging market bank focused on lending to small firms of nearly 97,000 matched loan applications and loan contracts over a four-year period. The information from this data set helps to provide an understanding of whether the ability of banks to produce information (e.g., Diamond, 1984; Ramakrishan and Thakor, 1984; Boyd and Prescott, 1986) can overcome rationing.

Having a panel data set has several advantages. First, I can follow borrowers during their relationships with the bank and establish the dynamic patterns of requested and granted loan amounts that arise when borrowers and banks interact repeatedly. In contrast, the existing evidence on the impact of a strong bank-borrower relationship on credit availability relies on cross-sectional data and does not explicitly observe loan demand (e.g., Petersen and Rajan, 1994, 1995; Cole, 1998; Elsas and Krahnen, 1998). Ioannidou and Ongena (2010) follow borrowers over several interactions with their lenders, but do not establish the role that loan requests play. Second, I can control for unobserved borrower heterogeneity that might affect credit rationing (e.g., entrepreneurial ability or time-invariant firm risk). Regressions with firm fixed effects focus the analysis on within-firm variation over time and alleviate the potential endogeneity problem that these unobservables might be correlated with the included indicators of informational asymmetries. I also use year-quarter fixed effects to control for unobservable time-specific effects.

The results show that some loan size rationing due to informational asymmetries is present in lending to small firms: opaque firms (i.e., firms that are comparatively young or small or have no other liabilities when starting to borrow from the bank) are more rationed than more transparent firms and the degree of credit rationing decreases over loan sequences. These findings are in line with the predictions of the credit rationing theories that rationing is the outcome of information and incentive problems in bank lending.

Several alternative rationales exist that might explain the observed heterogeneity in the wedge between requested and granted loan amounts. Young and small firms might have larger growth opportunities or increase their borrowing capacity more (e.g., through increasing equity stakes or higher-quality collateral) over time than older and larger firms. I control for an array of firm characteristics such as size, disposable income, leverage, age and the type of collateral that was pledged. However, the observed

rationing and its decrease over bank relationships for the initially opaque firms survive the inclusion of these variables.

Apart from that, the requested loan amount might be endogenous in the sense that it depends on anticipated supply. I address three potential scenarios in the empirical analysis. First, after their first interaction with the bank firms might overstate their requests when they themselves experience rationing at their first loan. In contrast, I find that firms which were initially rationed first decrease their requested amount and then increase it much more moderately than the initially non-rationed firms. In addition, a comparison with the bank side highlights that the bank is willing to disproportionately increase its lending stakes and thereby decrease rationing over time for the initially rationed firms. These findings are consistent with the observed credit rationing arising due to asymmetric information. In the case of adverse selection, the group of rationed borrowers is a pool of "good" and "bad" firms. Thus, the bank should make up for the previous rationing of the newly disclosed good firms. Similarly, the risk of moral hazard might decrease over time, and the bank might disproportionately increase its granted loan amounts for those firms that have successfully established trust. Second, firms that expect to be rationed because they heard from other firms in the neighborhood about the rationing might overstate their request to end up receiving what they actually want. I do not find evidence for this scenario. Third, owners of young and small firms might be overconfident about or misjudge their borrowing potential. The smaller loan amounts granted than requested would then be a sign of the bank's adjustment to reasonable loan sizes rather than credit rationing. However, when I augment the main regressions with a measure of the difference between a borrower's actual requested amount and the realistic requested amount given the respective firm and loan characteristics to account for the borrower's overconfidence or misjudgment all results on credit rationing hold. Also, when I explicitly account for firms' requests in a two-stage approach using the firm owner's gender as an instrument all of the results on credit rationing hold.

Overall, the results imply that the resolution of information problems over the course of bank relationships leads to lower loan size rationing because the bank is willing to increase its stakes to meet the firms' (growing) demand.[2]

The remainder of the paper is organized as follows. Section 2 derives testable hypotheses from the banking theories on credit rationing and provides information on the empirical setting. Section 3 describes the data, while Section 4 presents the findings from the empirical analyses. Section 5 discusses the results and concludes.

2. Related theoretical literature and empirical setting

2.1. Related theoretical literature

Modern theories of credit rationing rationalize why profit-maximizing banks might rather set an interest rate below the market-clearing rate and ration credit than increase interest rates when facing an increased demand (e.g., Jaffee and Russell, 1976; Stiglitz and Weiss, 1981; Watson, 1984; Parker, 2003). These models show that credit rationing occurs if banks are unable to distinguish between borrowers with different risk characteristics or to control the actions borrowers take after the loan's disbursal (see also Bhattacharya and Thakor, 1993). A rise in interest rates can then affect the quality of demand as the least risky borrowers drop out of the market. Thus, the average risk of the borrower pool increases (adverse selection). A rise in interest rates can also affect the behavior of demand because some borrowers might opt for riskier projects after having received funding (moral hazard). Both effects, in turn, can have negative impacts on banks' expected profits and therefore induce banks to ration credit.

[2] My results are also related to recent evidence on the importance of bank relationships in syndicated lending to large firms (Bharath et al., 2011) and in consumer lending (Puri et al., 2011a). More broadly, my paper complements studies that focus on credit lines to assess how banks use the information they gather from multiple interactions with their borrowers (e.g., Mester et al., 2007; Norden and Weber, 2010) and studies that provide evidence on the firm characteristics that determine the probability of being denied credit (Brown et al., 2011; Cole, 2013). Boot (2000) and Ongena and Smith (2000) provide overviews of the beneficial effects of bank relationships on loan terms.

Theories of financial intermediation constitute that banks are able to accumulate private information about their borrowers through screening and monitoring (e.g., Diamond, 1984; Ramakrishan and Thakor, 1984; Boyd and Prescott, 1986). While banks in practice do invest in information production, there nevertheless remain informational asymmetries. Such informational asymmetries can be expected to be particularly large in the beginning of bank-borrower relationships in general and in the case of opaque firms in particular. In the beginning of bank-borrower relationships the bank cannot fully distinguish between "good" and "bad" opaque firms so that a pooling of borrowers with different (to the bank unobservable) default risks with non-price rationing may occur. Therefore, credit rationing can be expected to be tighter for the opaque firms because information problems are more severe, and thus the risk of adverse selection is larger. Nevertheless, it seems plausible that some rationing is also present for the more transparent firms because the bank cannot observe all their actions or efforts taken after the loan is disbursed. Moral hazard should therefore prevail in both borrower groups in the beginning of bank relationships.

In a multi-period setting (see Sobel, 1985; Ghosh and Ray, 2001), credit rationing is expected to decrease over the course of bank-borrower relationships for both opaque and more transparent firms. In the case of adverse selection the impact on the degree of credit rationing over the loan sequences works along the intensive and extensive margins. On the one hand, the need for credit rationing is reduced over the course of the multiple interactions between the same borrower and lender because informational asymmetries are resolved. On the other hand, bad borrowers reveal themselves over time and are not granted another loan. In the case of moral hazard, trust might be established (Boot and Thakor, 1994) or the owners' stakes in their firms might increase over time so that they can bear a larger share of the risk which, in turn, decreases the risk of moral hazard.

The above reasoning leads to the following testable hypotheses on the relation between borrower opaqueness and credit rationing:

Hypothesis 1. Credit rationing is present for opaque and more transparent firms in the beginning of their bank relationships.

Hypothesis 2. Credit rationing is tighter for the opaque firms in the beginning of their bank relationships.

Hypothesis 3. Credit rationing decreases over the course of the bank-firm relationships for both the opaque and the more transparent firms.

2.2. Empirical setting

The data set used in this study comprises all of the small annuity loans, credit lines, and overdrafts with amounts up to 50,000 euros extended to firms by one Bulgarian bank (henceforth called the "Bank") between April 2003 and September 2007. The Bank is a nationwide commercial, full-service bank that focuses on lending to micro, small and medium firms.[3] The Bank provides an ideal background for studying loan size rationing in small firm lending because it offers an empirical setting that is closely related to the setting of Jaffee and Russell (1976). Jaffee and Russell (1976) focus on loan size rationing of borrowers with unlimited liability in an environment with asymmetric information.[4] In my data set, I have information on the wedge between demanded and granted loan amounts for firms which are mostly sole proprietorships with unlimited liability in an emerging market, that is, an environment plagued by large informational asymmetries.

I do not observe the Bank's decision to reject loan applications and can therefore neither account for credit rationing at the loan approval stage (as in Stiglitz and Weiss, 1981) nor estimate demand conditional on loan approval. However, the potential bias arising from this lack of rejected loan applications should work against me finding any significant loan size rationing because the approved borrowers in my sample

[3] As with the majority of banks in Bulgaria and the region, the Bank is owned by foreign investors. In 2007, 82% of the bank assets in Bulgaria were in the hands of institutions with a majority of foreign ownership. In Central and Eastern Europe the average share of foreign bank assets in 2007 was 80%. Compared to the aggregate Bulgarian banking system where 41% of assets are loans to firms, 70% of the assets of the Bank are firm loans.

[4] While size rationing in Jaffee and Russell (1976) does not necessarily imply an efficiency loss, Kjenstad et al. (2015) extend their model to show inefficient rationing in this setting.

are a selection of the whole population of potential small firm borrowers that is transparent enough to be granted a loan in the first place. If I still find loan size rationing, this can be interpreted as a lower bound of credit rationing.

An argument can be made that requested and granted loan amounts do not mirror *real* demand and supply but might be driven by strategic considerations. In my setting, the granted loan terms largely reflect the Bank's supply decision (see below). On the borrower side, firms might strategically overstate their requests so that they end up with their desired loan amount, but I do not find evidence of such behavior. While the empirical analysis shows some evidence that borrowers learn from the size rationing at their first loans, nevertheless requested and granted loan amounts are fairly good starting points to account for demand and supply.

At the heart of the Bank's lending technology is an analysis of the borrower's debt capacity. A prospective borrower first meets a client advisor who assesses whether the borrower meets the Bank's basic requirements. If this is the case, the client fills out a loan application form and indicates his or her *preferred loan amount*, maturity, and currency, and the purpose of the loan. The client also has to provide information about the firm ownership, other bank relationships and the free cash flow available for the repayment of the loan. In the next step, the Bank's credit administration prepares information on the borrower's credit history with the Bank and other banks. Firm loans in Bulgaria are covered by both the public credit registry and, since 2005, a private credit bureau. Yet, 45.5% of the first-time firm borrowers in the data set do not have any other debt at the time of the loan's disbursement. The loan officer conducts a financial analysis that includes a visit to the firm's site. While this analysis allows the loan officer to gather some information on the borrower's firm, most of these small firms do not have bookkeeping, let alone audited financial statements. Therefore, informational asymmetries still prevail after the financial analysis; the hard information gathered is only reliable to a certain extent, and soft information might matter as well. Eventually, the Bank's credit committee makes the final decision on the loan terms leaving hardly any room for borrowers to negotiate the loan terms.

Collateral requirements and interest rates are largely standardized and play a minor role in the individual loan contracting process for my sample. Importantly, this setting implies that the low-risk opaque firms in my sample cannot use collateral to signal their quality, which is a standard solution to overcome credit rationing in the related theory (Bester, 1985).

3. Data and univariate results

3.1. Data set and empirical model

For each disbursed loan, the data set comprises information on the loan terms requested by the firms and the terms granted by the Bank, as well as firm characteristics and relationship indicators at the time of the loan's origination. Table 1 provides definitions and descriptive statistics for all of the variables.

I exclude all observations with missing loan or firm-level data and all loans after the fifth in a sequence due to few observations in these categories. Based on the fact that interest rate and collateral requirements are fixed for small loans but are individually negotiated for medium loans with amounts of more than 50,000 euros, eventually the main analysis excludes all medium loans. These exclusions lead to the final sample of 96,894 loans to 58,736 firms among which 25,745 are repeat clients.[5]

I study the factors that influence the degree of credit rationing in the sample in two steps. First, I estimate an OLS model for the full sample with $Share\ granted_{i,k,t}$ (the ratio of the granted loan amount to the requested loan amount for loan k taken out by firm i in month t) as the dependent variable:

$$Share\ granted_{i,k,t} = a + \beta_1 A_{i,t} + \beta_2 B_{i,t} + \beta_3 L_k + \beta_4 R_i + \beta_5 T_t + e_{i,k,t}, \quad (1)$$

[5] These numbers do not imply that generally only half of the firms come back to borrow again from the Bank. Rather the case is that for most of the 26,831 firms which start borrowing in 2006 and 2007, the observation period ends before they come back for a second loan.

