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A Loss of a Lending Relationship: Shock or Relief?

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A loss of a lending relationship: shock or relief?

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Abstract

We use loan-level panel data and a novel identification setting – closures of banks – to study how lending relationships affect firms' borrowing costs. We find that firms continued borrowing at similar loan rates after exogenously losing their relationships with a healthy bank. However, after losing relationships with a financially distressed bank, firms' borrowing costs dropped sharply and converged to the market's average. This suggests that stressed banks use informational monopoly power to hold up their best borrowers and to extract rents from them. Closures of such banks can release firms from the hold-up and allow borrowing significantly cheaper elsewhere. Meanwhile, on average we find no effect of relationships with healthy banks on borrowing costs, but there is a differential effect: in the beginning relationships are costly while in the long run they pay off.

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1. Introduction

The 2007-9 financial crisis exposed the importance of firm-bank relationships. While they generally helped firms access credit (Bolton et al., 2016; Beck et al., 2017), relationships with severely hit banks were less helpful. Stressed banks cut lending (Ivashina and Scharfstein, 2008), raised interest rates (Santos, 2011), and since lending relationships were sticky and switching banks was costly, firms dependent on the stressed banks were forced to lay off staff (Chodorow-Reich, 2014), cut investment (Carvalho et al., 2015), and even shut down (Jiménez et al., 2017). Are relationships with financially distressed banks overall beneficial or harmful and what makes it difficult to switch banks? Existing theories explain sources of switching costs and how lending relationships can both help and harm firms (Sharpe, 1990; Rajan, 1992; Bolton et al., 2016). However, endogeneity makes empirical identification hard. Ideally, to gauge firm's benefits from a relationship, one would like to compare how easily the firm accesses credit when it has the relationship and when it does not, but firms start and stop relationships endogenously.

We contribute to the literature by tackling this endogeneity problem with a novel setting – closures of banks – which exogenously terminated firms' lending relationships and forced them to switch banks. Lithuania offers an ideal setting for identification due to its exhaustive credit register and simultaneous closures of two banks in the aftermath of the financial crisis. First, "Healthy bank" – a healthy[1] subsidiary of an international parent bank – unexpectedly left Lithuania as part of its parent's global cost optimization plan. Second, "Distressed bank" [2] shut down after the regulator unexpectedly uncovered severe misreportings of the bank's asset values. We exploit this setting to study how firms' loan rates changed when their banks closed. We find that loan rates of the "Healthy bank's" clients remained unchanged while loan rates of the "Distressed bank's" highest credit quality borrowers dropped sharply and immediately converged to the market's average. In line with the Sharpe's (1990) model, these results suggest that the best clients of "Distressed bank" incurred high switching costs stemming from interbank information asymmetries: i.e. firms' attempts to switch falsely signalled their inferiority (e.g. inability to borrow from the informed inside bank) to uninformed outside banks. In turn, the inside bank could hold up these firms and

[1] Borrowers of "Healthy bank" had less frequent repayment delays and lower loan rates than clients of most other banks operating in Lithuania (Figures 1.1 to 1.4).

[2] Borrowers of "Distressed bank" had more frequent repayment delays and higher loan rates (Figures 1.1 to 1.4) than clients of most other banks in Lithuania.

extract rents from them. When the bank closed, firms could switch without giving the false signal and thus received average market rates. We also find that relationships with healthy banks neither helped nor harmed firms on average, but there was a differential effect: banks raised loan rates in the beginning of relationships but, possibly due to reputational concerns, reduced them later.

While the literature has studied effects of banks' closures on aggregate economic outcomes (Bernanke, 1983; Ashcraft, 2005) and subsequent firms' investments (Minamihashi, 2011; Korte, 2015), to our knowledge, this is the first paper to address the following research questions particularly relevant for policymakers. How does a closure of a bank affect loan rates of its customers? Does it depend on the closed bank's health and the lost relationships' length? Intuitively, if a lending relationship helped a firm borrow cheaper, then losing it would increase borrowing costs, while if the relationship made borrowing more expensive, escaping it would make borrowing cheaper. Thus, answers to the aforementioned questions suggest answers to broader questions. How do lending relationships with banks affect firms' borrowing costs? Does it depend on the banks' health and the relationships' length? What makes switching between banks costly?

In theory, lending relationships can make borrowing both cheaper and more expensive. On the one hand, repeated interactions reduce information asymmetries between firms and banks, which may alleviate firms' borrowing costs (e.g. Diamond, 1984). On the other hand, firm-bank relationships create information asymmetries across banks. These asymmetries generate switching costs for good-quality firms and lead to an adverse selection of firms willing to switch banks, thus, by trying to switch good firms would wrongly signal inferior quality (Sharpe, 1990).[3] As a result, banks gain monopoly power to hold up their current customers and to extract rents from them (Rajan, 1992; Von Thadden, 2004), but the decision to do so depends on banks' concerns about reputation (Sharpe, 1990).[4] Customers of financially distressed banks might be perceived by other banks as particularly risky, which would inflate their switching costs and make them even more vulnerable

[3] For example, suppose that all banks lend at 5% interest rate to good firms and at 15% to bad firms. Banks know firms' quality only when they have relationships with them. If an unknown firm approaches a bank, the uninformed bank charges an average of 10%. In this case, only bad firms would switch, as for good firms switching is costly. If a good firm tried to switch, it would be mistakenly identified as a bad firm by uninformed outside banks. If banks know that switching is costly, they have monopoly power over their good quality clients.

[4] Banks that are known for exploiting their customers might struggle to attract new borrowers.

to hold-up. Moreover, financially distressed banks lack resources and incentives to care about reputation (Boot, Greenbaum and Thakor, 1993) and thus are more likely to exploit hold-up.

This theoretical framework predicts that an involuntary loss of a lending relationship can lead to both a drop and a hike in borrowing costs of high credit quality firms. If lending relationships help firms borrow cheaper via the reduction of information asymmetries between them and their banks, a loss of such a relationship would increase borrowing costs. If lending relationships make borrowing more expensive because reputationally unconcerned banks exploit their customers' switching costs stemming from interbank information asymmetries, an involuntary loss of such a relationship would reduce interbank information asymmetries and allow a firm to borrow cheaper from more reputationally concerned banks. Other factors may also explain changing borrowing costs after the "Distressed bank's" closure, e.g. (1) deterioration of firms' credit quality could have caused the bank's closure or (2) the bank's closure could have affected the perception of firms' quality. However, these scenarios would push borrowing costs upwards after the bank's closure, while we find the opposite. Thus, we might underestimate the negative impact on borrowing costs.

We exploit the credit registry provided by the Bank of Lithuania, which contains quarterly data on all loans outstanding between 2011 q4 and 2018 q1 among all firms and banks registered in Lithuania. We also observe lenders, borrowers, initiation dates and termination dates of all loans issued between 1995 and 2011, which allows measuring complete lengths of all firm-bank relationships. We primarily analyze leasing contracts, which make up 69% of all contracts in the database, but our findings are robust to the inclusion of term loans and credit lines. We disregard credit unions and other small lenders and consider 12 largest banks, which account for 95% of observations. Our sample period is marked by an economic recovery after the 2007-9 crisis. In 2011 Lithuania's GDP grew by 6%, the financial system was stable and total profits in the banking sector almost reached a record-high pre-crisis level (Bank of Lithuania, 2011).

We analyze the closures of two banks[5]. First, on January 30, 2013, "Healthy bank" – a healthy branch of a foreign bank announced its strategic decision to leave the Lithuanian and Estonian markets as part of a global cost-saving plan and to concentrate its business in Latvia, where the

[5] During the time period of our data sample, three banks ceased to exist. One more bank was closed in November 2011 due to a fraud of the owners who were discovered to tunnel assets. Due to structural changes in the database, the failure of this bank coincides with the starting period of our data sample, therefore, we do not use this bank's closure.

head office of the Baltic region was located. Second, a "Distressed bank" closed two weeks later in February 2013 due to the risk mismanagement and the uncovered misreporting of asset values. The closure was unexpected even to governmental institutions which lost large uninsured deposits. Three weeks later, an auditor finished reviewing all bank's assets and split them into a "good bank" (loans that were likely to function normally) and a "bad bank" (loans that were likely to default, and likely caused the bank's failure). The "good bank's" loans were sold to another bank and the "bad bank" was liquidated. To control for the quality of firms, we only consider firms assigned to the "good bank" and only those that did not delay any repayment throughout the whole sample period from 2011 to 2018. One could argue that our estimated drop in borrowing costs was affected by the auditors' conclusions, however, our results are robust to considering only loans issued before the bank was split, i.e. within the three weeks after the failure. Furthermore, our results are unaffected by pricing policies of the bank which acquired the "good bank". Only less than half of firms assigned to the "good bank" took new loans from the acquiring bank, while more than half chose other banks. Our results are robust to considering the latter group only.

Results. Our analysis can be split into four parts. In the first part, we examine graphically how firms' borrowing costs changed when their banks closed. We find that the closure of the "Healthy bank" did not affect its clients' borrowing costs (Figure 7.1.), while the closure of the "Distressed bank" lead to an average drop of 1.0 percentage point in its customers' borrowing costs, which immediately converged to the market's average (Figure 2.1.). The drop was even larger for firms lacking other lending relationships (Figure 2.2.) but less dramatic for firms that had very long (>6 years) relationships with the failed bank (Figure 2.3). These findings suggest that relationships with the healthy bank on average neither benefited nor hurt its borrowers, while relationships with the financially distressed bank were costly and not easy to escape. Furthermore, it appears that long-term relationships were relatively beneficial as compared to short-term relationships.

In the second part, we test formally if the drops observed visually were statistically significant. We use a difference-in-difference analysis to compare borrowing costs of a treatment group and a control group before and after the closures of the two banks. A treatment group comprises customers of a closed bank (first "Healthy" and then "Distressed"), while a control group is formed of customers of all other banks. The findings confirm the results drawn from the graphical analysis.

These results are robust to using different loan types (i.e. including term loans and credit lines) and control groups (i.e. customers of one bank, which was the most similar to the closed bank).

In the third part, we test if borrowing costs of the "Distressed bank's" customers after the closure indeed converged to the market's average as suggested by the graphical analysis. We follow Ioannidou and Ongena (2010) and Bonfim et al. (2018) to match forced-switching loans (i.e. first loans issued to former "Distressed bank's" customers by their new banks) with non-switching loans (i.e. similar loans issued at the same time by the same banks to similar old customers of those banks) and to compare interest rates between them. We find that on average forced-switchers borrowed at the same rates as old customers at the same banks. As old customers had no advantage, this again implies that relationships with healthy banks neither benefited nor hurt firms on average. Moreover, in line with Von Thadden (2004) and Bonfim et al. (2018), this serves as evidence that switching costs primarily stem from interbank information asymetries[6]. We find, however, a differential effect – very old customers (>6 years) received 20 bps lower rates than forced-switchers, and short-term customers (<6 years) received 24 bps higher rates than forced-switchers. This suggests that short-term relationships are costly while long-term relationships are beneficial.

In the fourth part, we test if longer relationships with banks indeed help firms borrow cheaper. We use two methods: a non-parametric loan matching, which tackles endogeneity between the interest rate and other loan characteristics as in Ioannidou and Ongena (2010), and a parametric panel regression similar to Lopez-Espinosa et al. (2017), which uses loan-level data and allows us to control for firm-specific-time-varying, bank-specific-time-varying and firm-bank-specific-time-invariant characteristics. Partially in line with Ioannidou and Ongena (2010), we find that when firms switch banks voluntarily, they receive a discount of 25 bps[7] on average, but in the next 2-3 years rates increase by around 50 bps. In contrast to the authors, our longer sample period allows

[6] Bonfim et al. (2018) interpret this as evidence that switching costs primarily stem from information asymmetries as opposed to direct shoe-leather switching costs. In line with the authors, we find that regular-switchers receive discounts on loans issued by their new banks, while forced-switchers do not. In Von Thadden's (2004) model, switching discounts are explained by randomized attempts of uninformed outside banks to outbid informed inside banks, thus a forced-switcher that has lost its inside bank would have no reason to receive a discount. If instead of information asymmetries the shoe leather switching costs and the competition for a market share was causing switching discounts, a switcher should receive one whether or not it still has an inside bank (Klemperer, 1987).

[7] The discount found by Ioannidou and Ongena (2010) is 87 bps, and by Bonfim et al. (2018) – 59 bps

us to uncover that rates decrease in the later years and drop below initial levels after 5 years. Results of the panel regression confirm this pattern.

Empirical evidence in relationship lending literature suggests that switching costs do stem primarily from interbank information asymmetries and create hold-up opportunities (Bonfim et al., 2018), while evidence on whether banks abuse hold-up is mixed and depends on circumstances (see, e.g., Petersen and Rajan, 1994; Angelini et al., 1998; Berlin and Mester, 1999; Dahiya et al., 2003; Schenone, 2009; Ioannidou and Ongena, 2010; Kysucky and Norden, 2015; Gobbi and Sette, 2015; Bolton et al., 2016; Beck et al., 2017). Another branch of literature related to ours studies how bank lending depends on banks' health. Stressed banks were found to cut lending (Ivashina and Scharfstein, 2008), increase interest rates (Hubbard et al., 2002; Santos, 2011; Chodorow-Reich, 2014) and affect their customers' stock prices (Slovin et al. 1993; Ongena et al. 2003; Carvalho et al., 2015). Other papers study transmissions of liquidity shocks from banks to firms (Schnabl 2012; Chava and Purnanandam 2011; Khwaja and Mian 2008).

In line with Santos (2011), we find that a financially distressed bank charged its good customers a premium on their loans. We contribute by demonstrating that the premium disappeared and the good customers could borrow cheaper elsewhere when the bank was shut down. Besides providing practical knowledge relevant to firms, banks, and regulators, this finding also contributes to the relationship lending literature as identification of hold-up costs and switching costs. While the distressed bank was functioning, it was able to hold up its customers and charge a premium (i.e. hold-up costs). The fact that firms chose to pay these costs instead of switching to other banks suggests that switching costs were even higher. When the bank closed, interbank information asymmetries and the adverse selection problem were alleviated, i.e. all firms, good and bad, had to switch, thus by switching firms no longer signaled their inferiority and received average rates.

We also contribute to a large body of literature studying how interest rates depend on the length of lending relationships (Petersen and Rajan, 1994; Berger and Udell, 1995; Lopez-Espinosa et al., 2017). By measuring complete lengths of firm-bank relationships and controlling for unprecedented level of fixed effects we uncover a concave link between relationship age and interest rates, which is in line with reputational concerns (Sharpe, 1990). To our knowledge, only

Lopez-Espinosa et al. (2017) measured entire lengths of relationships and found a similar pattern. We add much needed external validity to their findings, as they analyzed only one Spanish bank.

Finally, we add validity to the recent findings of Bonfim et al. (2018), who studied firms' switches of banks succeeding closures of banks' branches. The paper tested the model of Von Thadden (2004) and found that switching costs stem primarily from information asymmetries as opposed to direct shoe-leather costs. We find similar results and contribute by introducing an arguably stronger identification of forced switches[8].

The rest of the paper is structured as follows. Section 2 presents the data. Section 3 describes the closures of the banks. Section 4 uses both a graphical analysis and a difference-in-difference analysis to study how the closures of the banks affected the borrowing costs of their customers. Section 5 conducts a loan matching analysis to test whether forced-switchers at new banks indeed received similar rates to those received by old customers. Section 6 directly tests the effect of relationship length on loan rates. Section 7 concludes.

2. Data

We use quarterly data on corporate loans outstanding between 2011 q4 to 2018 q1, provided by the Bank of Lithuania, and observe the following variables: year, quarter, loan id, loan type, firm id, bank id, loan issue date, loan maturity date, loan outstanding amount, loan interest rate, loan currency, loan collateral value, indicator if a firm had late repayments within a given quarter, firm's industry and firm's total loan amount. The database includes all debt contracts issued to all firms by all credit institutions registered in Lithuania. In addition, we observe firm id, bank id, loan initiation date and and loan termination date of all loans between 1995 and 2011, which allows us to measure complete lengths of all firm-bank relationships.

We disregard credit unions and other small lenders and consider 12 largest banks, which account for 95% of all observations, 89% of the number of loans outstanding and 98% of the market share measured by the size of banks' total assets. In our sample period, these banks had 190,728 outstanding debt contracts issued to 35,905 firms, which constitutes 1,635,779 quarterly

[8] Closures of banks' branches did not completely eliminate the possibility to continue borrowing from the same banks, while a closure of the whole bank did.

observations. These include 117,557 new contracts that were issued to 25,436 firms within our sample period between 2011 q4 to 2018 q1. All these contracts were issued in the local currency and only between one firm and one bank[9]. In our analyses, we primarily use leasing contracts that constitute 69% of all contracts, but we show that our results are robust if we include term loans and credit lines, which together with leasing cover 86% of the number of contracts. The total amount issued sums up to 48 billion EUR. 54% of this amount is attributable to term loans, 14% to leasing contracts, 12% to credit lines and the rest to overdrafts, mortgages and other types of contracts.

3. Closures of Banks

The economic environment during our sample period was marked by a sharp recovery after the 2007-2009 financial crisis. In 2011 Lithuania's GDP grew by 6%, the financial system was stable and total profits in the banking sector almost reached a record-high pre-crisis level (Bank of Lithuania, 2011). Nevertheless, during the time period of our sample, three banks closed due to different reasons.

First, "Healthy bank" [10] – a branch of an international bank – in 2013 q1 (January 30) announced its strategic decision to leave the Lithuanian and Estonian markets and to concentrate its business in Latvia. According to the bank's press release, this decision was part of the strategic plan to increase internal efficiency of activities in the Central and Eastern Europe. After the announcement, it stopped issuing new loans and effectively abandoned its current borrowers that were forced to switch to other banks.

Second, "Distressed bank" [11] was closed in 2013 q1 (February 12), due to the risk mismanagement and the uncovered over-reporting of its asset values. Although the bank was commonly known to be relatively risky due to rumors and negative coverage in the media, the closure was largely unexpected by markets and governmental institutions (Kuodis, 2013). Yet, it did not shock the rest of the financial system: financial markets reacted modestly while the total amount of deposits in

[9] We have dropped 2,886 loans (2%) issued in foreign currencies and 1,005 (1%) collective loans taken jointly by more than one firm. In our database, there were no syndicated loans issued jointly by more than one bank.

[10] Borrowers of "Healthy bank" had the lower borrowing costs and less frequent defaults (Figures 1.1 to 1.4) than borrowers of most other banks in Lithuania

[11] Borrowers of "Distressed bank" had the higher borrowing costs and more frequent defaults (Figures 1.1 to 1.4) than borrowers of most other banks in Lithuania

the banking system even increased in the days following the shutdown (Kuodis, 2013). After the shutdown, KPMG Baltics manually reviewed all bank's assets and split them into a "good bank" (loans that were likely to function normally) and a "bad bank" (loans that were likely to default). The "good bank's" loans were sold to another bank and the "bad bank" was liquidated. In this research, we consider firms from the "good bank" only.

Third, "Bank 3" was shut down in 2011 q4 (November 16) due to a fraud committed by the two biggest shareholders, who tunneled around 0.7 billion euros. This was unexpected news in the media and the bankruptcy administrator announced publicly that "Bank's 3" closure was "a consequence of a fraud and not the economic crisis" (Cooper, 2012). Unfortunately, due to structural changes in the credit registry, the beginning of our sample period coincides with the bank's closure, thus we cannot compare its customers' borrowing costs before and after the closure. However, thanks to a long database on firm-bank relationships reaching 1995, we can identify long-term and short-term customers of the bank. We observe their loans obtained after being forced to switch to other banks, and we use this information in section 5, where we test whether forced-switchers at new banks received similar rates to those received by old customers.

In order to verify the health of "Healthy bank" and "Distressed bank", we compare credit quality of their customers with credit quality of customers of other banks. We define banks' customers in line with Ioannidou and Ongena (2010): if a firm had any amount of debt outstanding with a particular bank at any point of time within one prior year, the firm is called a customer of that bank. We identify customers of all banks at the end of 2012 q4 – just before the quarter in which both "Distressed bank" and "Healthy bank" stopped issuing loans. We exclude customers of "Distressed bank" that were assigned to the "bad bank" during the bank's resolution process. For each bank, we calculate a proportion of customers that delayed at least one repayment on any debt contract within one year before January 1, 2013 (Figure 1.1) and within one year after February 12, 2013 – i.e. the date of the closure of the "Distressed bank" (Figure 1.2). Similarly, for the same groups of customers, we calculate a simple average interest rate across all outstanding leasing contracts within one year before January 1, 2013 (Figure 1.3) and within one year after February 12, 2013 (Figure 1.4), but in the latter case, we only consider contracts issued after February 12, 2013. We repeat the same exercise around the closure of "Bank 3" on November 16, 2011 but due

to data availability we can only calculate ex-post outcomes. Figure 1.5 displays the proportion of firms with delayed repayments and Figure 1.6 displays average interest rates.