Table 1
Variable definitions and summary statistics.

Variable	Definition	Mean	SD	Min	Median	Max
Dependent variables						
Share granted	Granted loan amount as a share of requested loan amount (%)	0.92	0.22	0.03	1	2
Granted amount	Loan amount as stated in the loan contract (EUR)	4300	5329	51	2433	51,423
Requested amount	Requested loan amount (EUR)	4816	6045	51	2779	100,618
Loan characteristics						
Fixed capital loan	Loan is for fixed capital financing (1 = yes, 0 = no)	0.52	0.50	0	1	1
Annuity loan	Loan is an annuity loan vs. credit line or overdraft (1 = yes, 0 = no)	0.75	0.43	0	1	1
Mortgage	Loan is collateralized by a mortgage (1 = yes, 0 = no)	0.07	0.26	0	0	1
Cash	Loan is collateralized by cash (1 = yes, 0 = no)	0.01	0.05	0	0	1
Pledge	Loan is collateralized by a pledge (1 = yes, 0 = no)	0.23	0.42	0	0	1
Time between loans	Days between disbursement dates of two adjacent loans in a loan sequence	331	200	0	301	1573
Loan number	Indicates the number of the loan in a sequence of loans a borrower takes out from the Bank (1 to 5)	1.76	1	1	1	5
Firm characteristics						
Age	Firm age at disbursement date (years)	8.32	5.47	0	8	71
Initially young	Firm age was below or equal to two years when first borrowing from bank (1 = yes, 0 = no)	0.18	0.39	0	0	1
Assets	Total assets of firm at disbursement date (EUR)	27,638	47,454	315	10,803	480,087
Initially small	Firm size (total assets) was below median firm size when first borrowing from the bank (1 = yes, 0 = no)	0.51	0.50	0	1	1
Sole proprietorship	Firm is sole proprietorship (1 = yes, 0 = no)	0.92	0.27	0	1	1
Leverage	Total debt as share of total assets of firm at disbursement date	0.14	0.19	0	0.06	1
Disposable income	Total disposable income per month at disbursement date (EUR)	406	724	5	147	7449
Other credit	Borrower has credit from other sources outstanding at time of loan disbursement (1 = yes, 0 = no)	0.63	0.48	0	1	1
No liabilities at first loan	Borrower has zero liabilities at the first loan taken out from the Bank (1=yes, 0=no)	0.45	0.50	0	0	1
Medium loan	Borrower also takes out a medium-sized loan with amount > 50,000 EUR during the observation period (1 = yes, 0 = no)	0.01	0.11	0	0	1
Loan officer change	Firm experienced a loan officer change during duration of previous loan (1=yes, 0=no)	0.25	0.43	0	0	1
Previous arrears	Borrower was past-due on interest or principal payments more than 30 days at the previous loan (1 = yes, 0 = no)	0.01	0.11	0	0	1

where $A_{i,t}$ is a vector of indicators measuring the level of asymmetric information, while $B_{i,t}$ and L_k are vectors of firm and loan characteristics.[6] The vectors R_i and T_t comprise regional and year-quarter dummies and account for the region-specific (such as local competition) and general (such as macroeconomic and monetary conditions, the Bank's refinancing situation, and the Bank's prevailing interest rate and collateral requirements for the small loans) environment at the time of the loan's disbursement.

Second, I estimate the outcome equation (1) as a panel model with firm fixed effects to control for any unobserved time-invariant borrower heterogeneity that might influence the *Share granted*. This specification focuses the analysis on the within-firm variation of the explanatory variables over loan sequences.

[6] All variables that are measured as euro volumes are adjusted for inflation. Note that throughout my observation period, Bulgaria had a currency board in which the exchange rate of the local currency is fixed to the euro.

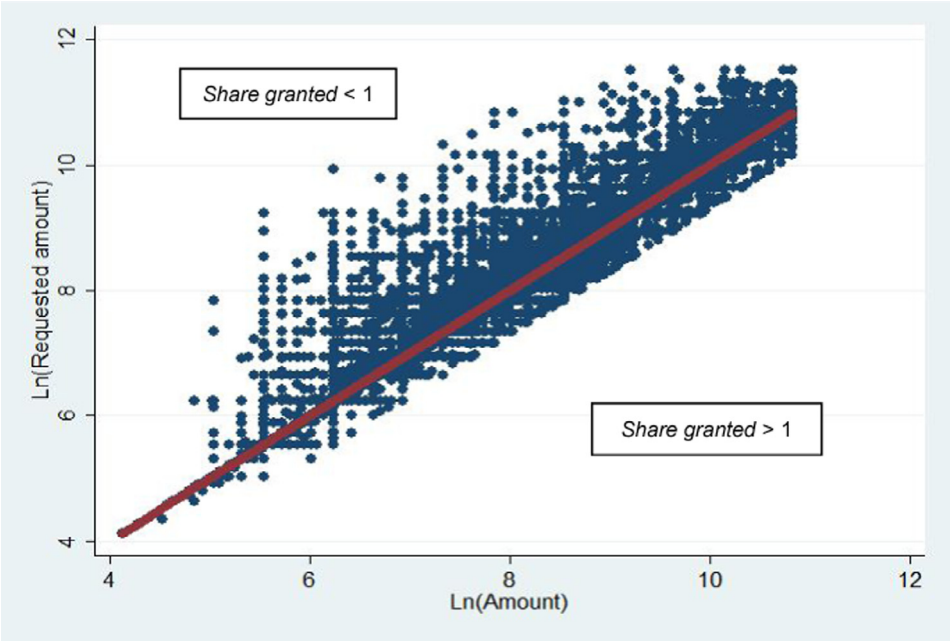

Fig. 1. Scatterplot of requested vs. granted loan amounts.

3.2. Credit rationing and information asymmetries

Because I observe requested and granted loan amounts I am able to measure loan size rationing as the ratio of the granted to the requested loan amount (*Share granted*). It is an inverse measure of credit rationing with smaller values indicating tighter rationing.

Fig. 1 contains a scatterplot of firms' requested loan amounts against their respective granted loan amounts (both measured in log euro) and provides an indication of the importance of credit rationing in the sample. All observations above the 45 degree line are loans that are granted with a lower than requested loan amount, that is, are credit rationed (*Share granted* < 1). In total, these loans make up 26.3% of the sample. For loans on the 45 degree line requested and granted loan amounts are identical, while 4.6% of the loans are granted with larger than requested loan amounts (*Share granted* > 1).[7]

Theory predicts that informational asymmetries are a key determinant of credit rationing. The empirical banking literature has identified several dimensions of asymmetric information and lending relationships. Kysucky and Norden (2015) distinguish between four dimensions of lending relationships: time (with duration of the bank-borrower relationship being a proxy for private information availability and firm age being a proxy for public information availability), distance (e.g., physical, organizational or personal distance between the bank/the loan officer and the borrower), exclusivity (with the concentration of borrowing to one bank promoting private information production) and cross-product synergies (with the simultaneous provision of lending, payment and deposit services increasing private information availability). Berger and Udell (1998) provide a financial growth cycle framework of small business finance based on firm age, size and information availability (e.g., having a track record of borrowing).

My data set provides me with four measures of asymmetric information that capture three of these dimensions. For the time dimension, I include proxies for the duration of the bank-borrower relationship

[7] Given these distributional properties, I perform several robustness tests with regard to the regressions that contain *Share granted* as the dependent variable and find my main results and conclusions to hold. First, I replace *Share granted* with a dummy *Rationed* ($= 1$ if the *Share granted* is smaller than 1 and $= 0$ otherwise). Second, because Fig. 1 might imply that the loans with a larger granted than requested amount are loans granted at a discount, that is, that firms receive in nominal terms what they requested, I also re-run the cross-sectional regressions using a tobit estimator accounting for the right censoring at *Share granted* equaling one.

and for firm age. To measure the duration of the relationship I use the *Loan number*. It indicates how many interactions between the firms and the Bank have taken place that provide the Bank with the opportunity to monitor firms and to observe their repayment behavior. For firms that had already taken out loans before my observation period, I have information on the number of these loans. With respect to firm age, I define *Initially young* firms as those with a firm age of up to two years at their first loan because such firms have not had the time to establish a public track record (Petersen and Rajan, 1994). For the exclusivity (information availability) dimension I include the variable *No liabilities at first loan* which is a dummy that is 1 if the firm has zero other liabilities when taking out the first loan at the Bank, and 0 if it has other liabilities. It is an indirect proxy for the extent of information that is available to the Bank on the firm's borrowing record with other banks.[8] Another widely used proxy for firm opaqueness in the banking literature is firm size. However, Hyytinen and Pajarinen (2008) show that within-firm changes in size, in contrast to within-firm changes in age, may not be a good proxy to capture reduced information asymmetries. Nevertheless, their results do not rule out that cross-sectional, i.e., between-firm, variation in size is an indicator of opacity. To define *Initially small* firms I split the sample at the median value of firm size at the first loan.

In sum, both the theoretical and the empirical literature highlight that information asymmetries can vary between firms at a certain point in time (e.g., young vs. old firms in the beginning of their bank relationships) or within firms when they mature, grow or borrow repeatedly from the same bank. The Hypotheses 1 and 2 derived in Section 2.1 relate to such between-firm variations and Hypothesis 3 to such within-firm variations. In the subsequent empirical analysis, the variable *Loan number* then captures the difference in opacity between firms at different stages of their lending relationship with the Bank in the full sample OLS regressions. In the panel FE regressions it accounts for the within-firm changes in opacity when the same firm repeatedly interacts with the Bank. The variables *Initially young, Initially small* and *No liabilities at first loan* capture the difference in opacity between firms at their first interaction with the Bank.[9]

Table 2 displays the degree of loan size rationing (*Share granted*) for subsamples of opaque vs. more transparent firms. To capture the effect of different levels of asymmetric information between firms and to separate the effect from that of the repeated interactions over time, the table provides evidence for the subsample of first loans as well as the subsample of all of the subsequent loans.

Table 2 shows that credit rationing is significantly larger for the *Initially young* than for the initially old firms and that this result holds for the subsamples of first and subsequent loans. However, the economic difference is very small in the subsample of subsequent loans, but it is larger for first loans. In line with this finding, the last column of Table 2 shows that the decrease in credit rationing between the first and subsequent loans is significantly more pronounced on average for the *Initially young* firms than for the initially old firms. Findings for the *Initially small* vs. the initially large firms and for firms with *No liabilities at first loan* vs. firms with liabilities at first loan are very similar.

Table 3 provides summary statistics on the evolution of the *Share granted* as well as the *Share of rationed firms* (the fraction of firms that receives a smaller loan amount than requested) over loan sequences of different lengths.

Panel A shows that for the full sample, the *Share granted* increases similarly for all loan sequences no matter how many loans they comprise. Furthermore, the initial degree of credit rationing hardly varies for sequences of different lengths. Equivalently, the *Share of rationed firms* decreases similarly for all loan sequences independent of their length and hardly varies for first loans. Panel B confirms these patterns for those firms that are rationed at their first loan. The *Share granted* obviously increases over loan sequences

[8] However, the variable is a very crude proxy of informational asymmetries and likely to underestimate the availability of information from a firm's borrowing record. On the one hand, firms with zero liabilities when taking out their first loan with the Bank might have had other bank loans before but have repaid them. On the other hand, firms with liabilities when taking out their first loan at the Bank may have trade credit outstanding but might never have borrowed from a bank and therefore do not have a track record at the credit register.

[9] Correlations between *Initially young, Initially small* and *No liabilities at first loan* are small and Fort et al. (2013) highlight that it is important to control for both firm age and firm size to be able to distinguish between, for instance, young-small and old-small firms. Therefore, all regressions include these three opaqueness indicators jointly.

Table 2
Asymmetric information and the degree of credit rationing for first vs. later loans.