Figures 1.1 and 1.2 indicate that both before and after the failure of "Distressed bank", its customers were among those with the most frequent repayment delays, even when firms assigned to the "bad bank" during the bank's resolution process are excluded. In contrast, customers of "Healthy bank" were consistently among those with the least frequent repayment troubles. These patterns are reflected by average leasing interest rates of each customer group prior January 1, 2013 in Figure 1.3: borrowers of "Distressed bank" paid the most, while borrowers of "Healthy bank" were among those paying the least. Interestingly, as revealed by Figure 1.4, ex-post the closures of the two banks, the relative position of "Healthy bank's" customers has not changed, while average interest rate for customers of "Distressed bank" moved considerably closer to the average. In the next section, we analyze this move in more detail.

4. How does a bank's closure affect borrowing costs of its customers?

4.1. Empirical strategy

In this section, we apply in parallel a graphical analysis and a difference-in-difference method to study how borrowing costs of customers of the "Distressed bank" changed when the bank failed and the firms switched to other banks. We then repeat the same analysis with customers of "Healthy bank" – a bank which left the market due to a strategic decision and not due to financial distress.

In line with the exercise in section 3, a bank's customer at a given moment is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one prior year[12]. We identify banks' customers on February 12, 2013 – the day of "Distressed bank's" closure[13]. We call a customer "exclusive" if it had no debts with any other bank within the same prior year. For each firm, we measure in quarters the lengths of the firm's existing lending relationships with each bank[11] at the end of 2012 q4 and calculate an average length across all

[12] In line with Ioannidou and Ongena (2010), we conservatively assume that relationship ties are broken if there is a gap without outstanding loans of 1 year or longer.
[13] For "Healthy bank's" analysis we use the day the bank announced its plans to leave the market – January 30, 2013. After this date, the bank issued only two debt contracts, which we drop from our analysis.

existing firm's relationships. For exclusive customers, this average corresponds to the length of their single relationship. In our setting, firms with average relationships longer than 6 years are called "long-term" and other firms are called "short-term". The cut-off of 6 years was chosen due to an interest rate pattern uncovered in Figure 10, which indicates that after 6 years of relationships, average interest rates start to decrease. This pattern is tested in section 6.

The data sample is split into two periods: "before" takes into account debt contracts issued up to 2012 December 31, while "after" takes into account contracts issued after 2013 February 12 – the day when activities of "Distressed bank" were suspended[14]. For each firm, at the end of every quarter, we calculate an average interest rate weighted by loan outstanding amounts, which is used as a proxy for firms' borrowing costs. Borrowing costs of 2013 q1 and later quarters are based only on contracts issued after 2013 February 12[14]. First, we consider only leasing contracts, which make up 69% of all contracts in our sample. Then we include term-loans and credit lines, which together with leasing contracts account for 86% of all contracts in the sample. In order to control for the firm quality, we only consider firms that were not assigned to the "bad bank" of "Distressed bank" and only those that did not delay any repayment throughout our sample period from 2011 q4 to 2018 q1.

If we consider only leasing contracts, we end up with 193,001 quarterly observations of 19,110 firms, 346 of which were customers of "Distressed bank"[15] – the treatment group. These numbers increase to 262,669 observations, 25,749 firms and 657 customers of "Distressed bank"[16] when we consider leasing, term-loans and credit lines together. The control group comprises all the firms in the sample which were not customers of "Distressed bank". We show that our results are robust to using an alternative control group – customers of the most similar bank to "Distressed bank" in terms of size, customer's quality (measured as a proportion of firms with delayed repayments) and customers' average borrowing costs.

We hypothesize that if "Distressed bank" exploited hold-up and extracted rents from its customers, we would see their borrowing costs decreasing more than for other firms after the bank's failure.

[14] For "Healthy bank's" analysis we use the day the bank announced its plans to leave the market – January 30, 2013. After this date, the bank issued only two debt contracts, which we drop from our analysis.
[15] Without firms' credit quality restrictions these numbers would be 222,984, 22,550 and 647, respectively.
[16] Without firms' credit quality restrictions these numbers would be 311,379, 31,137 and 1,173, respectively

This effect should be particularly strong for more depended "exclusive" customers, and, if long-term relationships are beneficial as suggested by Figure 10, even stronger for "exclusive" "short-term" customers. In order to test these hypotheses, we run the following regression specifications. Specifications marked with "a" exclude fixed effects, while those with "b" include both quarter-fixed effects and firm-fixed effects. Firm-fixed effects exclude firms that appear in only one of the two periods. In order to account for the possibility of standard errors being correlated within firms and quarters, we cluster errors within these two dimensions.

Specification (1a):

$$borrowing\_costs_{f,q} = \beta_0 + \beta_1 * after_q + \beta_2 * closed_f + \beta_3 * closed_f * after_q + \varepsilon_{f,q} \quad (1a)$$

Where

- $borrowing\_costs_{f,q}$ is an average interest rate weighted by loan outstanding amounts in quarter q for firm f.
- $after_q$ is a dummy variable equal to 1 if the quarter q is equal to or larger than 2013 q1 and zero otherwise.
- $closed_f$ is a dummy variable equal to 1 if firm f was in a treatment group, i.e. a customer of the closed bank "Distressed bank", and zero if firm f was in a control group.

Due to a common trend of decreasing interest rates throughout the whole sample period, we expect the coefficient β_1 to be negative. Our coefficient of interest is β_3, which we also expect to be negative and statistically significant. This would indicate that after the bank's failure, borrowing costs of "Distressed bank" customers decreased by more than could be explained by the common trend.

Specification (2a):

$$borrowing\_costs_{f,q} = \beta_0 + \beta_1 * after_q + \beta_2 * closed_f + \beta_3 * exclusive_f + \beta_4 * closed_f * after_q + \beta_5 * closed_f * exclusive_f + \beta_6 * exclusive_f * after_q + \beta_7 * closed_f * exclusive_f * after_q + \varepsilon_{f,q} \quad (2a)$$

Where $exclusive_f$ is a dummy variable equal to 1 if firm f is a customer of only one bank and zero otherwise.

If our coefficient of interest on the triple interaction β_7 is negative and statistically significant, it means that the negative effect measured by the coefficient β_3 in regression specification (1) is particularly strong for exclusive customers as compared to non-exclusive ones, i.e. borrowing costs of exclusive "Distressed bank" customers dropped the most.

Specification (3a):

$$borrowing\_costs_{f,q} = \beta_0 + \beta_1 * after_q + \beta_2 * closed_f + \beta_3 * exclusive_f + \beta_4 * short\_term_f + \beta_5 * closed_f * after_q + \beta_6 * exclusive_f * after_q + \beta_7 * short\_term_f * after_q + \beta_8 * closed_f * exclusive_f + \beta_9 * closed_f * short\_term_f + \beta_{10} * exclusive_f * short\_term_q + \beta_{11} * after_q * closed_f * exclusive_f + \beta_{12} * after_q * closed_f * short\_term_f + \beta_{13} * after_q * exclusive_f * short\_term_f + \beta_{14} * closed_f * exclusive_f * short\_term_f + \beta_{15} * after_q * closed_f * exclusive_f * short\_term_f + \varepsilon_{f,q} \quad (3a)$$

Where $short\_term_f$ is a dummy variable equal to 1 if firm's *f* average length of existing lending relationships before the bank's failure was shorter than 6 years and zero otherwise.

If our coefficient of interest on the quadruple interaction β_{15} is negative and statistically significant, it means that the negative effect measured by the coefficient β_7 in regression specification (2) is stronger for "short-term" customers than for "long-term" customers i.e. borrowing costs of "exclusive" "short-term" "Distressed bank's" customers dropped the most.

4.2. Results

First, we run the difference-in-difference regression specifications (1a), (1b), (2a), (2b), (3a) and (3b), using customers of "Distressed bank" as the treatment group, all other firms in the dataset as the control group, and only considering leasing contracts, which comprise 69% of all contracts in our dataset. Then we modify this setting by (1) considering only term loans, (2) considering leasing contracts, term loans and credit lines together, (3) using customers of the most similar bank to "Distressed bank" as a control group, and (4) using customers of "Healthy bank" as a treatment group.

Table 2 presents the main results. The coefficient of interest β_3 in regression specification (1a) is equal to -1.039 and statistically significant at 1% level. This means that after the closure of

"Distressed bank", interest rates on leasing contracts for its customers (i.e. the treatment group) decreased by 1% more than for all other firms on average. This result is displayed in Figure 2.1: before the "Distressed bank's" failure, the average interest rate of the treatment group was declining in parallel to the rate of the control group but was consistently higher by roughly 1%. Immediately after the bank's closure the average interest rate of its customers dropped sharply and converged to the market's average.

When controlling for firm-fixed effects and quarter-fixed effects in specification (1b), the estimated coefficient of interest is smaller (-0.421) but still negative and statistically significant at 1% level. Quarter-fixed effects absorb time-specific shocks common to the whole market, while firm-fixed effects control for the survivorship bias and effectively considers observations only of those firms which appear in the database both before and after the bank's failure.

As shown in Table 2, column (2a), the coefficient of interest β_7 is equal to -2.492 and statistically significant at 1% level, while the coefficient on β_3 remains close to the one estimated in (1a). This indicates that while for "non-exclusive" borrowers average leasing interest rates dropped by 1% relative to the rest of the market, "exclusive" customers enjoyed a massive drop of 3.5% on average. This differential effect can be seen in Figure 2.2: the gap between "exclusive" and "non-exclusive" borrowers was large before the bank's failure, but it almost vanished after it. Interestingly, despite the downward common trend of average interest rates, leasing rates for "exclusive" customers were increasing before the bank's closure, but it joined the common trend after it. When controlling for quarter-fixed effects and firm-fixed effects in specification (2b), we still get significant results: a drop of 0.5% for "non-exclusive" customers (p-value = 0.001) and a drop of 2.3% for "exclusive" customers (p-value = 0.023).

Table 2, column (3a) shows that the coefficient of interest on the quadruple interaction β_{15} in specification (3a) is negative and statistically significant at 10% level. It becomes even more negative and significant at 1% level in specification (3b) with quarter-fixed effects and firm-fixed effects. It appears that the "exclusive" "short-term" customers experienced a bigger drop than any other group of firms, which is reflected in Figure 2.3. The figure displays average borrowing costs only of customers of "Distressed bank" split into 4 groups. Before the bank's closure, "exclusive" "short-term" customers on average had highest rates, followed by "exclusive" "long-term"

borrowers, followed by “non-exclusive” “short-term” customers and, finally, followed by “non-exclusive” “long-term” borrowers. After the closure, the gaps between these groups shrank and the average borrowing costs intertwined over time. Despite arguably stronger dependence on “Distressed bank”, the “long-term” customers were treated better by the failing bank than the “short-term” ones, which implies that long-term relationships may be beneficial. In order to test this implication directly, we examine the link between the relationship length and interest rates using loan matching and panel regression analyses in section 6.