	First loans	Later loans	
	Share granted		
Initially young firms	0.856***	0.938***	
	(0.002)	(0.003)	
	($N = 11{,}428$)	($N = 6404$)	
Initially old firms	0.905***	0.954***	
	(0.001)	(0.001)	
	($N = 41{,}933$)	($N = 37{,}129$)	
Diff/**Diff-in-diff**	−0.050***	−0.016***	**−0.033*** **
	(0.002)	(0.003)	**(0.004)**
	($N = 53{,}361$)	($N = 43{,}533$)	**($N = 96{,}894$)**
Initially small firms	0.856***	0.935***	
	(0.001)	(0.002)	
	($N = 26{,}351$)	($N = 17{,}652$)	
Initially large firms	0.932***	0.968***	
	(0.001)	(0.002)	
	($N = 27{,}010$)	($N = 15{,}562$)	
Diff/**Diff-in-diff**	−0.076***	−0.033***	**−0.043*** **
	(0.002)	(0.002)	**(0.003)**
	($N = 53{,}361$)	($N = 33{,}214$)	**($N = 86{,}575$)**
No liabilities at first loan	0.885***	0.947***	
	(0.001)	(0.002)	
	($N = 24{,}320$)	($N = 14{,}854$)	
Liabilities at first loan	0.903***	0.953***	
	(0.001)	(0.002)	
	($N = 29{,}041$)	($N = 18{,}379$)	
Diff/**Diff-in-diff**	−0.017***	−0.007***	**−0.011*** **
	(0.002)	(0.002)	**(0.003)**
	($N = 53{,}361$)	($N = 33{,}233$)	**($N = 86{,}594$)**

This table reports difference-in-difference estimates for *Share granted* for *First loans* and *Later loans* in loan sequences, for different subsamples based on various measures of asymmetric information. See Table 1 for definitions of all variables. The table also reports standard errors and the number of observations (N) in parentheses.
*Significance at the 0.1-level.
**Significance at the 0.05-level.
*** Significance at the 0.01–level.

due to two effects: First, the wedge between requested and granted amounts becomes smaller. Second, over time a larger fraction of firms receives their requested loan amount.

These descriptive results provide some first evidence in line with Hypotheses 1, 2, and 3 as credit rationing is present for both opaque and transparent firms but tighter for the former, and first loans are more rationed than subsequent loans in a loan sequence. They also show that the decrease in loan size rationing over bank-firm relationships does not only occur because risky borrowers drop out of the sample but also because repeat borrowers receive an increasing share of their requested loan amounts over multiple interactions with the Bank. Both of these processes are in line with the models on ex-ante informational asymmetries and adverse selection.

The observed degrees of credit rationing should be considered as a lower bound on the real economic significance of credit rationing because I do not observe rejected loan applications (see Section 2.2). Considering all firms in Table 2, for a loan of 50,000 euros, the difference of 5 (8) percentage points in the *Share granted* for the initially young (small) vs. the initially old (large) firms at their first interaction with the Bank amounts to 2500 (4000) euros. This difference in the *Share granted* between opaque and more transparent firms does not seem very large but could still set the opaque firms at a disadvantage compared to the more transparent firms in that the former cannot expand or improve their business in the same way. Table 3, Panel A, however, highlights that rationing does play a considerable role in my dataset with a fraction of around 30% of firms being rationed at their first interaction with the Bank. And Table 3,

Table 3
The degree of credit rationing over loan sequences of different lengths.

Panel A: full sample

Panel A displays sample means for the degree of credit rationing (*Share granted*) and the *Share of rationed borrowers* for each loan number in loan sequences of different lengths. See Table 1 for definitions of all variables.

Total number of loans in the sequence	1		2		3		4		5		*N*
Loan number	Share granted/*Share of rationed borrowers*										
1	0.90	*0.30*	0.89	*0.31*	0.89	*0.31*	0.89	*0.32*	0.90	*0.29*	53,361
2			0.94	*0.23*	0.95	*0.21*	0.95	*0.22*	0.95	*0.21*	24,060
3					0.96	*0.21*	0.96	*0.19*	0.95	*0.19*	11,579
4							0.96	*0.19*	0.97	*0.17*	5422
5									0.97	*0.16*	2472

Panel B: borrowers rationed at their first loan

Panel B displays sample means for the degree of credit rationing (*Share granted*) and the *Share of rationed borrowers* for each loan number in loan sequences of different lengths for the subsample of borrowers who were rationed at their first loans. See Table 1 for definitions of all variables

Total number of loans in the sequence	1		2		3		4		5		*N*
Loan number	Share granted/*Share of rationed borrowers*										
1	0.61	*1.00*	0.60	*1.00*	0.61	*1.00*	0.63	*1.00*	0.63	*1.00*	16,350
2			0.89	*0.36*	0.90	*0.33*	0.92	*0.32*	0.92	*0.32*	6447
3					0.92	*0.28*	0.94	*0.24*	0.94	*0.22*	2591
4							0.94	*0.26*	0.94	*0.20*	978
5									0.94	*0.23*	340

Panel B documents that the rationing for these firms is sizeable with the *Share granted* ranging between 0.60 and 0.63 at their first interaction with the Bank.[10]

One concern with the observed patterns of loan size rationing over loan sequences could be that they are driven by the economic and credit booms that Bulgaria experienced during the observation period, i.e. that credit rationing decreases over loan sequences because later loans are made in periods where banks lend more in general. I therefore repeat the descriptive analysis with a matched sample. The matching process matches all first loans made in a given year to all similar (based on firm and loan characteristics[11]) second to fifth loans made in the same year.

The results from the matched sample reported in Appendix A largely confirm Table 2 results where I consider loan sequences of individual borrowers over time. Thus, even in a given year, I find evidence that credit rationing is present for both opaque and transparent firms but tighter for the former, and first loans are more rationed than subsequent loans in a loan sequence.[12] Appendix B then shows that also in each year, in the matched sample, the *Share granted* (*Share of rationed borrowers*) is positively (negatively) correlated with the loan number, confirming the Table 3 results. These findings alleviate the concern that the pattern of increasing credit availability over loan sequences, which is stronger for the young and small borrowers, is driven by the credit boom in Bulgaria between 2003 and 2007.

The subsequent multivariate analysis needs to assess whether the descriptive univariate results persist when controlling for borrower and loan risk.

[10] In comparison, Becchetti et al. (2011) report that 20% of loans in their full sample of Italian firms and 24% of first loans are loan size rationed, which are similar to the respective 26% and 30% in my sample. Cheng and Degryse (2010) document a share granted of 66% in their sample, which is close to the 60% that I find for the rationed first-time borrowers in my sample, but they study a very different setting of credit card extensions in China.

[11] These are *Initially young, Initially small, No liabilities at first loan, Sole proprietorship, Leverage, Disposable income, Medium loan, Fixed capital loan, Annuity loan, Mortgage, Cash, Pledge, Industry* and *Region*. For the continuous variables *Leverage* and *Disposable income* loans are considered matches if their respective values lie within a window of ± 30% of the values of the first loan they are matched to.

[12] These findings are also true for firms that have *No liabilities at first loan* vs. firms that have *Liabilities at first loan*. But the decrease in credit rationing between the first and later loans is not significantly more pronounced for the former in every year.

3.3. Further determinants of the degree of credit rationing

I control for the observable borrower risk with a vector of firm characteristics that is gathered by the Bank during its financial analysis and therefore plays a crucial role in its assessment of the borrower. Sole proprietorships are less risky than otherwise similar incorporated firms because their owners have unlimited liability in the firms. *Sole proprietorship* equals one if the firm is a sole proprietorship and zero otherwise. Borrowers that are highly indebted face a higher risk of default in case of external shocks to their income. Also, borrowers with a lower equity stake in their firm are more prone to moral hazard and this may induce the Bank to lend less. *Leverage* thus measures the firm's total debt as a share of its total assets at the disbursement date of the loan. The variable *Medium loan* accounts for the fact that some firms can also have a loan with an amount of more than 50,000 euros. A firm with little financial scope (Ln(*Disposable income*)) to react to unforeseen cuts to its income is more vulnerable to external shocks and thus more risky. Further, a firm that faced repayment problems in its previous loan should be more risky (Jimenez et al., 2006) which, in turn, might influence the degree of rationing in the next loan. *Previous arrears* therefore equals one if the firm was past-due on interest or principal payments more than 30 days in its previous loan and zero otherwise. I also control for the age of the firms in log years (Ln(*Age*)) and the size of the firms in terms of their total assets measured in log euros (Ln(*Assets*)) at the disbursement date of the loan. To account for all remaining time-variant differences in firm characteristics, the regressions contain a full set of *Industry*∗*Year-quarter* fixed effects.[13]

I also account for loan characteristics that are predetermined to the Bank's loan amount decision as they are related to the purpose of the loan.[14] The variable *Fixed capital loan* indicates whether a loan is for fixed capital financing or working capital. If a loan is intended for fixed capital financing, the underlying asset can be sold in case of default, which lowers the risk associated with such loans. Similarly, an *Annuity loan* (dummy variable that is one if the loan is an annuity loan and zero if it is a credit line or overdraft) can be considered less risky because of its regular repayment schedule. While the collateral requirements are standardized and the majority of loans are secured by a promissory note, some loans are secured (partly) by cash, pledge or mortgage. The variables, *Cash, Pledge* and *Mortgage* account for the possibility that they indicate a form of higher quality collateral.

I also account for further facets of informational asymmetries between the Bank and its borrowers. The variable *Loan officer change* captures whether the loan officer has changed during the duration of the previous loan. If the information gathered by the loan officer cannot be fully transmitted within the bank, which is likely for qualitative soft information, part of it is lost when a loan officer change takes place (see, e.g., Berger and Udell, 2002; Stein, 2002; Liberti and Mian, 2009; Uchida et al., 2012). In addition, the *Time between loans* measures the days between the disbursement dates of two adjacent loans in a loan sequence and accounts for the amount of information the Bank has been able to gather in the meantime. To capture the exclusiveness of the relationship between the firm and the Bank I calculate a firm's outstanding debt at the Bank and compare it to its total liabilities at the time of each loan disbursement. *Other credit* then takes on the value of one if total liabilities are larger than the outstanding debt at the Bank and zero otherwise.

[13] The industries are agriculture and food processing (the baseline category; 16% of the loans in the sample), construction (1%), manufacturing (4%), trade (49%), transport (9%), tourism (1%) and other services (20%). Compared to the share of firms active in these industries in the Bulgarian economy in 2008, manufacturing firms are underrepresented while agriculture and trade firms are overrepresented in my sample. However, trade also is the most prominent firm activity in the country as a whole (see http://www.nsi.bg/otrasalen.php?otr=71).

[14] Studying the requested and granted loan amounts and maturities uncovers that both loan terms are complements because for 67% of all of the loans, they are adjusted in the same direction; that is, requests for both loan terms are either higher, lower, or equal to both granted loan terms. The Spearman rank correlation between the *Share granted* and the ratio of granted to requested maturity is 0.44 and significant (p-value < 0.01), which means that the two variables are not independent and that I can therefore concentrate on the analysis of requested and granted loan amounts.

4. Multivariate results

4.1. Determinants of the degree of credit rationing

Table 4 displays the regression results on the determinants of *Share granted*. Regressions for the full sample include a full set of industry∗year-quarter and region fixed effects. The regressions for the subsample of repeat clients include firm fixed effects but exclude all variables with (almost) no within-variation. Standard errors are reported in parentheses and are adjusted for clustering at the firm level.

Columns (1)–(3) of Table 4 present the OLS estimates for the full sample. While the estimations are based on a sample of firms that is transparent enough to be granted a loan in the first place, the results do provide evidence for the existence of loan size rationing even after controlling for borrower risk.

The variables *Loan number 2,…, Loan number 5* capture the effect that the intensity of the bank-borrower relationship has on observed loan size rationing for the initially older (column (1)) and larger (column (2)) firms and those firms with liabilities at their first loan (column (3)). Among such firms, those that borrow more often from the Bank are less credit rationed with the degree of credit rationing decreasing significantly between the first two interactions by 3–5 percentage points. A Wald test for differences in coefficients of the subsequent adjacent loan numbers shows that they do not differ significantly after the third loan. This finding is in line with the conclusion of previous studies that most of the valuable private information is gathered at the beginning of a bank-borrower relationship (e.g. Cole, 1998).

Those firms that are *Initially young, Initially small* or have *No liabilities at first loan* experience credit rationing when taking out their first loan from the Bank that is significantly higher than the rationing of those firms that are initially older, initially larger or have liabilities at their first loan. The significantly positive interaction effects of *Loan number 2,…, Loan number 5* and *Initially young, Initially small* and *No liabilities at first loan*, respectively, indicate that the decrease in rationing is more pronounced for the initially younger and smaller firms and those with initially no liabilities. For instance, when comparing loan size rationing between *Initially young* firms that take out a second loan from the Bank and those that take out a first loan, loan size rationing is, on average, an additional 3.2 percentage points lower than when comparing the respective initially older firms. For *Initially small* firms, this additional decrease is 3.9 percentage points and for firms with *No liabilities at first loan* it is 1.3 percentage points.

The results from the repeat client analysis presented in columns (4)–(6) show that Hypothesis 3 is also confirmed for individual bank-firm relationships. When focusing on the variation of variables when the same firm takes out a sequence of loans and controlling for unobserved firm heterogeneity, I can confirm that decreased informational asymmetries are an important determinant of the reduction in credit rationing for both the initially opaque and more transparent firms. This finding implies that the decrease in the degree of credit rationing observed over time is not only due to a sample effect because bad borrowers drop out (the extensive margin effect) but also because individual borrowers experience less loan size rationing in subsequent stages of their bank relationships (the intensive margin effect).

Results for the firm and loan risk characteristics show that credit rationing also depends on the observable credit risk of the firm.[15] Firms with more *Disposable income* and firms taking out a *Fixed capital loan* are less credit rationed, whereas firms with higher *Leverage* are more rationed. *Sole proprietorships* that can be considered to be less risky because of their owners' unlimited liability and because the management does not easily change are less rationed.

I perform several robustness checks and report them in Appendix C. Panel A contains additional analyses for the full sample and Panel B for the subsample of repeat clients. Columns (1)–(3) in Panel A add the firm's actual age and size and a dummy whether it has other liabilities (*Other credit*) at the loan's disbursement as control variables. This procedure reduces the economic magnitude of the main effects of *Initially young, Initially small* and *No liabilities at first loan* due to their correlation with the additional controls but does not change the previous conclusions. These results confirm that there is an effect from informational asymmetries being resolved over bank-firm relationships on credit rationing beyond the

[15] The Bank might actually *constrain* credit to the observably riskier firms to deal with their higher default risk. While this constraint also leads to a smaller granted than requested loan amount, it is conceptually different from loan size rationing due to asymmetric information. Nevertheless, I stay with the expression "rationing" because some of the proxies for credit risk might partly capture asymmetric information.

Table 4
Determinants of credit rationing.

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
		Full sample			Repeat clients	
			Share granted			
Loan number 2	0.045***	0.032***	0.045***	0.057***	0.047***	0.061***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Loan number 3	0.059***	0.042***	0.058***	0.072***	0.065***	0.080***
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)
Loan number 4	0.070***	0.039***	0.065***	0.087***	0.068***	0.089***
	(0.004)	(0.005)	(0.005)	(0.008)	(0.009)	(0.009)
Loan number 5	0.073***	0.067***	0.076***	0.102***	0.103***	0.107***
	(0.006)	(0.008)	(0.008)	(0.010)	(0.012)	(0.012)
Initially young	−0.044***	−0.032***	−0.032***			
	(0.003)	(0.002)	(0.002)			
Loan number 2*Initially young	0.032***			0.023***		
	(0.005)			(0.006)		
Loan number 3*Initially young	0.040***			0.022***		
	(0.007)			(0.008)		
Loan number 4*Initially young	0.035***			0.026**		
	(0.011)			(0.012)		
Loan number 5*Initially young	0.059**			0.033*		
	(0.024)			(0.019)		
Initially small	−0.047***	−0.063***	−0.046***			
	(0.002)	(0.002)	(0.002)			
Loan number 2*Initially small		0.039***			0.035***	
		(0.003)			(0.004)	
Loan number 3*Initially small		0.044***			0.039***	
		(0.005)			(0.006)	
Loan number 4*Initially small		0.069***			0.062***	
		(0.007)			(0.008)	
Loan number 5*Initially small		0.028**			0.018	
		(0.012)			(0.013)	
No liabilities at first loan	−0.003	−0.003*	−0.009***			
	(0.002)	(0.002)	(0.002)			
Loan number 2*No liabilities at first loan			0.013***			0.003
			(0.003)			(0.005)
Loan number 3*No liabilities at first loan			0.016***			0.002
			(0.005)			(0.006)
Loan number 4*No liabilities at first loan			0.024***			0.013
			(0.008)			(0.009)
Loan number 5*No liabilities at first loan			0.010			−0.007
			(0.012)			(0.013)
Sole proprietorship	0.011***	0.011***	0.011***			
	(0.003)	(0.003)	(0.003)			
Leverage	−0.049***	−0.054***	−0.053***	−0.043***	−0.051***	−0.044***
	(0.005)	(0.005)	(0.005)	(0.009)	(0.009)	(0.009)
Ln(Assets)				0.011***	0.008**	0.012***
				(0.003)	(0.003)	(0.003)
Ln(Disposable income)	0.012***	0.011***	0.012***	0.012***	0.013***	0.013***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Other credit				0.014***	0.013***	0.012***
				(0.003)	(0.003)	(0.003)
Medium loan	−0.022***	−0.017**	−0.021***			
	(0.008)	(0.008)	(0.008)			
Fixed capital loan	0.014***	0.014***	0.014***	0.008***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Annuity loan	0.010	0.001	0.007	0.008	−0.002	0.005
	(0.006)	(0.006)	(0.006)	(0.008)	(0.009)	(0.009)
Mortgage	0.019***	0.019***	0.019***	0.008	0.008	0.009
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)
Cash	0.043***	0.044***	0.044***	0.040*	0.039*	0.038*
	(0.012)	(0.012)	(0.012)	(0.021)	(0.022)	(0.022)

(*continued on next page*)

Table 4 (*continued*)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
		Full sample			Repeat clients	
				Share granted		
Pledge	−0.004*	−0.003	−0.004*	−0.008***	−0.008**	−0.009***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Observations	86,575	86,575	86,575	58,528	52,991	52,997
Method	OLS	OLS	OLS	Panel FE	Panel FE	Panel FE
R^2 (adjusted / within)	0.056	0.057	0.056	0.040	0.045	0.041
Industry*Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	No	No	No

Columns (1)–(3) include results for the full sample from OLS regressions, while columns (4)–(6) report results from fixed effects regressions for the subsample of *Repeat clients* (loans disbursed to firms that take out more than one loan from the Bank during the observation period). Standard errors are reported in parentheses and account for clustering at the firm level. The dependent variable *Share granted* is the granted loan amount as a share of the requested loan amount and indicates the degree of credit rationing. All explanatory variables are defined in Table 1.

* Significance at the 0.1-level.
** Significance at the 0.05-level.
*** Significance at the 0.01-level.

effect of, for instance, firms becoming less risky with increasing age and size. Column (4) shows that results are qualitatively unchanged when all opaqueness indicators are estimated in a single regression even though the many interaction effects introduce multicollinearity.

The analysis so far relies on the implicit assumption that macroeconomic changes have a similar impact on borrowers of different opaqueness and are differenced out by comparing the various groups. However, Fort et al. (2013) provide evidence that young and small firms respond more strongly to business cycle dynamics than more mature and larger firms. In columns (5)–(7) of Panel A I therefore re-estimate the Table 4 regressions but include group-specific non-linear time trends that allow the outcome trends to vary between the opaque vs. the more transparent borrower groups. This approach relaxes the underlying assumption of a common trend of the various groups with respect to the outcome variable. Importantly, my time series is relatively short and the time trends are correlated with the variable *Loan number*. Nevertheless, these regressions confirm my main results.

Turning to the additional analyses for the subsample of repeat clients in Panel B, column (1) again shows that results are qualitatively unchanged when all opaqueness indicators are estimated in a single regression. Column (2) adds those explanatory variables that are not defined for all first loans and therefore uses the second loan as the reference category. Not surprisingly, the interaction effects between the *Loan number* dummies and the other opaqueness indicators are not significant because most of the within-firm variation for these variables is between the first and the second loan. Column (2) shows that a previous *Loan officer change* leads to higher loan size rationing. This effect is in line with the conjecture of Berger and Udell (2002) that not all of the soft information gathered by loan officers can be transformed into common knowledge within the Bank.[16] When a borrower is in arrears for more than 30 days in her previous loan (*Previous arrears*), then the share granted at the next loan is significantly lower, again confirming that the Bank is also concerned with the observable credit risk of a firm when constraining credit. As expected, the longer the *Time between loans* the less rationed borrowers are, possibly because the Bank can gather more information or because a larger fraction of the earlier loan is already paid back. Columns (3)–(5) report the results from regressions including group-specific non-linear time trends that

[16] An alternative explanation for the impact of *Loan officer change* on credit constraints is that the firm and the loan officer were colluding leading to better loan terms than the firm risk would justify. Although there are a few firm-loan officer relationships that last up to five interactions, the average number of interactions with a loan officer is 1.6 for repeat clients, which leaves little room for collusion. Furthermore, maybe the most risky borrowers are transferred to specialized loan officers and this is the reason why rationing is higher after a loan officer change. According to the Bank the changes mostly occur because loan officers are promoted within the Bank or because they leave the Bank. The Bank does not follow a policy to regularly rotate its loan officers internally as in Hertzberg et al. (2010).

allow the outcome trends to vary between the opaque vs. the more transparent borrower groups. Again, these regressions confirm my main results.

4.2. Potential endogeneity of loan demand

A concern with the previous results might be that demand is potentially endogenous. This could be the case due to at least three scenarios. First, after their first interaction with the Bank firms might overstate their requests when they themselves experience rationing at their first loan. Second, firms that expect to be rationed because they heard from other firms in the neighborhood about the rationing might similarly overstate their request to end up receiving what they actually want. Third, in the beginning of bank relationships the young and small firms and those with no other liabilities might not know how much to request because they do not have experience with borrowing or they might state overconfident requests. I address all three scenarios one by one in the following.

4.2.1. Requested and granted loan amounts over loan sequences

The requested loan amount might be endogenous in the sense that borrowers who experience credit rationing at their first loan may overstate their following loan requests in expectation of rationing. In the following analysis, I first test for the effects that borrowers' experiences with rationing at their first loan have on their following loan requests. I then add the Bank side with the evolution of granted loan amounts into the picture to establish *how* credit rationing is actually relieved over time in bank relationships. Table 5 reports results from a panel model with firm fixed effects for the determinants of requested and granted loan amounts.

In contrast to the above scenario that borrowers may overstate their loan requests as a reaction to previous rationing, the results in column (1) show that firms which were initially rationed first decrease their requested amount and then increase it much more moderately than the initially non-rationed firms. Turning to those firms that were granted more than they requested at their first loans in column (2) shows that these firms increase their requests considerably more during the first three interactions with the Bank than the firms that initially received their requested amount. While models of credit rationing do not incorporate dynamic patterns on the demand side, the results above hint at borrower learning. Agarwal et al. (2013) study borrower learning in the credit-card market and find that borrowers seem to learn to avoid paying future fees through negative feedback, that is, the experience of past fees. Similarly, borrowers can learn from the negative feedback they receive from initial credit rationing and adapt their requested loan amounts accordingly. Also, they seem to infer from the positive feedback they receive from being initially granted more than they requested that in future interactions with the Bank they can expect large amounts as well.

In sum, some of the decrease in the degree of rationing over bank-firm relationships might be related to borrower learning. However, a comparison with the Bank side highlights that the Bank is willing to disproportionately increase its lending stakes and thereby decrease rationing over time for the initially rationed firms.

First of all, the results for all repeat borrowers in columns (3) and (6) of Table 5 show that the requested amounts increase significantly over multiple interactions with the Bank (as indicated by a Wald test for differences in adjacent loan numbers) but less so than the granted amounts (e.g., 13% compared to 23% between the first and second loans). Together with the significantly positive but also smaller coefficient for *Other credit*, this finding provides clear evidence that the observed decrease in credit rationing over loan sequences does not stem from firms' *reduced* demand at the Bank due to their access to debt capital from other sources. Second, column (4) shows that the reduction in rationing due to the Bank's willingness to increase its lending stakes is most prominent in the subsample of the initially rationed firms. The significantly positive interaction terms between the *Loan number* dummies and the *Rationed at first loan* indicator show that the Bank increases its granted loan amounts more pronouncedly for the firms that were rationed in their first loans.

Since I control for the size (*Assets*) and the *Disposable income* of the firms as well as the type of collateral, these results cannot be explained by the reasoning that the younger and smaller firms that are initially rationed grow faster or increase their borrowing capacity more between loans than the older

Table 5
Requested and granted loan amounts over bank relationships.