The results are largely similar, and in some cases even more pronounced if we (1) consider only term loans (Table 3 and figures 3.1 to 3.3), (2) consider leasing contracts, term loans and credit lines together (Table 4 and figures 4.1 to 4.3), and (3) use customers of the most similar bank to “Distressed bank” as a control group (Tables 5 and 6 and figures 5.1 to 6.2).

Finally, we repeat the analysis using customers of “Healthy bank” as a treatment group, all other firms as a control group, and considering only leasing contracts. Table 7a shows that none of the coefficients of interest are significant, while figure 7.1 reveals that average borrowing costs of “Healthy bank’s” customers followed the common trend without major shifts before and after the bank’s closure. This suggests that relationships with healthy banks on average neither reduces nor inflates borrowing costs for firms. The results are similar if we consider leasing contracts, term loans, and credit lines together (Table 7b and figure 7.2).

Overall our results suggest that the “Distressed bank” exploited hold-up opportunities and extracted rents from their good (i.e. firms that were assigned to the “good part” of the failed bank and did not delay any repayments within our sample period), and especially, exclusive short-term customers. After the bank was closed, the firms were free to choose other lenders at average market rates. This implies that while the distressed bank was functioning, interbank information asymmetries were causing severe switching costs for “Distressed bank’s” customers. Once the bank failed, information asymmetries, adverse selection and thus switching costs disappeared. Such behavior of “Distressed bank” is not surprising, considering that financially distressed banks have fewer resources and incentives to care about their reputation, and their bad reputation arguably increases switching costs for their current customers. This reasoning is confirmed by the

absence of evidence of similar behavior by "Healthy bank". Being a healthy international bank, it may have high concerns about reputation.

The large estimated hold-up costs imposed by the distressed bank are somewhat surprising considering the credit market's transparency in Lithuania. Banks can access 10 years history of their applicants' all current and expired debt contracts. Information includes loan types, starting and maturity dates, repayment schedules, loan amounts, interest rates, the number of payments delayed, the number of days delayed, the total amounts delayed etc. Nevertheless, important information asymmetries across banks appear to remain. For example, firms are likely to keep borrowed funds in an account with the same bank, who, in turn, can observe firms' spending patterns. Furthermore, due to a possibility of the loan evergreening by the distressed bank, other banks may treat firms' credit histories with caution.

In the next section we use a loan matching analysis ex-post "Distressed bank's" failure to strengthen the validity of these findings: (1) firms' borrowing costs converge to a market's average after the failure of their distressed bank, (2) relationships with healthy banks on average neither reduce nor inflate borrowing costs for firms, and (3) information asymmetries are the primary cause of switching costs.

5. Do interest rates really converge after the failure of a distressed bank?

In this section, we use the fact that after losing a sole lender due to its closure, firms were forced to switch to other banks. We follow a loan matching analysis in order to compare interest rates on forced-switching loans and similar non-switching loans issued at the same time by the same bank to two similar firms – a forced-switcher and an old customer (non-switcher). This analysis allows us to study the following findings from section 4 in more detail: (1) whether firms' borrowing costs converge to a market's average after the failure of their distressed bank, (2) whether relationships with healthy banks on average neither reduce nor inflate borrowing costs for firms[17], and (3) whether information asymmetries are the primary cause of switching costs, as argued by Bonfim et al. (2018) in a similar setting[18]. In this analysis, we examine former "exclusive"

[17] If relationships with healthy banks were beneficial (costly), we would expect an old customer of a bank to pay a lower (higher) interest rate than a similar new customer, which was forced to switch.

[18] Bonfim et al. (2018) study closures of banks' branches. We argue that our identification of forced switching is cleaner since a closure of the whole bank completely eliminates possibilities of borrowing from that bank.

customers of both all three closed banks, namely "Distressed bank", "Healthy bank" and "Bank 3" together and "Distressed bank" separately. To control for the quality of "Distressed bank's" customers, we only use firms assigned to the "good bank" after the bank's failure, as explained in section 3. We also consider both only leasing and leasing, term loans and credit lines together.

5.1. Empirical strategy

Table 8a provides switching-related definitions used in our setting. We follow the loan matching technique applied by Ioannidou and Ongena (2010), who studied endogenous firms' decisions to switch banks and matched regular switching loans (i.e. loans from a bank with which a firm had no debts outstanding within one prior year) with similar non-switching loans (i.e. loans from a firm's current bank). In order to assure the comparability between their results and ours, we first replicate their setting comparing regular-switching loans with non-switching loans and then compare forced-switching loans (i.e. a subset of switching loans taken by firms that were forced to switch after losing their sole lending relationship) to non-switching loans.

All loans are considered only once – in a quarter in which they were issued. Table 8b provides average characteristics of each group of loans. In total, our dataset contains 1,302 forced-switching loans, 13,133 regular-switching loans, and 81,731 non-switching loans. As compared to non-switching loans, forced-switching loans on average carry a higher interest rate. Also, the latter type of loans appears to be more likely to have a fixed interest rate, larger collateral, slightly shorter time to maturity and a larger loan amount. Borrowers of forced switching loans seem to be much smaller as measured by the total amount of debt, slightly more risky as measured by the probability of delayed repayments one year before and one year after taking a loan, and to have less and shorter lending relationships on average. Regular-switching loans appear to be the largest, and their borrowers the riskiest and with the most lending relationships. In terms of all other considered characteristics, regular-switching loans appear in between forced-switching loans and non-switching loans. In order to control for these differences when comparing interest rates, we match loans on these loan and firm characteristics. All matching variables are explained in Table 8c.

TABLE 8a

Definitions of switching

Table 8a provides switching-related definitions used in section 5.

Term	Definition

Inside bank	A bank with which a firm had any amount of debt outstanding at any point of time within 1 prior year. In line with Ioannidou and Ongena (2010), we conservatively assume that relationship ties are broken if there is a gap without outstanding loans of 1 year or longer. The authors show that results are robust using time periods other than 1 year.
Outside bank	A bank with which a firm had no debt outstanding at any point of time within 1 prior year.
Switcher	A firm which is taking a loan from an outside bank. Consistently with Ioannidou and Ongena (2010) and Bonfim et al. (2018), we exclude firms that had no debts with any bank within the last 12 months.
Switching loan (or regular-switching loan)	A loan taken by a switcher from an outside bank.
Non-switching loan	A loan taken by a firm from its inside bank.
Forced-switching loan	A switching loan, which is taken by a firm that lost its sole inside bank (i.e. one of the 3 banks that left the market: "Bank 3", "Distressed bank" (only the "good part" is considered) or "Healthy bank") within the last 12 months.

We apply the following procedure. First, we identify all newly issued regular-switching, forced-switching and non-switching loans based on definitions in Table 8a. Consistently with section 4, we consider both leasing separately and the three most popular loan types together: leasing, term loans, and credit lines. Second, every regular-switching loan is matched with as many as possible non-switching loans based on the set of matching variables described in Table 8c. For each pair, we calculate an interest rate spread between a switching and a non-switching loan. The spreads are regressed on a constant and standard errors are clustered at a switching loan level. Third, we repeat the procedure considering forced-switching loans instead of regular-switching loans.

TABLE 8b

Summary statistics of loan characteristics

Table 8b provides average characteristics of all newly issued debt contracts between 2011 q4 and 2018 q1

	Non-switching loans	Regular-switching loans	Forced-switching loans	Loans to firms that had no loans in 1 prior year	Total
Number of all newly issued debt contracts	**81,731**	**13,133**	**1,302**	**21,391**	**117,557**
Interest rate (%)	3.34	4.49	4.95	4.92	3.77
Probability of a floating rate (%)	75%	66%	58%	62%	71%
Probability of using collateral (%)	17%	32%	51%	27%	21%
Proportion of collateralized loan amount (%)	27%	54%	69%	39%	33%
Time to maturity (quarters)	12	12	11	12	12
Loan amount (euros)	223,510	347,619	259,267	208,172	234,980
Amount of total borrowers's debt (euros)	21,126,904	4,594,471	1,612,482	612,518	15,330,980
Probability of borrower's delayed repayment within last year (%)	6%	10%	7%	-	6%
Probability of borrower's delayed repayment within next year (%)	7%	11%	8%	5%	7%
Number of borrower's prior inside banks	1.9	2.3	1.5	-	1.8
Length of borrower's prior relationships (quarters)	21	17	10	-	21

TABLE 8c

Matching Variables

Table 8b provides the descriptions of matching variables

Category	Matching variables	A switching loan and a non-switching loan were matched:
Macro	Year & quarter	if both loans were issued in the same quarter (in total 26 quarters: 2011 q4 – 2018 q1)
Bank	Outside bank	if the bank, which issued both loans, was the switcher's new (outside) bank (in total 12 banks)
Firm	Firm	if both loans were issued to the same firm, (in total 25,436 firms)
Firm	Repayment troubles last year	if either both firms delayed at least one repayment or both firms did not delay any repayments in the previous 4 quarters
Firm	Economic activity (sector)	if both firms operated in the same sector (in total 20 sectors)
Firm	Total bank debt (+-30%)	if a non-switcher's total amount of debt in the given quarter was similar to a switcher's total amount of debt (using a (-30%, +30%) window around switcher's debt).
Loan	Loan type	if both loans were of the same type (e.g. leasing, term loans, credit lines)
Loan	Proportion of loan collateralized (+-30%)	if both loans had a similar proportion of the face value collateralized (using a (-30%, +30%) window around the switching loan's collateralized proportion)
Loan	Loan maturity (+-30%)	if both loans had a similar maturity (using a (-30%, +30%) window around the switching loan's maturity)
Loan	Loan amount (+-30%)	if both loans had a similar amount (using a (-30%, +30%) window around the switching loan's amount)
Loan	Floating loan rate	if both loans had either floating or fixed interest rates (a rate is defined as floating if it varies more than 50% of the time)
Firm	Loan rate on prior inside loans (+-30%)	if both firms had similar interest rates (maximum across all outstanding loans) in the previous period (using a (-30%, +30%) window around the switcher's rate)
Firm	Prior relationship length (+-30%)	if both firms had similar lengths of lending relationships (average across all inside banks) in the previous period (using a (-30%, +30%) window around the switcher's length)
Firm	Prior multiple bank relationships	if both firms either had or did not have multiple bank relationships in the previous period
Firm	Prior primary lender	if both firms either had or did not have a primary lender (a bank which provided more than 50% of a firm's debt) in the previous period
Firm	Prior scope of the bank relationship	if both firms either had or did not have different loan types

5.2. Results

5.2.1. Regular-switching loans

Table 9 presents the results. As seen in column I, when matching on all the loan and firm characteristics defined in Table 8c, regular-switching loans obtain a discount of 26.3 bps (significant at 1% level) as compared to non-switching loans. This result is not surprising since firms are expected to switch only when they receive an offer which is better than one from their inside bank. Using similar sets of matching variables, Ioannidou and Ongena (2010) found a discount between 82.2 bps and 97.2 bps in Bolivia in 1999-2003. The smaller discount obtained in Lithuania could be explained by a more concentrated loans' market (Herfindahl-Hirschman Index (HHI) for outstanding loans throughout our sample period varied from 1,632 to 1,992, while in Bolivia in 1999-2003 HHI varied between 1,335 and 1,587).