Dependent variable	(1) Rationed at first loan	(2) Granted more at first loan	(3) All repeat loans	(4) Rationed at first loan	(5) Granted more at first loan	(6) All repeat loans
	Ln(*Requested amount*)			Ln(*Granted amount*)		
Loan number 2	0.248***	0.268***	0.127***	0.214***	0.212***	0.226***
	(0.011)	(0.012)	(0.010)	(0.010)	(0.012)	(0.009)
Loan number 3	0.405***	0.444***	0.273***	0.396***	0.395***	0.398***
	(0.019)	(0.021)	(0.017)	(0.018)	(0.020)	(0.016)
Loan number 4	0.518***	0.572***	0.382***	0.527***	0.525***	0.532***
	(0.027)	(0.030)	(0.024)	(0.026)	(0.029)	(0.023)
Loan number 5	0.559***	0.624***	0.434***	0.588***	0.589***	0.612***
	(0.038)	(0.041)	(0.032)	(0.038)	(0.041)	(0.030)
Loan number 2*Rationed at first loan	−0.378***			0.093***		
	(0.011)			(0.010)		
Loan number 3*Rationed at first loan	−0.382***			0.097***		
	(0.018)			(0.018)		
Loan number 4*Rationed at first loan	−0.395***			0.091***		
	(0.030)			(0.030)		
Loan number 5*Rationed at first loan	−0.403***			0.073		
	(0.053)			(0.052)		
Loan number 2*Granted more at first loan		0.172***			−0.106***	
		(0.034)			(0.033)	
Loan number 3*Granted more at first loan		0.174***			−0.096**	
		(0.044)			(0.043)	
Loan number 4*Granted more at first loan		0.105			−0.155*	
		(0.082)			(0.083)	
Loan number 5*Granted more at first loan		0.066			−0.168	
		(0.126)			(0.121)	
Leverage	−0.479***	−0.569***	−0.512***	−0.599***	−0.651***	−0.601***
	(0.029)	(0.035)	(0.028)	(0.028)	(0.034)	(0.026)
Ln(Assets)	0.120***	0.116***	0.113***	0.134***	0.124***	0.130***
	(0.009)	(0.011)	(0.009)	(0.009)	(0.011)	(0.009)
Ln(Disposable income)	0.114***	0.111***	0.104***	0.124***	0.117***	0.124***
	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.006)
Other credit	0.139***	0.155***	0.142***	0.158***	0.166***	0.165***
	(0.008)	(0.010)	(0.008)	(0.008)	(0.010)	(0.008)
Fixed capital loan	0.307***	0.318***	0.305***	0.314***	0.321***	0.317***
	(0.008)	(0.010)	(0.008)	(0.008)	(0.009)	(0.007)
Annuity loan	0.481***	0.488***	0.451***	0.480***	0.473***	0.470***
	(0.030)	(0.033)	(0.027)	(0.028)	(0.032)	(0.025)
Mortgage	0.787***	0.824***	0.814***	0.791***	0.819***	0.822***
	(0.018)	(0.020)	(0.017)	(0.017)	(0.020)	(0.016)
Cash	0.001	−0.007	0.012	0.043	0.013	0.076
	(0.075)	(0.090)	(0.069)	(0.071)	(0.087)	(0.067)
Pledge	0.131***	0.149***	0.138***	0.128***	0.146***	0.126***
	(0.009)	(0.011)	(0.009)	(0.009)	(0.011)	(0.009)

(*continued on next page*)

Table 5 (*continued*)

Dependent variable	(1) Rationed at first loan	(2) Granted more at first loan	(3) All repeat loans	(4) Rationed at first loan	(5) Granted more at first loan	(6) All repeat loans
	Ln(*Requested amount*)			Ln(*Granted amount*)		
Observations	50,687	36,209	58,528	50,687	36,209	58,528
Method	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE
R^2 (within)	0.342	0.383	0.317	0.389	0.369	0.380
Industry*Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	No	No	No	No	No	No

This table reports results from fixed effects regressions for the subsample of *Repeat clients* (loans disbursed to firms that take out more than one loan from the Bank during the observation period). Columns (1) and (4) exclude those borrowers who were granted more at their first loan and columns (2) and (5) exclude those borrowers who were rationed at their first loan. Standard errors are reported in parentheses and account for clustering at the firm level. The dependent variables are Ln(*Requested amount*) which is the natural logarithm of the granted loan amount in EUR in columns (1)–(3) and Ln(*Granted amount*) which is the natural logarithm of the requested loan amount in EUR in columns (4)–(6). All explanatory variables are defined in Table 1.

* Significance at the 0.1-level.

** Significance at the 0.05-level.

*** Significance at the 0.01-level.

or larger firms. Rather, this finding is consistent with the observed credit rationing arising due to asymmetric information. In the case of adverse selection the group of rationed borrowers is a pool of good and bad firms. Thus, the Bank should be expected to make up for the previous rationing of the newly disclosed good firms. Similarly, the risk of moral hazard decreases over time, and the Bank might disproportionately increase its granted loan amounts for the borrowers with whom trust has successfully been established.[17]

4.2.2. Potential anticipation of credit rationing

It is possible that firms anticipate being credit rationed and therefore overstate their requests to ensure that they end up with the amount that they need. Such an anticipation effect is particularly plausible if other firms in the neighborhood experienced credit rationing recently.

To test this scenario, I study requested (and granted) loan amounts over loan sequences in a panel model with firm fixed effects and compare loans that are taken out from branches where credit rationing in the previous quarter was high with loans that are taken out from branches where credit rationing in the previous quarter was low. For each loan, the variable *High average rationing* thus takes on the value of one if average credit rationing in the previous quarter at the branch from which a firm borrows is above the median of previous-quarter rationing at all branches (median = 0.93). The variable *High average rationing at first loan* has no within-firm variation and indicates whether a borrower takes out the first loan from a branch where credit rationing was high in the previous quarter.

The results in Table 6 do not show a significantly different evolution in requested amounts for firms borrowing from branches where credit rationing was high in the previous quarter compared to firms borrowing from branches where credit rationing was low.[18] Therefore, such a scenario of rationing anticipation does not seem to drive my results.

4.2.3. The effect of the requested loan size

The previous results might simply be driven by the fact that the young and small firms request too much, especially at their first interaction with the Bank, because they are overconfident about their

[17] This effect on the Bank side should be stronger for the more opaque firms for which information and incentive problems are (initially) larger, evidence for which is provided in Appendix D.

[18] *High average rationing* is only marginally significant in column (2) where the dependent variable is Ln(*Granted amount*). All coefficients of *High average rationing* (*at first loan*) are insignificant if I study rationing during the previous year at each branch to take into account that it might take some time until such knowledge about rationing spreads within networks of families and neighbors.

Table 6
Potential anticipation of credit rationing.

Dependent variable	(1) Ln(*Requested amount*)	(2) Ln(*Granted amount*)	(3) Ln(*Requested amount*)	(4) Ln(*Granted amount*)
Loan number 2	0.125***	0.224***	0.119***	0.231***
	(0.010)	(0.009)	(0.012)	(0.011)
Loan number 3	0.271***	0.396***	0.269***	0.419***
	(0.017)	(0.017)	(0.021)	(0.020)
Loan number 4	0.379***	0.531***	0.373***	0.555***
	(0.024)	(0.023)	(0.031)	(0.030)
Loan number 5	0.433***	0.613***	0.391***	0.564***
	(0.032)	(0.031)	(0.046)	(0.045)
High average rationing	0.003	0.013*		
	(0.007)	(0.007)		
Loan number 2*High average rationing at first loan			0.017	−0.002
			(0.011)	(0.011)
Loan number 3*High average rationing at first loan			0.024	−0.007
			(0.018)	(0.017)
Loan number 4*High average rationing at first loan			0.021	−0.023
			(0.031)	(0.030)
Loan number 5*High average rationing at first loan			0.034	0.018
			(0.054)	(0.054)
Observations	57,349	57,349	48,951	48,951
Method	Panel FE	Panel FE	Panel FE	Panel FE
R^2 (within)	0.312	0.373	0.315	0.380
Firm and loan characteristics	Yes	Yes	Yes	Yes
Industry*Year-quarter fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Region fixed effects	No	No	No	No

This table reports results from fixed effects regressions for the subsample of *Repeat clients* (loans disbursed to firms that take out more than one loan during the observation period). The dependent variables are Ln(*Requested amount*) which is the natural logarithm of the granted loan amount in EUR in columns (1) and (3) and Ln(*Granted amount*) which is the natural logarithm of the requested loan amount in EUR in columns (2) and (4). For each loan, the variable *High average rationing* takes on the value of one if average credit rationing in the previous quarter at the branch from which a firm borrows is above the median of previous-quarter rationing at all branches (median = 0.93). The variable *High average rationing at first loan* has no within-firm variation and indicates whether a borrower takes out the first loan from a branch where credit rationing was high in the previous quarter. All regressions control for the same firm and loan characteristics as in Table 5 (definitions are provided in Table 1).
**Significance at the 0.05-level.
*** Significance at the 0.01-level.
* Significance at the 0.1-level.

potential or lack borrowing experience. Loan officers then might just scale back firms' requested amounts to a sustainable level. In these scenarios the *Share granted* would not reflect credit rationing but the difference between a borrower's misjudged or overconfident request and the private soft information a loan officer has about the borrower's repayment capacity.

I attempt to address these concerns by (i) augmenting the Table 4 regressions with a measure of the difference between a borrower's actual requested amount and the realistic requested amount given the respective firm and loan characteristics to account for the borrower's overconfidence or misjudgment and (ii) using a two-stage approach to investigate the effect of a too large request on credit rationing.

To assess whether the *Share granted* rather reflects the private (to me unobservable) information a loan officer has about a borrower's repayment capacity I create the variable *Difference*. I estimate the regression model from Table 5, column (3) both without and with firm FE. The predicted values of *Requested amount* from these regressions represent the realistic requested amount given the firm and loan characteristics (including firm age, firm size, whether the firm has other liabilities outstanding and the loan number). *Difference* is then the actual *Requested amount* minus the respective predicted value. The larger this difference is, the larger the potential overconfidence or misjudgment by the borrower (the difference (measured in log euros) ranges from around −3 to 3). I include the *Difference* indicator as an additional explanatory variable in the Table 4 regressions to explore whether the relationship between my proxies of asymmetric information and the *Share granted* still holds even when controlling for the deviation of the actual requested amount from its realistic value.

The results in Table 7 show that *Difference* has a significantly negative effect on the *Share granted*. This implies that loan officers seem to have some information on borrowers' repayment capacity and scale back too large requests to realistic levels. Nevertheless, I find that the results for the main indicators of asymmetric information (as well as the other non-reported firm and loan characteristics) remain qualitatively and quantitatively very similar as in Table 4.

Turning to the two-stage estimation, I now capture the notion of a too large request from a different angle. I use the variable *Relative requested amount* (the *Requested amount* as a share of *Assets*), i.e., I relate a borrower's request to the size of the firm. In the first stage, I then estimate the following model:

$$\begin{aligned} \textit{Relative requested amount}_{i,k,t} = {} & a + \beta_1 A_{i,t} + \beta_2 B_{i,t} + \beta_3 L_k + \beta_4 R_i + \beta_5 T_t + \beta_6 \textit{Male}_i \\ & + \beta_7 \textit{Male}_i{}^{*}\textit{No liabilities at first loan}_{i,} + e_{i,k,t}, \end{aligned} \tag{2}$$

which includes the same indicators of asymmetric information ($A_{i,t}$), firm and loan characteristics ($B_{i,t}$ and L_k) and regional and year-quarter dummies (R_i and T_t) as Eq. (1) and two additional instrumental variables that are excluded from the second stage (*Male*$_i$ and *Male*$_i$∗*No liabilities at first loan*$_{i,}$). *Male* is a dummy that is one if the borrower is male and zero if female.

Male borrowers may be more overconfident making them more prone to request too high loan amounts relative to their firms' size because they tend to overestimate the precision of their information (Odean, 1998). Barber and Odean (2001) show that men are overconfident when it comes to financial matters. Gender differences in self-confidence are particularly strong if feedback is lacking (Lenney, 1977). Therefore, I include the interaction term *Male*∗*No liabilities at first loan* as an additional instrument to capture other experience with borrowing which should provide feedback on a firm's borrowing capacity. This reasoning would translate into a positive sign for β_6 and a negative sign for β_7.