As shown in Table 9, column II, the result is virtually the same if matching restrictions are somewhat relaxed. By increasing the matching window for all continuous variables from ±30% to ±70% and dropping a few variables we increase the number of observations from 112 to 285,453 without biasing the result. The estimated discount in column/model II is 25.9 bps and significant at 1% level. Under model II, two loans are matched if they were issued in the same quarter by the same bank to two firms of similar size (proxied by total debt) and riskiness (proxied by a dummy equal to 1 if a firm delayed at least one repayment in one prior year, and zero otherwise), and if the two loans were of the same type, similar amount, similar proportion of loan amount collateralized, and similar maturity. Under model II we have enough observations to estimate switching discounts for the three types of loan types separately (columns III to V): 26.1 bps discount (significant at 1% level) for leasing, 7.0 bps (significant at 5% level) discount for term loans and 28.1 bps (significant at 1% level) discount for credit lines. We use the model II as a benchmark model in the rest of our analysis.

5.2.2. Forced-switching loans

In order to compare forced-switching loans to non-switching loans, we apply the set of matching variables used in Table 9 column (model) II. Table 10 present the results of the analysis, in which customers of all three closed banks and all three loan types are considered together. The estimated switching discount in column I is equal to 3.9 bps and is not statistically significant. This implies that after losing their lending relationships and switching to new lenders, firms on average are

offered interest rates similar to ones received by other market participants. This also implies that relationships with healthy banks on average neither reduce nor inflate borrowing costs. Bonfim et al., (2018) interprets this finding as evidence that information asymmetries are the primary source of switching costs. The interpretation follows from the theoretical model of Von Thadden (2004), which explains regular-switching discounts as successful randomized attempts of uninformed outside banks to outcompete offers of informed inside banks. Thus if the inside bank does not exist, there is no reason for a discount. If instead shoe-leather switching costs and the competition for the market share were causing the discounts (Klemperer 1987), a firm should receive one regardless of whether it has an inside bank or not.

In columns II and III of Table 10, we split the matched loan pairs into two groups and re-estimate the discounts. Column II considers loan pairs, in which non-switchers had long prior lending relationships (on average longer than 6 years), while column III considers non-switchers with prior relationships shorter than 6 years[19] on average. When compared to non-switchers engaged in long-term relationships, forced-switchers received more expensive loans by 12.8 bps on average (significant at 10% level). In contrast, forced-switchers received an average discount of 19.5 bps (significant at 5% level) when compared to non-switchers with shorter-term relationships. These results are even more pronounced in columns V and VI, respectively, where we ensure that both switchers and non-switchers in matched pairs had similar average lengths of prior lending relationships. We estimate a hike of 19.9 bps (significant at 5% level) in column V and a discount of 24.7 bps (significant at 1% level) in column VI. In column IV we show that putting both long-term and short-term non-switchers together under this model, similarly to column I, also reveals no discount.

The results reported in Table 10 are robust to analyzing customers of "Distressed bank" separately and only considering leasing contracts. Table 11 reports these results.

Overall we find that on average forced-switchers at new banks received interest rates similar to ones offered to old customers. This strengthens the validity of evidence from section 4, showing that firms' borrowing costs converge to a market's average after the failure of their distressed bank.

[19] The cut-off of 6 years was chosen due to an interest rate pattern uncovered in Figure 10, which indicates that after 6 years of relationships, average interest rates start to decrease. This pattern is tested in detail in section 6.

Moreover, consistently with the diff-in-diff analysis for "Healthy bank", this implies no benefits or costs on average from relationships with healthy banks. Also, as argued by Bonfim et al. (2018), this implies that switching costs mainly stem from information asymmetries. Yet, we find a differential effect depending on relationship length. In line with findings of the difference-in-difference analysis for "Distressed bank", this suggests that long-term relationships with healthy banks are beneficial, and shorter-term relationships are costly. In the next section, we test this implication directly.

6. How do interest rates depend on lending relationship length?

This question has been heavily studied in the relationship lending literature (e.g. Petersen and Rajan, 1994; Berger and Udell, 1995), however not many studies analyzed the benefits and costs of very long-term relationships. To our knowledge, only Lopez-Espinosa et al. (2017) tracked the complete lengths of lending relationships. They found a concave link between relationship length and interest rates, which is in line with our findings in sections 4 and 5. In this section we study this link not only in order to explain our findings in sections 4 and 5, but also to add much needed external validity to the findings of Lopez-Espinosa et al. (2017), who studied the behavior of only one Spanish bank.

6.1. Empirical strategy

Figure 10 displays average interest rates of all newly issued debt contracts in the first year of our sample period (2011 q1 – 2012 q3) grouped by the length of relationships between borrowers and lenders. We restrict the period to one year in order to avoid influence from the downward trend of interest rates over time. The graph shows that interest rates increase in the first years of relationships, stay elevated until the 6^{th} year, and then starts decreasing in relationship time. This pattern could be driven by changes in other loan characteristics or by the survivorship of the best-quality firms. In order to rule out these possible explanations, we employ two different techniques: (1) the loan matching and (2) the panel regression.

6.1.1. Loan matching

Arguably, interest rates on loans are decided jointly with other loan characteristics, i.e. loan size, maturity, and collateral. Therefore, regressing an interest rate on a relationship length and

including endogenous loan characteristics as controls could bias the results. Different studies tackle the endogeneity by using the distance between a firm and a bank as an instrumental variable (Bolton et al. 2016; Beck et al., 2017), applying propensity score matching (Li et al. 2017), using simultaneous equations (Bharath et al., 2011), omitting endogenous controls (Schafer, 2016) or assuming that interest rates are set after deciding other loan characteristics (Bharath et al., 2011). We follow Ioannidou and Ongena (2010), who use a non-parametric approach – matching similar loans on other loan characteristics. In this way, we do not need to assume anything about the sequence of loan pricing.

We follow a procedure similar to the one described in section 5.1. Firstly, we identify all newly issued switching and non-switching loans based on definitions in Table 8a. Consistently with sections 4 and 5, we consider the three most popular loan types: leasing, term loans, and credit lines. Secondly, every regular-switching loan is matched with as many as possible subsequent non-switching loans taken by the same firm from the same bank. The loans are matched if they are of the same loan type and similar maturity, loan amount and collateral size. In order to control for changes in firms' quality over time, we run our analysis twice: (1) first, matching two loans if the borrower either delayed at least one repayment within one year before taking each loan, or did not delay any repayments before each loan, and (2) second, keeping only those firms which never delayed any repayment within our sample period.

Thirdly, for each matched pair, we calculate an interest rate spread between a non-switching loan and a switching loan and a time spread between the two loans. Based on the time spread, each pair gets assigned one out of six yearly time-gap dummies equal to 1. The six time-gaps are: up to 1 year, between 1 and 2, between 2 and 3, between 3 and 4, between 4 and 5 and more than 5 years. Estimated interest rate spreads are regressed on a set of time-gap dummies. We control for time trends by subtracting a 3-months Euribor rate from every interest rate reported at the end of the quarter and by including switching loans' time fixed effects. Standard errors are clustered at a switching loan level.

6.1.1. Panel regression

In order to better control for firms' quality and other unobservable time-varying firm characteristics, we run a panel regression similar to Lopez-Espinosa et al. (2017) but controlling

for observable and unobservable firm-specific-time-varying characteristics. The identification stems from firms that in the same quarter borrowed from at least two different banks with which they had different relationship lengths. In addition, we control for firm-bank-specific-time-invariant[20], bank-specific-time-varying[21] and loan type-specific characteristics.

We estimate the following regression model using newly issued leasing contracts, term loans and credit lines between 2011 q4 and 2018 q1.

$$interest\_rate_{l,f,b,q} = \alpha + \beta_1 \times ln(relationship\_length_{f,b,q}) + \beta_2 \times ln^2(relationship\_length_{f,b,q}) + \beta_3 \times time\_to\_maturity_{l,f,b,q} + \beta_4 \times perc\_collateral_{l,f,b,q} + \beta_5 \times loan\_size_{l,f,b,q} + firm \times quarter\ FE + firm \times bank\ FE + bank \times quarter\ FE + loantype\ FE + \epsilon_{l,f,b,q} \quad (4)$$

where,

- $interest\_rate_{l,f,b,q}$ is the interest rate charged for the newly issued loan l, taken by firm f, from bank b, in quarter q.
- $relationship\_length_{f,b,q}$ is the length of the relationship between firm f and bank b in quarter q measured in quarters. Relationship lengths are measured from 1995 to 2018.
- $time\_to\_maturity_{l,f,b,q}$ is time to maturity of the issued loan
- $perc\_collateral_{l,f,b,q}$ is the amount of the collateral relative to the size of the loan: collateral/loan_size
- $loan\_size_{l,f,b,q}$ is the outstanding amount of the loan
- FE stands for "fixed effects"

In line with Lopez-Espinosa et al. (2017), we use the logarithm of relationship length and its square. The logarithm assures that an extra year in a long lasting relationship has less impact on the interest rate than an extra year in a short relationship. Including a squared logarithm allows capturing non-linear dynamics, which could resemble the shape of dynamics between the lending

[20] For instance, if a manager of a firm personally knows a manager of a bank, this could lead to both longer lending relationships and lower interest rates. Firm x Bank – fixed effects control for this and similar possibilities.
[21] For instance, if a bank occasionally engages in promotion campaigns, this could affect its relationships and interest rates at the same time. Bank x Time – fixed effects control for this and similar possibilities.

relationship length and the interest rate depicted in Figure 10. We expect to obtain a positive and significant coefficient on the logarithm of relationship length and a negative and significant coefficient on its square.

6.2. Results

6.2.1. Loan matching

Results are presented in Table 12. All six estimated dummy coefficients on time-gap dummies are significant at 1 % level and are equal to 49.3 for a time gap smaller than 1 year, 55.2 for a gap between 1 and 2 years, 46.1 for a gap between 2 and 3 years, 37.6 for a gap between 3 and 4 years, 31.3 for a gap between 4 and 5 years and -41.6 for a gap larger than 5 years. This implies that after switching to a new bank and receiving a discount of 25.9 bps (estimated in Table 9, column II) the following loans taken in the next 5 years from the same bank are on average more expensive, which is broadly in line with Ioannidou and Ongena (2010). Loans taken within the first year of the new relationship are on average more expensive by 49.3 bps than the switching loan. Loans taken within the second year of the relationship are on average more expensive by 55.2 bps than the switching loan etc.

However, after two years the interest rate starts to decrease and after five years it drops below the average rate received on the switching loan. The loan rate dynamics are depicted in Figure 8. The results are robust if we take into account only those firms which never delayed any repayment throughout our sample period (time-gap dummies are reported in the last row of Table 12).

6.2.1. Panel regression

The results of the panel regression are consistent with the results of the loan matching analysis. Table 13, columns 4 presents the results of our benchmark regression specification (4) described in section 6.1.1. As expected, the coefficient on the logarithm of relationship length is positive (significant at 1% level) while the coefficient on its square is negative (significant at 10% level). The results are even more significant in column 5 (both coefficients significant at 1% level) where we additionally control for fixed effects of loan-type interacted with time, firm and bank. Column 6 shows that the results are virtually the same if we drop possibly endogenous controls for loan characteristics (maturity, loan size and collateralized proportion of the loan size).

Table 13 also reveals that it is important to control for firm x time fixed effects (column 3) in order to capture the nonlinear dynamics, although they are partially captured by using non-interactive firm, bank, time and loan-type fixed effects (column 2). Without absorbing any fixed effects, the results are insignificant (column 1).

Predicted values of regression specification 4 and 5 are displayed in Figure 9. They indicate that interest rates on average rise sharply by roughly 0.5% in the first year of a new lending relationship and then start decreasing until after 6 years rates fall below the initial levels. These results are in line with the interest rate dynamics estimated using the loan matching analysis (Table 12 and Figure 8).

Overall our results suggest that very long term relationships (on average above 6 years) help firms to reduce borrowing costs, while shorter-term relationships are costly. This pattern is consistent with the following explanation. Banks attract new customers by offering discounts. After starting the new lending relationships banks exploit their informational advantages and extract rents from their customers in the next 6 years on average. However, banks provide their customers with incentives to stay loyal by slowly lowering lending prices and promising even lower rates in the long run.

7. Conclusion

In this paper, we studied how lending relationships with banks affected firms' borrowing costs. For identification, we used closures of banks – a novel setting, which allowed us to ask the following research questions for the first time. How does a closure of a bank affect borrowing costs of its customers? Does it depend on the health of the bank and the length of the lost relationships? We used the graphical and the difference-in-difference analyses and found that the closure of the healthy bank had no effect on its customers' borrowing costs. Meanwhile, when the financially distressed bank closed, its customers' borrowing costs dropped sharply and immediately converged to the market's average. The drop was even more pronounced for "exclusive" borrowers (i.e. those lacking other lending relationships) and especially for "short-term" (<6 years) borrower.

The loan matching analysis confirmed that after the closure of the distressed bank its customers borrowed at average market interest rates. We found that banks offered on average the same rates to their old customers and to forced-switchers (firms that lost their sole inside bank), which suggests that relationships with healthy banks on average neither benefited nor hurts firms. In line with Bonfim et al. (2018), this serves as evidence that information asymmetries are the primary source of switching costs. Nevertheless, we found a differential effect: long-term customers (>6 years) received lower rates and shorter-term (<6 years) customers received higher rates than forced-switchers. The panel regression and loan matching analyses confirmed that short-term relationships are generally costly, but long-term relationships are beneficial.

Overall, existing theory and our findings suggest that normally banks offer discounts to attract firms and in the next few years exploit their switching costs stemming from interbank information asymmetries. Yet, possibly due to reputational concerns, banks treat their loyal customers well and signal to other firms that in the long run relationships pay off. Meanwhile, if a bank is in financial distress, it has more opportunities to hold-up its customers and fewer resources and incentives to treat them nicely. As a result, borrowing costs of such customers stay inflated until the bank's closure eliminates adverse selection and allows firms to switch banks without signaling inferiority.

Our results have some policy implications. Firstly, liquidating a distressed failing bank, as opposed to bailing it out, may help its high credit quality customers to quickly access much cheaper and more fairly priced financing. This consideration is particularly relevant if the bank's failure is isolated and does not cause a systemic event. Secondly, closing healthy banks with many long-term customers could increase borrowing costs for those customers as suggested by Sharpe (1990). In addition, lending relationships can have implications for resolutions of failed banks. E.g. if relationships are beneficial, regulators have extra incentives to save banks in order to preserve valuable information accumulated about their customers (Slovin et al., 1993). If relationships are costly, liquidation might help good firms escape abusive relationships and borrow cheaper elsewhere. This may improve credit allocation (Dell'Ariccia and Marquez, 2004).

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Appendix

FIGURE **1**.1

Proportion of each bank's customers with delayed repayments prior to January 1, 2013

Figure 1.1 shows the proportion of each bank's customers that delayed at least one repayment on any debt contract within one year prior to January 1, 2013. A bank's customer is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one year prior to January 1, 2013. The figure displays the proportion and the 95% confidence interval.

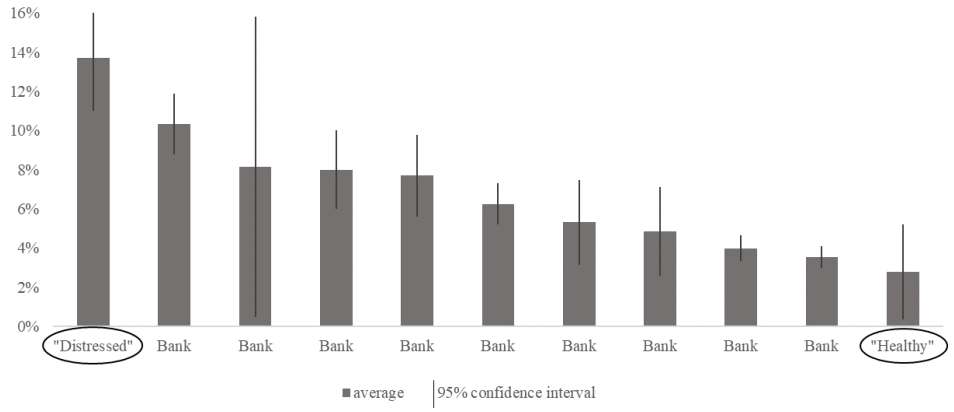

FIGURE **1**.2

Proportion of each bank's customers with delayed repayments after February 12, 2013

Figure 1.2 shows the proportion of each bank's customers that delayed at least one repayment on any debt contract within one year after February 12, 2013 (the date of the closure of "Distressed bank"). A bank's customer is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one year prior to January 1, 2013. The figure displays the proportion and the 95% confidence interval.

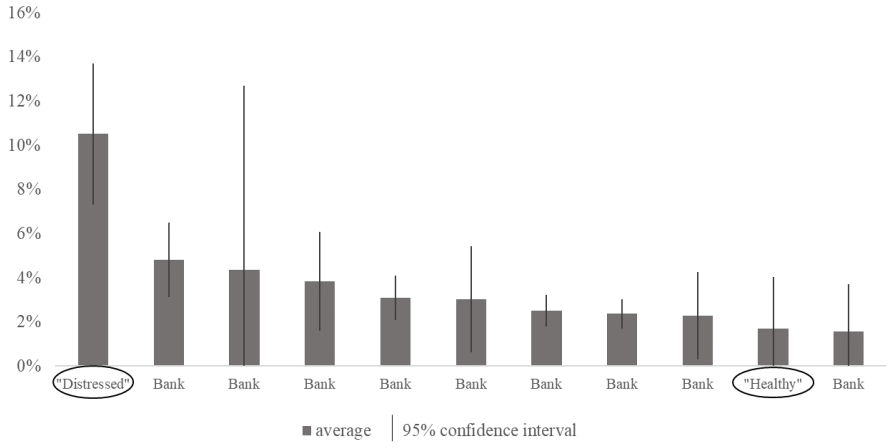

FIGURE **1**.3

Leasing interest rates of each bank's customer group prior to January 1, 2013

Figure 1.3 shows a simple average interest rate calculated for each bank's customer group across all leasing contracts outstanding and across all quarters within one year prior to January 1, 2013. A bank's customer is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one year prior to January 1, 2013. The figure displays the average interest rate and the 95% confidence interval.

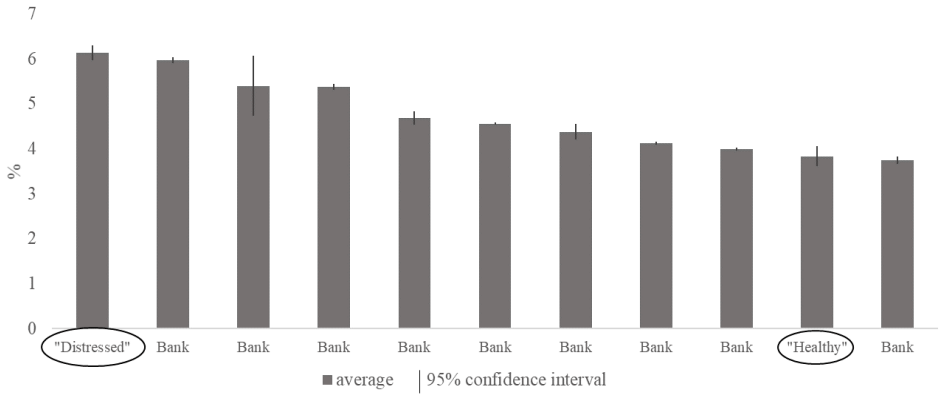

FIGURE **1**.4

Leasing interest rates of each bank's customer group after February 12, 2013

Figure 1.3 shows a simple average interest rate calculated for each bank's customer group across all leasing contracts outstanding and across all quarters within one year after February 12, 2013 (the date of the closure of "Distressed bank"). Only contracts issued after February 12, 2013 are considered. A bank's customer is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one year prior to January 1, 2013. The figure displays the average interest rate and the 95% confidence interval.

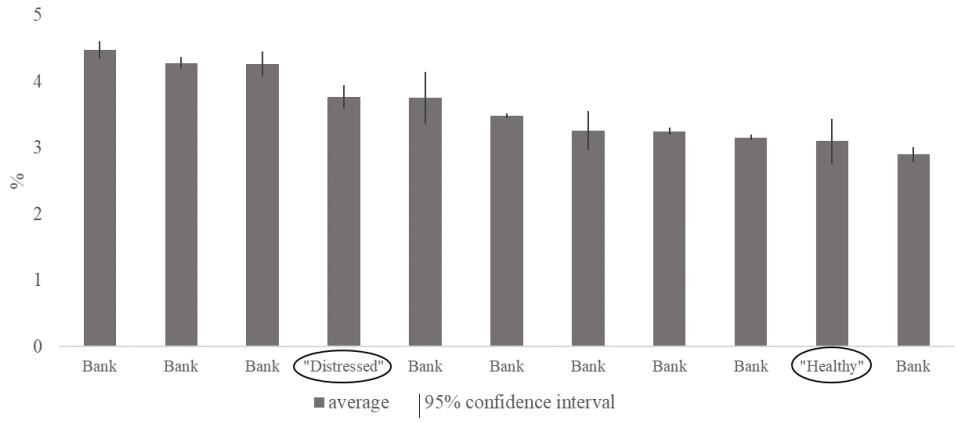

FIGURE **1**.5

Proportion of each bank's customers with delayed repayments after November 16, 2011

Figure 1.5 shows the proportion of each bank's customers that delayed at least one repayment on any debt contract within one year after November 16, 2011. A bank's customer is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one year prior to November 16, 2011. The figure displays the proportion and the 95% confidence interval.