Alternatively, male borrowers may be more experienced in borrowing than females and therefore request more adequate loan amounts relative to their firm's size. Ongena and Popov (2013) support this reasoning by showing for 17 European countries that women are more likely to be discouraged from applying for loans. If females indeed lack experience in borrowing, then both β_6 and β_7 should carry a negative sign.

Importantly, Ongena and Popov (2013) also show that the granted loan terms of successful loan applications do not differ between male and female firm owners and that there is no systematic difference in the growth rate of male vs. female firms. The latter finding rules out that differing skills or firm fundamentals are underlying drivers of their results. Therefore, the instruments serve my purpose well because they influence the borrowing decision but not directly (nor through the firm fundamentals or firm owners' skills) the Bank's lending decision. More specifically, gender should influence the relative requested amount but not directly the granted amount, and therefore it impacts on credit rationing only via its impact on demand.

In the second stage, I estimate the same model as in Eq. (1) but include the predicted values of *Relative requested amount* from the first stage as an additional explanatory variable.

The results from GMM estimations of the two-stage approach are reported in Table 8 and show that my findings in Table 4, columns (1)–(3) are not mainly driven by borrowers' too large requests.[19] Columns (2),

[19] Running the two-step approach with firm fixed effects shows that the individual fixed effects are not jointly significant. Therefore, I focus this analysis on the full sample without firm fixed effects.

Table 7
Size of request.

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
		Full sample			Repeat clients	
				Share granted		
Difference	−0.109***	−0.109***	−0.109***	−0.113***	−0.117***	−0.116***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Loan number 2	0.045***	0.028***	0.044***	0.056***	0.043***	0.064***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Loan number 3	0.058***	0.038***	0.058***	0.071***	0.060***	0.082***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)
Loan number 4	0.067***	0.030***	0.061***	0.086***	0.058***	0.090***
	(0.004)	(0.005)	(0.005)	(0.007)	(0.009)	(0.008)
Loan number 5	0.066***	0.053***	0.071***	0.101***	0.085***	0.108***
	(0.006)	(0.008)	(0.008)	(0.009)	(0.012)	(0.012)
Initially young	−0.043***	−0.032***	−0.032***			
	(0.002)	(0.002)	(0.002)			
Loan number 2*Initially young	0.031***			0.025***		
	(0.004)			(0.005)		
Loan number 3*Initially young	0.039***			0.027***		
	(0.007)			(0.008)		
Loan number 4*Initially young	0.030***			0.029**		
	(0.011)			(0.012)		
Loan number 5*Initially young	0.061**			0.041**		
	(0.024)			(0.019)		
Initially small	−0.048***	−0.067***	−0.048***			
	(0.002)	(0.002)	(0.002)			
Loan number 2*Initially small		0.046***			0.046***	
		(0.003)			(0.004)	
Loan number 3*Initially small		0.052***			0.054***	
		(0.005)			(0.006)	
Loan number 4*Initially small		0.079***			0.086***	
		(0.007)			(0.008)	
Loan number 5*Initially small		0.042***			0.056***	
		(0.012)			(0.013)	
No liabilities at first loan	0.003*	0.003*	−0.003*			
	(0.002)	(0.002)	(0.002)			
Loan number 2*No liabilities at first loan			0.014***			−0.004
			(0.003)			(0.004)
Loan number 3*No liabilities at first loan			0.016***			−0.004
			(0.005)			(0.006)
Loan number 4*No liabilities at first loan			0.025***			0.008
			(0.007)			(0.009)
Loan number 5*No liabilities at first loan			0.007			−0.018
			(0.012)			(0.013)
Observations	85,982	85,982	85,982	58,528	52,991	52,997
Method	OLS	OLS	OLS	Panel FE	Panel FE	Panel FE
R^2 (adjusted/within)	0.167	0.169	0.167	0.145	0.154	0.148

(*continued on next page*)

Table 7 (*continued*)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
		Full sample			Repeat clients	
				Share granted		
Industry*Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	No	No	No

Columns (1)–(3) include results for the full sample from OLS regressions, while columns (4)–(6) report results from fixed effects regressions for the subsample of *Repeat clients* (loans disbursed to firms that take out more than one loan from the Bank during the observation period). All regressions take into account the *Difference* between the actual requested amount and the predicted requested amount derived from OLS and panel FE versions of the regression reported in Table 5, column (3) to account for the possibility that borrowers are too optimistic or overconfident in their requests and get scaled back by loan officers who realize this behavior. Standard errors are reported in parentheses and account for clustering at the firm level. The dependent variable *Share granted* is the granted loan amount as a share of the requested loan amount and indicates the degree of credit rationing. All regressions control for the same firm and loan characteristics as in Table 4 (definitions are provided in Table 1).

* Significance at the 0.1-level.

** Significance at the 0.05-level.

*** Significance at the 0.01–level.

(4), (6) contain the estimation results for the first stage regressions. The variables that are excluded from the second stage are highly significant and the negative effect of *Male* points towards the reasoning that male borrowers are more experienced in borrowing rather than overconfident in their requests. The test statistic of the validity of the instruments, Hansen's *J*, is very small and not significant indicating that the over-identifying restriction is valid. At the same time, the GMM *C*-statistic is significant, which rejects the null hypothesis that *Relative requested amount* is actually exogenous. Turning to the second-stage results in columns (1), (3), (5), I find that the results for the main indicators of asymmetric information (as well as the other non-reported firm and loan characteristics) are qualitatively and quantitatively very similar to the Table 4 results.

To summarize, both procedures to account for too large requested amounts by either overconfident or inexperienced borrowers show that my main results are indeed in line with credit rationing that is most severe for opaque borrowers in the beginning of their bank relationships.[20]

5. Discussion of results and conclusions

In this paper, I study type 2 credit rationing (loan size rationing) by using loan application and loan contract information for nearly 97,000 small loans granted by one bank in Bulgaria between April 2003 and September 2007. Measuring credit rationing by the ratio of granted to requested loan amounts, the results provide direct evidence on the presence of loan size rationing as well as its extent and evolution over repeated interactions between small firms and their bank. The structure of the data set also uncovers the underlying dynamic of the demand and supply patterns and their link to the observed degree of credit rationing.

[20] Another concern with the main analysis might be that the *Share granted* is an indicator of the soft information a loan officer has about the borrower's quality. In this case, the expectation is that rationed as compared to non-rationed firms are more likely to repay late because they are (as indicated by the loan officer's private information) more risky. In unreported regressions I find for first loans that the rationed firms are more likely to repay late than the non-rationed firms and this effect is economically larger for the more opaque firms. For loan numbers 3 to 5 the rationed firms are no more likely to be in arrears than the non-rationed firms. The results on first loans in a loan sequence cannot fully rule out the loan officer story but they are also in line with adverse selection problems. However, the findings on the later loans in loan sequences clearly do not support the idea that loan officers' private knowledge is the dominant explanation. Rather it seems that the observed rationing of the subsequent loans helps to mitigate moral hazard concerns that might still be present. The literature on dynamic incentives (e.g., Bolton and Scharfstein, 1990) suggests that the credit rationed borrowers are those who are provided with an incentive to pay back their loans duly and should therefore not perform worse than the group of non-rationed borrowers. In sum, the analysis of the relation between rationing and ex-post loan performance confirms that information and incentive problems can explain the observed rationing and its dynamics over time in the sample.

Table 8
Relative size of request (full sample results).

Dependent variable	(1) Second stage *Share granted*	(2) First stage *Relative requested amount*	(3) Second stage *Share granted*	(4) First stage *Relative requested amount*	(5) Second stage *Share granted*	(6) First stage *Relative requested amount*
Relative requested amount	0.043		0.041		0.042	
	(0.029)		(0.029)		(0.029)	
Loan number 2	0.049***	−0.100***	0.033***	−0.034***	0.048***	−0.061***
	(0.004)	(0.005)	(0.003)	(0.003)	(0.003)	(0.005)
Loan number 3	0.064***	−0.134***	0.045***	−0.056***	0.062***	−0.096***
	(0.005)	(0.009)	(0.004)	(0.005)	(0.004)	(0.008)
Loan number 4	0.076***	−0.151***	0.042***	−0.081***	0.070***	−0.119***
	(0.006)	(0.015)	(0.006)	(0.007)	(0.006)	(0.014)
Loan number 5	0.081***	−0.195***	0.071***	−0.113***	0.083***	−0.153***
	(0.009)	(0.023)	(0.009)	(0.010)	(0.010)	(0.020)
Initially young	−0.046***	0.061***	−0.034***	0.044***	−0.034***	0.045***
	(0.003)	(0.009)	(0.003)	(0.008)	(0.003)	(0.008)
Loan number 2*Initially young	0.034***	−0.045***				
	(0.005)	(0.014)				
Loan number 3*Initially young	0.042***	−0.039				
	(0.007)	(0.025)				
Loan number 4*Initially young	0.038***	−0.086***				
	(0.012)	(0.033)				
Loan number 5*Initially young	0.062**	−0.077*				
	(0.024)	(0.045)				
Initially small	−0.066***	0.454***	−0.084***	0.512***	−0.066***	0.452***
	(0.014)	(0.006)	(0.015)	(0.007)	(0.013)	(0.005)
Loan number 2*Initially small			0.045***	−0.149***		
			(0.006)	(0.009)		
Loan number 3*Initially small			0.050***	−0.164***		
			(0.007)	(0.015)		
Loan number 4*Initially small			0.075***	−0.160***		
			(0.009)	(0.024)		
Loan number 5*Initially small			0.035***	−0.184***		
			(0.013)	(0.040)		
No liabilities at first loan	−0.007**	0.145***	−0.007**	0.146***	−0.016***	0.192***
	(0.004)	(0.011)	(0.004)	(0.011)	(0.005)	(0.012)
Loan number 2*No liabilities at first loan					0.018***	−0.107***
					(0.005)	(0.010)
Loan number 3*No liabilities at first loan					0.020***	−0.104***
					(0.006)	(0.017)
Loan number 4*No liabilities at first loan					0.029***	−0.108***
					(0.008)	(0.028)
Loan number 5*No liabilities at first loan					0.016	−0.138***

(*continued on next page*)

Table 8 (*continued*)

Dependent variable	(1) Second stage *Share granted*	(2) First stage *Relative requested amount*	(3) Second stage *Share granted*	(4) First stage *Relative requested amount*	(5) Second stage *Share granted*	(6) First stage *Relative requested amount*
					(0.013)	(0.048)
Male		−0.032***		−0.032***		−0.031***
		(0.006)		(0.006)		(0.006)
Male*No liabilities at first loan		−0.055***		−0.056***		−0.057***
		(0.013)		(0.013)		(0.013)
Observations	86,575	86,575	86,575	86,575	86,575	86,575
R^2 (adjusted)		0.172		0.176		0.174
Hansen's J	0.085 (p-value = 0.771)		0.096 (p-value = 0.757)		0.053 (p-value = 0.819)	
GMM C stat (test of endogeneity)	16.501***		16.013***		16.557***	
Firm and loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year-quarter-, Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	No

This table reports full sample first (columns (2), (4), (6)) and second stage (columns (1), (3), (5)) estimates from an IV GMM estimation in which *Relative requested amount* (the requested loan amount as a share of the firm's total assets) is instrumented for by the borrower's gender (*Male* is a dummy variable that is 1 if the borrower is male, and 0 if she is female). Standard errors are reported in parentheses and account for clustering at the firm level. The dependent variable *Share granted* is the granted loan amount as a share of the requested loan amount and indicates the degree of credit rationing. All regressions control for the same firm and loan characteristics as in Table 4 (definitions are provided in Table 1).

* Significance at the 0.1-level.
** Significance at the 0.05-level.
*** Significance at the 0.01-level.

In line with theoretical predictions, credit rationing is most pronounced for opaque firms and at the beginning of bank relationships but is resolved with decreasing informational asymmetries over the course of the relationships. These results are robust to taking into account the potential endogeneity of the requested amount. Overall, the results imply that the resolution of information problems over the course of bank relationships leads to lower credit rationing because the bank is willing to increase its stakes to meet the firms' (growing) demand.