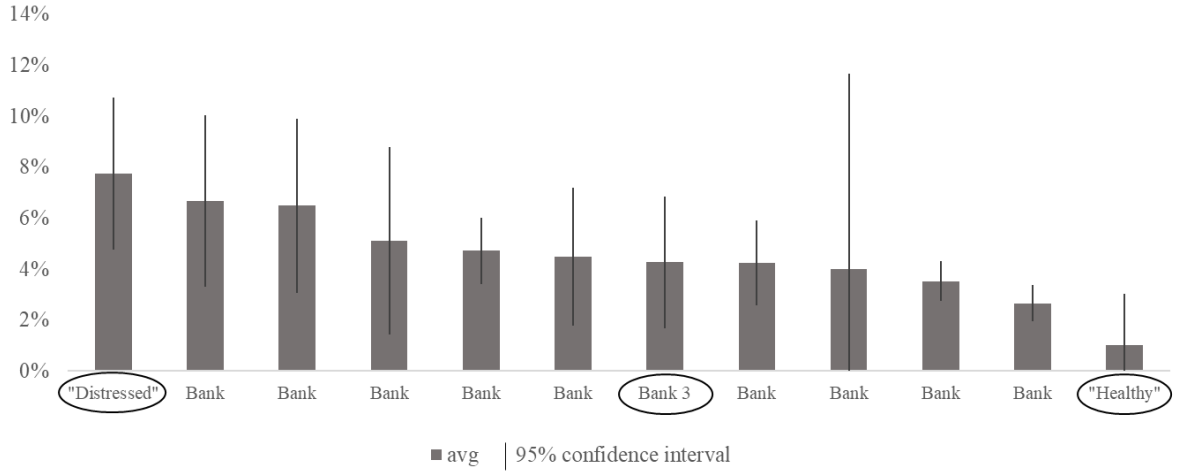

FIGURE **1**.6

Leasing interest rates of each bank's customer group after November 16, 2011

Figure 1.6 shows a simple average interest rate calculated for each bank's customer group across all leasing contracts outstanding and across all quarters within one year after November 16, 2011. A bank's customer is defined as a firm, which had any amount of debt outstanding with that bank for any period of time within one year prior to November 16, 2011. The figure displays the average interest rate and the 95% confidence interval.

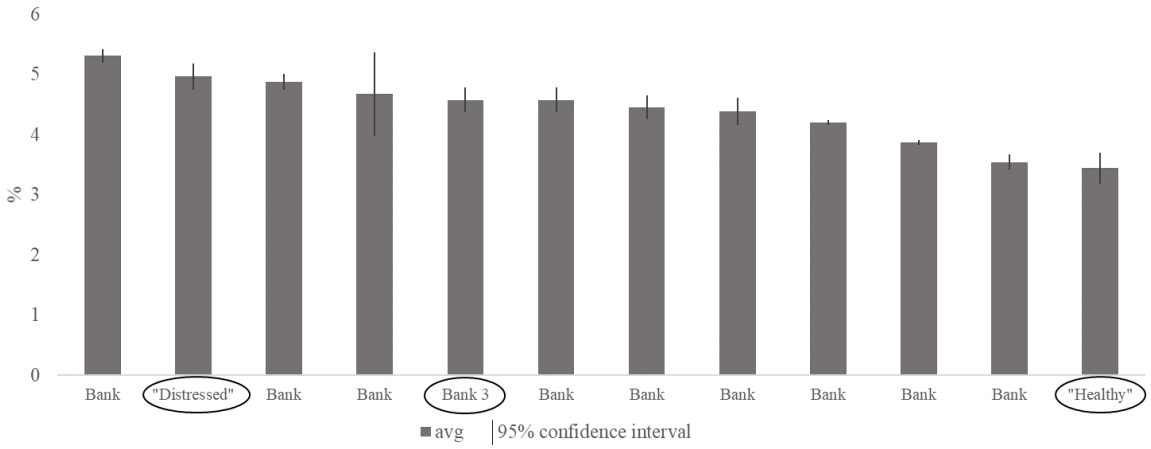

FIGURE **2**.1

Borrowing Costs of Customers of "Distressed bank" vs. **All Other Firms**. **Leasing Contracts**

Figure **2.**1 complements the results of Table **2**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Distressed bank"** and customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

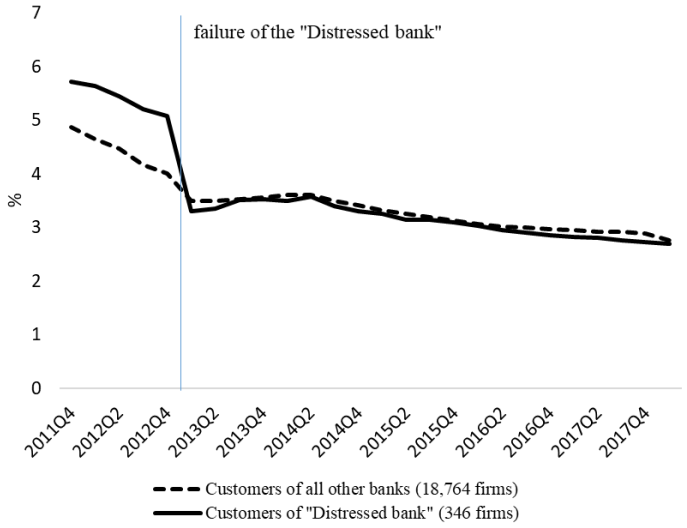

FIGURE **2**.2

Borrowing Costs of Exclusive Customers of "Distressed bank" vs. **All Other Firms. Leasing Contracts**

Figure **2**.2 complements the results of Table **2**, regression specification (2a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive customers of **"Distressed bank"** and exclusive and non-exclusive customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

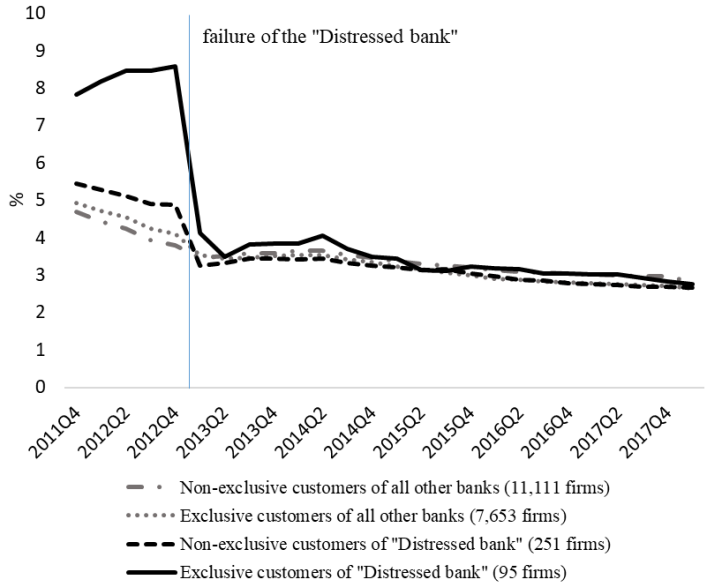

FIGURE **2**.3

Borrowing Costs of Exclusive and Short(Long)-Term Customers of "Distressed bank". Leasing Contracts

Figure **2**.3 complements the results of Table **2**, regression specification (3a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive, long-term and short-term customers of **"Distressed bank"**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. If a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, it is a "short-term" customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

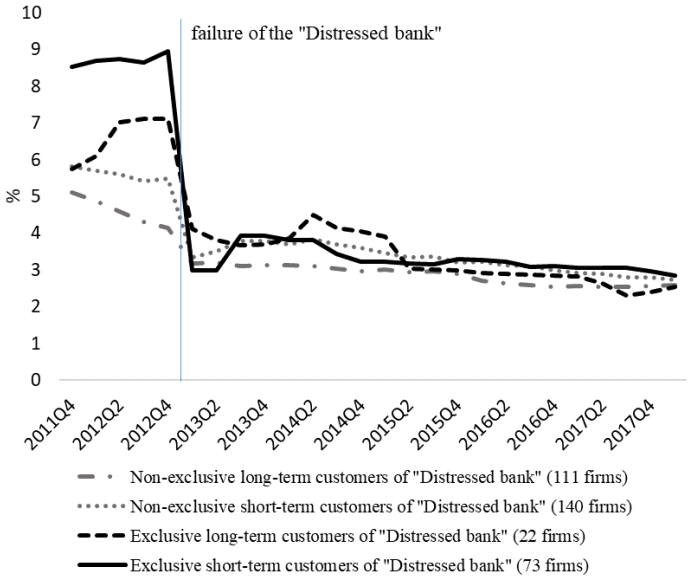

FIGURE **3**.1

Borrowing Costs of Customers of "Distressed bank" vs. **All Other Firms**. **Term Loans**

Figure **3.**1 complements the results of Table **3**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Distressed bank"** and customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **term loans** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **term loans** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

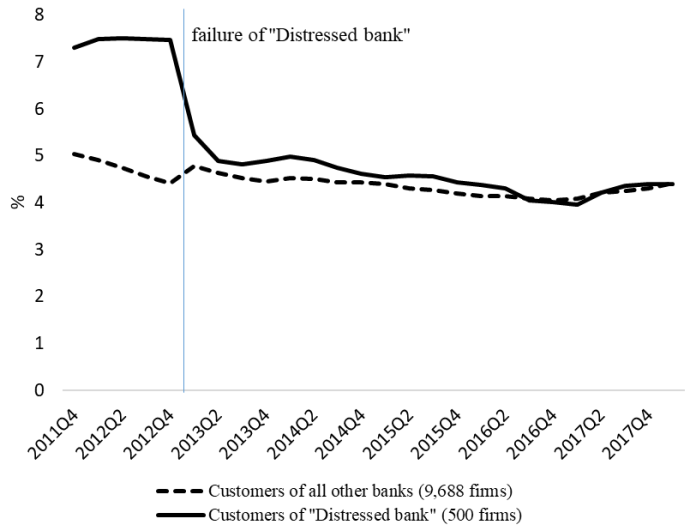

FIGURE **3**.2

Borrowing Costs of Exclusive Customers of "Distressed bank" vs. **All Other Firms. Term Loans**