With respect to the economic significance of the results, the difference in loan size rationing between the opaque and more transparent firms does not seem very large but could still set the opaque firms at a disadvantage in that they cannot expand or improve their business in the same way as the more transparent firms. That said, rationing does play a considerable role in the dataset with a fraction of around 30% of firms being rationed and receiving only around 60% of their requested loan amount at their first interaction with the bank.

The paper likely provides very conservative estimates of the overall importance of credit rationing because the data allow a focus on loan size rationing and its dynamic aspects, which is novel in the literature to the best of my knowledge, but do not contain information on loan discouragement and denial. Brown et al. (2011) use data from the 2005 Business Environment and Enterprise Performance Survey (BEEPS) conducted by the EBRD and the World Bank and their results highlight that discouragement is a considerably more important reason than loan denial for firms not to have a loan even though they would need credit. Furthermore, the results in Brown et al. (2011), as well as in Popov and Udell (2012) using the 2005 and 2008 BEEPS rounds, show that small and financially opaque firms are less likely to apply for a loan. Similarly, Chakravarty and Xiang (2013) find in their sample of ten emerging economies that smaller and younger firms are more likely to be discouraged.

In sum, discouragement is also related to firm opaqueness but seems to play a more important role than loan denial (as is also suggested in Cole (2013) for the US) or loan size rationing.

Credit rationing need not be inefficient and call for government intervention as highlighted, for instance, by De Meza and Webb (1992). From a policy point of view credit rationing should matter if it hinders economic growth (see, for instance, Levine (2005) for an overview of the literature that supports the conjecture that access to credit enhances economic growth). Unfortunately, the data do not contain information on indicators that would capture aspects of economic development. Brown et al. (2011) provide suggestive evidence that discouraged and rejected firms invest less in R&D and are less likely to innovate due to their restricted access to credit, while they do not find significant differences in sales or employee growth between firms.

To gain a comprehensive picture of the importance of credit rationing and the role that the resolution of informational asymmetries play future research is needed that can (i) combine all three facets of discouragement, denial and loan size rationing into one joint analysis and (ii) evaluate the various real effects stemming from rationing. Only then an informed conclusion about the necessity of policy interventions such as (partial) credit guarantee schemes as a tool to improve access to credit for opaque firms can be made.[21]

One question that arises concerns the transferability of the results. On the one hand, concentrating the analysis on small loans from one bank in an emerging market provides an ideal background for studying credit rationing because informational asymmetries are presumably severe. Furthermore, the loan granting process is the same for all observed loans reducing possible heterogeneity at this level. On the other hand, the bank and its loan contracts that are largely standardized with respect to interest rates and collateral requirements might seem special. However, standardizing interest rates is not uncommon in other loan categories like overdraft facilities or consumer loans, and the bank's lending technology is not singular in the context of emerging countries. Whether the results of this study can be extrapolated to domestically-owned banks is a question for future research. The existing empirical evidence whether domestic banks are better able to produce soft information and provide credit to opaque borrowers is mixed (see, e.g., the literature overview in Giannetti and Ongena (2012)). Recent evidence from 21 Eastern European and Central Asian countries by Beck et al. (2014) highlights that the often implicitly assumed contrast between domestic banks being relationship lenders and foreign banks being transactional lenders does not seem to hold in practice. They find that 51% of the domestic and 64% of the foreign banks consider themselves as relationship lenders in their SME business.

The dynamic patterns found in this study complement and connect key elements of the literatures on asymmetric information and credit rationing as well as relationship lending and the availability of credit for small firms. The data provide a natural setting to gain insights into the dynamics of requested and granted loan amounts in multiple interactions between borrowers and banks when information asymmetries are significant. However, more research seems warranted to analyze the various facets of credit rationing and their real effects in one joint model, the interaction between bank ownership and lending technologies and what roles factors like borrower learning or possibly borrower bargaining power play in the loan contracting process, and how they impact bank-borrower relationships.

Appendices

[21] Credit guarantee schemes can provide banks with the incentive to meet opaque firms' demand already in the initial stages of the bank-firm relationship and then gather the valuable information that they need to continue the lending relationship because the guarantor (e.g., the government) bears part of the default risk.

Appendix A

Asymmetric information and the degree of credit rationing for first vs. later loans by year (matched sample)

2003	First loans *Share granted*	Later loans		2004	First loans *Share granted*	Later loans		2005	First loans *Share granted*	Later loans	
Initially young firms	0.872***	0.935***		Initially young firms	0.858***	0.916***		Initially young firms	0.870***	0.944***	
	(0.006)	(0.032)			(0.004)	(0.007)			(0.004)	(0.004)	
	(*N* = 1114)	(*N* = 36)			(*N* = 1880)	(*N* = 835)			(*N* = 2501)	(*N* = 2463)	
Initially old firms	0.905***	0.932***		Initially old firms	0.908***	0.938***		Initially old firms	0.923***	0.959***	
	(0.003)	(0.005)			(0.002)	(0.001)			(0.002)	(0.001)	
	(*N* = 5451)	(*N* = 1671)			(*N* = 7752)	(*N* = 16,947)			(*N* = 7832)	(*N* = 44,631)	
Diff/**Diff-in-diff**	−0.033***	0.004	**−0.037**	Diff/**Diff-in-diff**	−0.050***	−0.022***	**−0.027*****	Diff/**Diff-in-diff**	−0.053***	−0.015***	**−0.038*****
	(0.006)	(0.033)	**(0.033)**		(0.005)	(0.007)	**(0.008)**		(0.004)	(0.004)	**(0.006)**
	(*N* = 6565)	(*N* = 1707)	**(*N* = 8272)**		(*N* = 9632)	(*N* = 17,782)	**(*N* = 27414)**		(*N* = 10,333)	(*N* = 47,094)	**(*N* = 57,427)**
Initially small firms	0.868***	0.917***		Initially small firms	0.862***	0.918***		Initially small firms	0.871***	0.946***	
	(0.003)	(0.005)			(0.003)	(0.002)			(0.003)	(0.001)	
	(*N* = 3706)	(*N* = 1277)			(*N* = 5272)	(*N* = 11,407)			(*N* = 4934)	(*N* = 31,060)	
Initially large firms	0.940***	0.975***		Initially large firms	0.943***	0.971***		Initially large firms	0.946***	0.983***	
	(0.004)	(0.009)			(0.003)	(0.002)			(0.002)	(0.001)	
	(*N* = 2859)	(*N* = 430)			(*N* = 4360)	(*N* = 6375)			(*N* = 5399)	(*N* = 16,034)	
Diff/**Diff-in-diff**	−0.072***	−0.058***	**−0.014**	Diff/**Diff-in-diff**	−0.081***	−0.053***	**−0.028*****	Diff/**Diff-in-diff**	−0.074***	−0.037***	**−0.038*****
	(0.005)	(0.011)	**(0.012)**		(0.002)	(0.003)	**(0.005)**		(0.004)	(0.002)	**(0.004)**
	(*N* = 6565)	(*N* = 1707)	**(*N* = 8272)**		(*N* = 9632)	(*N* = 17,782)	**(*N* = 27,414)**		(*N* = 10,333)	(*N* = 47,094)	**(*N* = 57,427)**
No liabilities at first loan	0.902***	0.912***		No liabilities at first loan	0.889***	0.933***		No liabilities at first loan	0.902***	0.959***	
	(0.004)	(0.007)			(0.003)	(0.002)			(0.003)	(0.001)	
	(*N* = 2722)	(*N* = 690)			(*N* = 4156)	(*N* = 7833)			(*N* = 4590)	(*N* = 28,052)	
Liabilities at first loan	0.898***	0.945***		Liabilities at first loan	0.905***	0.941***		Liabilities at first loan	0.917***	0.957***	
	(0.003)	(0.006)			(0.003)	(0.002)			(0.002)	(0.001)	
	(*N* = 3843)	(*N* = 1017)			(*N* = 5476)	(*N* = 9949)			(*N* = 5743)	(*N* = 19,042)	
Diff/**Diff-in-diff**	0.004	−0.034***	**0.038*****	Diff/**Diff-in-diff**	−0.016***	−0.008***	**−0.008***	Diff/**Diff-in-diff**	−0.015***	0.003	**−0.018*****
	(0.005)	(0.010)	**(0.011)**		(0.004)	(0.003)	**(0.005)**		(0.004)	(0.002)	**(0.004)**
	(*N* = 6565)	(*N* = 1707)	**(*N* = 8272)**		(*N* = 9632)	(*N* = 17,782)	**(*N* = 27,414)**		(*N* = 10,333)	(*N* = 47,094)	**(*N* = 57,427)**

(*continued on next page*)

Appendix A (*continued*)

2006	First loans *Share granted*	Later loans		2007	First loans *Share granted*	Later loans	
Initially young firms	0.850***	0.946***		Initially young firms	0.841***	0.895***	
	(0.004)	(0.003)			(0.004)	(0.005)	
	(*N* = 3078)	(*N* = 4527)			(*N* = 2855)	(*N* = 2213)	
Initially old firms	0.897***	0.936***		Initially old firms	0.899***	0.929***	
	(0.002)	(0.001)			(0.002)	(0.001)	
	(*N* = 10,138)	(*N* = 66,530)			(*N* = 10,760)	(*N* = 56,602)	
Diff/**Diff-in-diff**	−0.047***	−0.010***	**−0.057*** **	Diff/**Diff-in-diff**	−0.057***	−0.033***	**−0.024*** **
	(0.004)	(0.003)	**(0.005)**		(0.005)	(0.005)	**(0.007)**
	(*N* = 13,216)	(*N* = 71,057)	**(*N* = 84,273)**		(*N* = 13,615)	(*N* = 58,815)	**(*N* = 72,430)**
Initially small firms	0.842***	0.919***		Initially small firms	0.847***	0.905***	
	(0.003)	(0.001)			(0.003)	(0.001)	
	(*N* = 6289)	(*N* = 43,880)			(*N* = 6150)	(*N* = 32,083)	
Initially large firms	0.926***	0.965***		Initially large firms	0.919***	0.954***	
	(0.002)	(0.001)			(0.003)	(0.001)	
	(*N* = 6927)	(*N* = 27,177)			(*N* = 7465)	(*N* = 26,732)	
Diff/**Diff-in-diff**	−0.084***	−0.046***	**−0.038*** **	Diff/**Diff-in-diff**	−0.073***	−0.049***	**−0.023*** **
	(0.004)	(0.002)	**(0.004)**		(0.004)	(0.002)	**(0.004)**
	(*N* = 13,216)	(*N* = 71,057)	**(*N* = 84,273)**		(*N* = 13,615)	(*N* = 58,815)	**(*N* = 72,430)**
No liabilities at first loan	0.876***	0.928***		No liabilities at first loan	0.873***	0.915***	
	(0.003)	(0.001)			(0.003)	(0.001)	
	(*N* = 6787)	(*N* = 47,305)			(*N* = 6065)	(*N* = 34,561)	
Liabilities at first loan	0.896***	0.952***		Liabilities at first loan	0.897***	0.946***	
	(0.003)	(0.001)			(0.003)	(0.001)	
	(*N* = 6429)	(*N* = 23,752)			(*N* = 6550)	(*N* = 24,254)	
Diff/**Diff-in-diff**	−0.020***	−0.024***	**0.004**	Diff/**Diff-in-diff**	−0.025***	−0.031***	**0.007**
	(0.004)	(0.002)	**(0.004)**		(0.004)	(0.002)	**(0.004)**
	(*N* = 13,216)	(*N* = 71,057)	**(*N* = 84,273)**		(*N* = 13,615)	(*N* = 58,815)	**(*N* = 72,430)**

This table reports difference-in-difference estimates for *Share granted* for *First loans* and *Later loans*, for different subsamples based on various measures of asymmetric information. The loan sequences are derived from matching all first loans extended in one year to all similar (based on firm and loan characteristics) later loans extended in the same year. See Table 1 for definitions of all variables.

** Significance at the 0.05-level.

* Significance at the 0.1-level.

*** Significance at the 0.01-level.

Appendix B

The degree of credit rationing over loan sequences by year (matched sample)

Year	2003			2004			2005			2006			2007
Loan number	Share granted/*Share of rationed borrowers*/N												
1	0.90	*0.32*	6565	0.90	*0.32*	9632	0.91	*0.26*	10,333	0.89	*0.31*	13,216	0.89	*0.32*	13,615
2	0.93	*0.28*	1706	0.94	*0.24*	15,666	0.95	*0.16*	30,404	0.92	*0.22*	43,109	0.92	*0.25*	38,040
3	1.00	*0.00*	1	0.94	*0.24*	1801	0.97	*0.14*	13,919	0.95	*0.16*	18,837	0.93	*0.25*	13,482
4				0.98	*0.11*	276	0.94	*0.25*	3105	0.97	*0.13*	6940	0.96	*0.22*	5046
5				0.98	*0.08*	39	0.99	*0.14*	394	0.98	*0.14*	2171	1.01	*0.18*	2247

This table displays sample means for the degree of credit rationing (*Share granted*) and the *Share of rationed borrowers* for each loan number in loan sequences. The loan sequences are derived from matching all first loans extended in one year to all similar (based on firm and loan characteristics) later loans extended in the same year. See Table 1 for definitions of all variables.

Appendix C

Determinants of credit rationing: robustness tests

Panel A: full sample

Dependent variable	(1)	(2)	(3)	(4) *Share granted*	(5)	(6)	(7)
Loan number 2	0.040***	0.028***	0.040***	0.025***	0.044***	0.030***	0.044***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Loan number 3	0.050***	0.037***	0.050***	0.035***	0.057***	0.041***	0.057***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
Loan number 4	0.059***	0.031***	0.054***	0.031***	0.068***	0.037***	0.063***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)	(0.005)
Loan number 5	0.060***	0.058***	0.064***	0.059***	0.071***	0.064***	0.074***
	(0.006)	(0.008)	(0.008)	(0.010)	(0.006)	(0.008)	(0.008)
Initially young	−0.028***	−0.016***	−0.016***	−0.042***	−0.015	−0.032***	−0.032***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.015)	(0.002)	(0.002)
Loan number 2*Initially young	0.027***			0.028***	0.034***		
	(0.005)			(0.005)	(0.005)		
Loan number 3*Initially young	0.034***			0.035***	0.042***		
	(0.007)			(0.007)	(0.007)		
Loan number 4*Initially young	0.028**			0.029**	0.037***		
	(0.011)			(0.011)	(0.012)		
Loan number 5*Initially young	0.049**			0.056**	0.062***		
	(0.024)			(0.024)	(0.024)		
Initially small	−0.012***	−0.026***	−0.011***	−0.061***	−0.047***	−0.029***	−0.046***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.010)	(0.002)
Loan number 2*Initially small		0.033***		0.036***		0.040***	
		(0.003)		(0.003)		(0.003)	
Loan number 3*Initially small		0.036***		0.040***		0.045***	
		(0.005)		(0.005)		(0.005)	
Loan number 4*Initially small		0.061***		0.065***		0.071***	
		(0.007)		(0.007)		(0.007)	
Loan number 5*Initially small		0.019		0.024**		0.031**	
		(0.012)		(0.012)		(0.012)	
No liabilities at first loan	0.002	0.001	−0.007**	−0.006***	−0.003	−0.003	0.006
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.010)
Loan number 2*No liabilities at first loan			0.013***	0.006*			0.015***
			(0.004)	(0.003)			(0.003)

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Appendix C (*continued*)

Panel A: full sample

Dependent variable	(1)	(2)	(3)	(4) *Share granted*	(5)	(6)	(7)
Loan number 3*No liabilities at first loan			0.014***	0.009*			0.018***
			(0.005)	(0.005)			(0.005)
Loan number 4*No liabilities at first loan			0.023***	0.014*			0.026***
			(0.008)	(0.008)			(0.008)
Loan number 5*No liabilities at first loan			0.007	0.007			0.013
			(0.012)	(0.012)			(0.012)
Observations	85,982	85,982	85,982	86,575	86,575	86,575	86,575
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS
R^2 (adjusted)	0.062	0.063	0.062	0.058	0.056	0.058	0.055
Firm and loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year-quarter fixed effects	Yes	Yes	Yes	Yes	no	no	no
Firm fixed effects	No	No	No	No	No	No	No
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group-specific time trend, Industry fixed effects	No	No	No	No	Yes	Yes	Yes

This table reports results for the full sample from OLS regressions. Standard errors are reported in parentheses and account for clustering at the firm level. The dependent variable *Share granted* is the granted loan amount as a share of the requested loan amount and indicates the degree of credit rationing. All regressions control for the same firm and loan characteristics as in Table 4 (definitions are provided in Table 1).

* Significance at the 0.1-level.
** Significance at the 0.05-level.
*** Significance at the 0.01-level.

Panel B: repeat clients

Dependent variable	(1) *Share granted*	(2)	(3)	(4)	(5)
Loan number 2	0.045***		0.055***	0.040***	0.060***
	(0.004)		(0.004)	(0.005)	(0.005)
Loan number 3	0.064***	0.030***	0.068***	0.053***	0.077***
	(0.007)	(0.007)	(0.006)	(0.008)	(0.008)
Loan number 4	0.063***	0.040***	0.082***	0.052***	0.086***
	(0.009)	(0.011)	(0.008)	(0.011)	(0.011)
Loan number 5	0.100***	0.080***	0.095***	0.083***	0.103***
	(0.013)	(0.015)	(0.010)	(0.014)	(0.014)
Loan number 2*Initially young	0.019***		0.039***		
	(0.006)		(0.009)		
Loan number 3*Initially young	0.016*	−0.005	0.051***		
	(0.009)	(0.009)	(0.015)		
Loan number 4*Initially young	0.023*	0.007	0.066***		
	(0.014)	(0.014)	(0.022)		
Loan number 5*Initially young	0.037	0.016	0.084***		
	(0.026)	(0.027)	(0.031)		
Loan number 2*Initially small	0.035***			0.049***	
	(0.004)			(0.007)	
Loan number 3*Initially small	0.039***	0.000		0.064***	
	(0.006)	(0.006)		(0.011)	

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(*continued*)

Panel B: repeat clients

Dependent variable	(1) *Share granted*	(2)	(3)	(4)	(5)
Loan number 4*Initially small	0.061***	0.019**		0.096***	
	(0.009)	(0.009)		(0.016)	
Loan number 5*Initially small	0.018	−0.020		0.059***	
	(0.013)	(0.014)		(0.020)	
Loan number 2*No liabilities at first loan	−0.006				0.006
	(0.005)				(0.007)
Loan number 3*No liabilities at first loan	−0.006	0.001			0.009
	(0.006)	(0.006)			(0.012)
Loan number 4*No liabilities at first loan	0.001	0.009			0.021
	(0.009)	(0.009)			(0.016)
Loan number 5*No liabilities at first loan	−0.011	−0.000			0.002
	(0.013)	(0.013)			(0.020)
Loan officer change		−0.014***			
		(0.004)			
Previous arrears		−0.050**			
		(0.022)			
Time between loans		0.010***			
		(0.003)			
Observations	52,991	32,621	58,528	52,991	52,997
Method	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE
R^2 (within)	0.045	0.013	0.038	0.043	0.039
Firm and loan characteristics, Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Industry*Year-quarter fixed effects	Yes	Yes	No	No	No
Region fixed effects	No	No	No	No	No
Group-specific time trend, Industry fixed effects	No	No	Yes	Yes	Yes

This table reports results for the subsample of repeat clients (loans disbursed to firms that take out more than one loan from the Bank during the observation period) from panel FE regressions. Standard errors are reported in parentheses and account for clustering at the firm level. The dependent variable *Share granted* is the granted loan amount as a share of the requested loan amount and indicates the degree of credit rationing. All regressions control for the same firm and loan characteristics as in Table 4 (definitions are provided in Table 1).

* Significance at the 0.1-level.

** Significance at the 0.05-level.

*** Significance at the 0.01-level.

Appendix D
Granted and requested loan amounts for borrowers rationed at their first loans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Initially young		*Initially old*		*Initially small*		*Initially large*		*No liabilities at first loan*		*Liabilities at first loan*	
Dependent variable	Ln(*Granted amount*)	Ln(*Requested amount*)	Ln(*Granted amount*)	Ln(*Requested amount*)	Ln(*Granted amount*)	Ln(*Requested amount*)	Ln(*Granted amount*)	Ln(*Requested amount*)	Ln(*Granted amount*)	Ln(*Requested amount*)	Ln(*Granted amount*)	Ln(*Requested amount*)
Loan number 2	0.200***	0.243***	0.198***	0.251***	0.341***	0.387***	0.099***	0.156***	0.228***	0.276***	0.196***	0.245***
	(0.026)	(0.027)	(0.011)	(0.011)	(0.015)	(0.016)	(0.014)	(0.014)	(0.018)	(0.018)	(0.014)	(0.014)
Loan number 3	0.416***	0.421***	0.371***	0.404***	0.599***	0.613***	0.221***	0.263***	0.448***	0.471***	0.347***	0.374***
	(0.047)	(0.048)	(0.019)	(0.020)	(0.027)	(0.027)	(0.024)	(0.024)	(0.029)	(0.030)	(0.023)	(0.024)
Loan number 4	0.518***	0.474***	0.497***	0.518***	0.819***	0.793***	0.275***	0.320***	0.610***	0.613***	0.445***	0.455***
	(0.074)	(0.073)	(0.028)	(0.028)	(0.039)	(0.040)	(0.034)	(0.034)	(0.041)	(0.042)	(0.034)	(0.034)
Loan number 5	0.601***	0.550***	0.550***	0.549***	0.966***	0.938***	0.263***	0.272***	0.689***	0.671***	0.490***	0.481***
	(0.112)	(0.113)	(0.039)	(0.039)	(0.058)	(0.058)	(0.046)	(0.046)	(0.062)	(0.062)	(0.046)	(0.047)
Loan number 2*Rationed at first loan	0.167***	−0.358***	0.073***	−0.399***	0.078***	−0.417***	0.059***	−0.410***	0.107***	−0.387***	0.080***	−0.392***
	(0.025)	(0.025)	(0.011)	(0.012)	(0.013)	(0.014)	(0.016)	(0.017)	(0.015)	(0.015)	(0.014)	(0.015)
Loan number 3*Rationed at first loan	0.114**	−0.409***	0.088***	−0.396***	0.090***	−0.422***	0.047*	−0.419***	0.116***	−0.384***	0.077***	−0.407***
	(0.047)	(0.049)	(0.019)	(0.019)	(0.023)	(0.024)	(0.028)	(0.028)	(0.027)	(0.027)	(0.023)	(0.024)
Loan number 4*Rationed at first loan	0.120	−0.379***	0.087***	−0.406***	0.080**	−0.430***	0.022	−0.453***	0.125***	−0.381***	0.070*	−0.418***
	(0.085)	(0.090)	(0.031)	(0.032)	(0.039)	(0.040)	(0.045)	(0.046)	(0.044)	(0.045)	(0.039)	(0.040)
Loan number 5*Rationed at first loan	0.053	−0.494***	0.068	−0.409***	−0.001	−0.493***	0.062	−0.429***	−0.041	−0.492***	0.124*	−0.382***
	(0.152)	(0.155)	(0.055)	(0.055)	(0.073)	(0.074)	(0.071)	(0.072)	(0.084)	(0.084)	(0.065)	(0.066)
Observations	8200	8200	44,778	44,778	27,842	27,842	25,136	25,136	23,810	23,810	29,168	29,168
Method	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE	Panel FE
R^2 (within)	0.409	0.354	0.388	0.350	0.418	0.357	0.376	0.360	0.404	0.351	0.381	0.351
Firm and loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year-quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	No	No	No	No	No	No	No	No	No	No	No	No

This table reports results from fixed effects regressions for the sample of *Repeat clients* (loans disbursed to firms that take out more than one loan during the observation period) that were rationed at their first loan in the subsample of *Initially young* firms in columns (1)–(2), the subsample of *Initially old* firms in columns (3)–(4), the subsample of *Initially small* firms in columns (5)–(6), the subsample of *Initially large* firms in columns (7)–(8), the subsample of firms with *No liabilities at first loan* in columns (9)–(10) and the subsample of firms with *Liabilities at first loan* in columns (11)–(12). The dependent variables are Ln(*Granted amount*) which is the natural logarithm of the granted loan amount in EUR in columns (1), (3), (5), (7), (9) and (11) and Ln(*Requested amount*) which is the natural logarithm of the requested loan amount in EUR in columns (2), (4), (6), (8), (10) and (12). All regressions control for the firm and loan characteristics as in Table 5 (definitions are provided in Table 1).

* Significance at the 0.1-level.

** Significance at the 0.05-level.

*** Significance at the 0.01-level.

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