Figure **3**.2 complements the results of Table **3**, regression specification (2a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive customers of **"Distressed bank"** and exclusive and non-exclusive customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **term loans** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **term loans** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

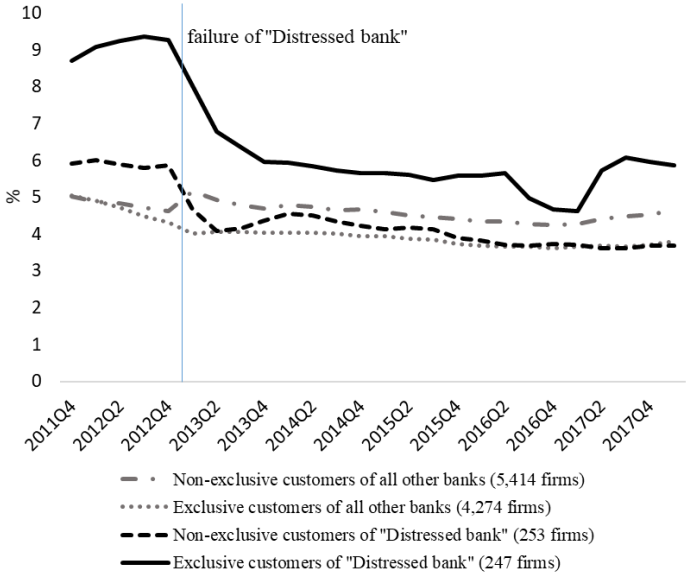

FIGURE **3**.3

Borrowing Costs of Exclusive and Short(Long)-Term Customers of "Distressed bank". **Term Loans**

Figure **3**.3 complements the results of Table **3**, regression specification (3a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive, long-term and short-term customers of **"Distressed bank"**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. If a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, it is a "short-term" customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **term loans** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **term loans** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

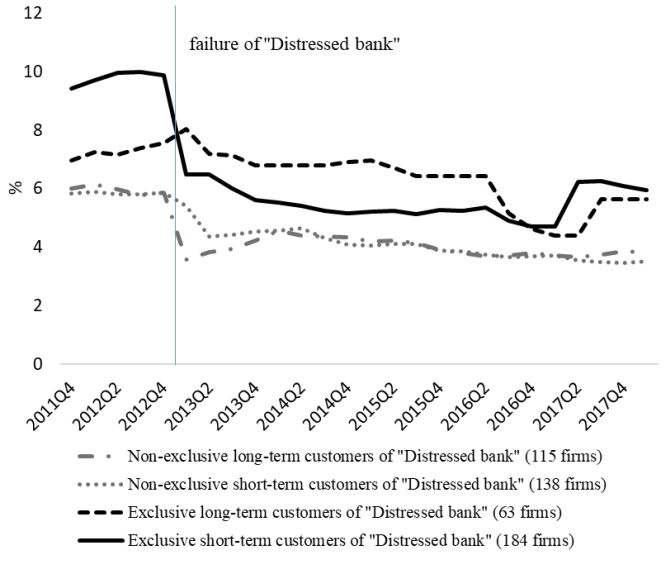

FIGURE **4**.1

Borrowing Costs of Customers of "Distressed bank" vs. All Other Firms. Leasing Contracts, Term Loans and Credit Lines

Figure **4.**1 complements the results of Table **4**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Distressed bank"** and customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

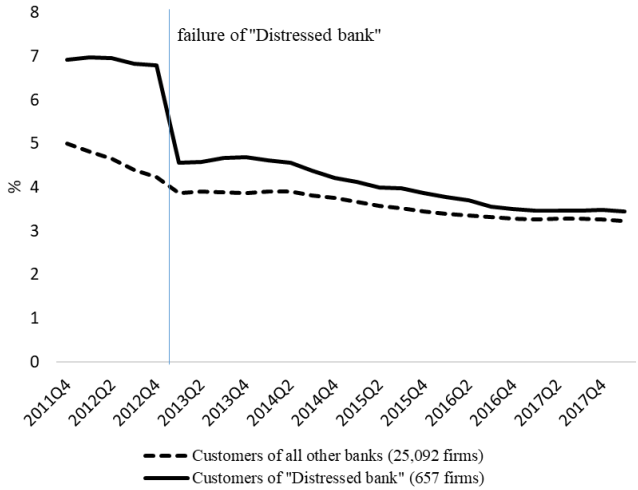

FIGURE **4**.2

Borrowing Costs of Exclusive Customers of "Distressed bank" vs. **All Other Firms. Leasing Contracts, Term Loans and Credit Lines**

Figure **4**.2 complements the results of Table **4**, regression specification (2a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive customers of **"Distressed bank"** and exclusive and non-exclusive customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

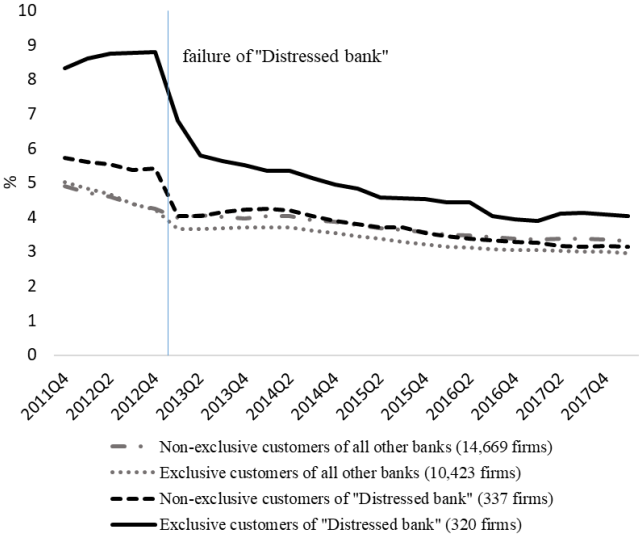

FIGURE **4**.3

Borrowing Costs of Exclusive and Short(Long)-Term Customers of "Distressed bank". **Leasing Contracts, Term Loans and Credit Lines**

Figure **4**.3 complements the results of Table **4**, regression specification (3a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive, long-term and short-term customers of **"Distressed bank"**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. If a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, it is a "short-term" customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

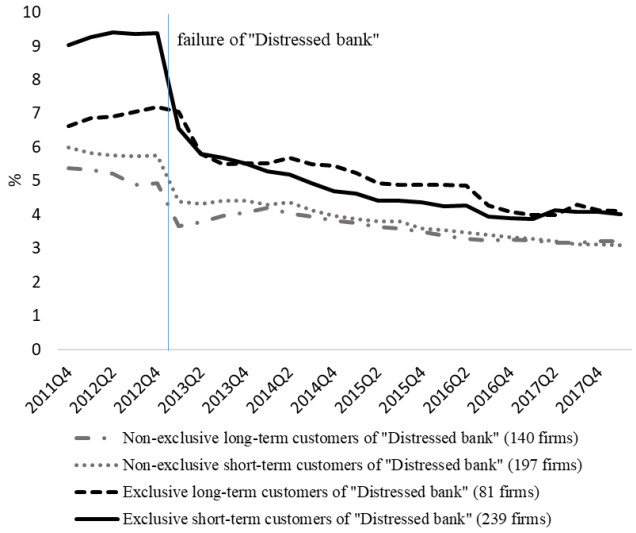

FIGURE **5**.1

Borrowing Costs of Customers of "Distressed bank" vs. a Similar Bank. Leasing Contracts

Figure **6.**1 complements the results of Table **6**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Distressed bank"** and customers of **a similar bank**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

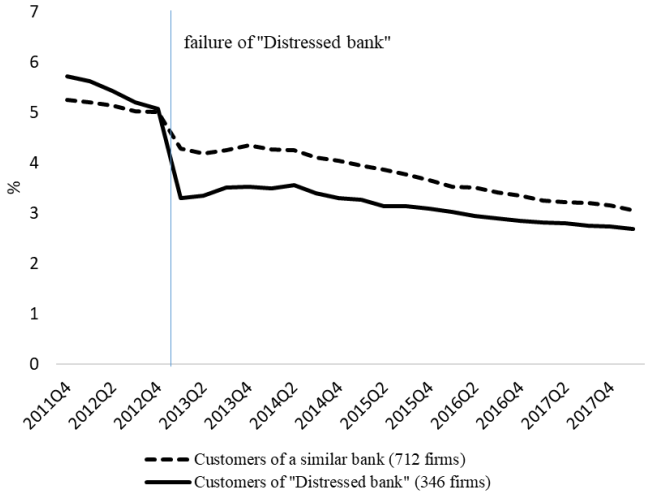

FIGURE **5**.2

Borrowing Costs of Exclusive Customers of "Distressed bank" vs. **a Similar Bank. Leasing Contracts**

Figure **6**.2 complements the results of Table **6**, regression specification (2a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive customers of **"Distressed bank"** and exclusive and non-exclusive customers of **a similar bank**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

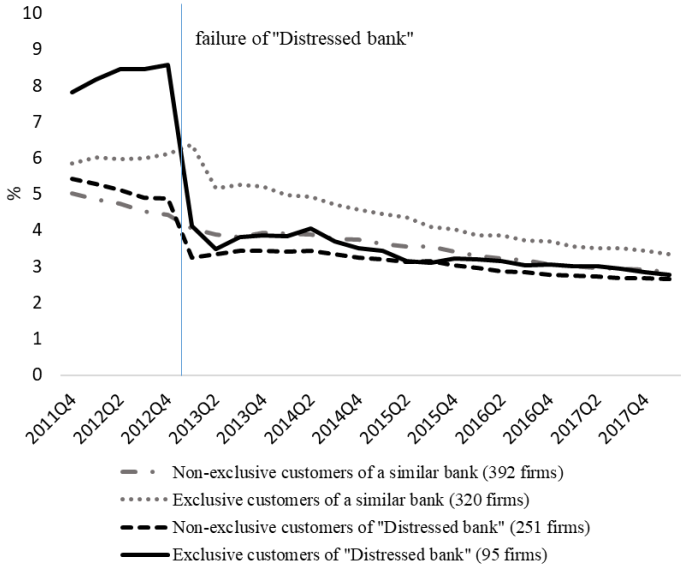

FIGURE **6**.1

Borrowing Costs of Customers of "Distressed bank" vs. a Similar Bank. Leasing Contracts, Term Loans and Credit Lines

Figure **6.**1 complements the results of Table **6**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Distressed bank"** and customers of **a similar bank**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

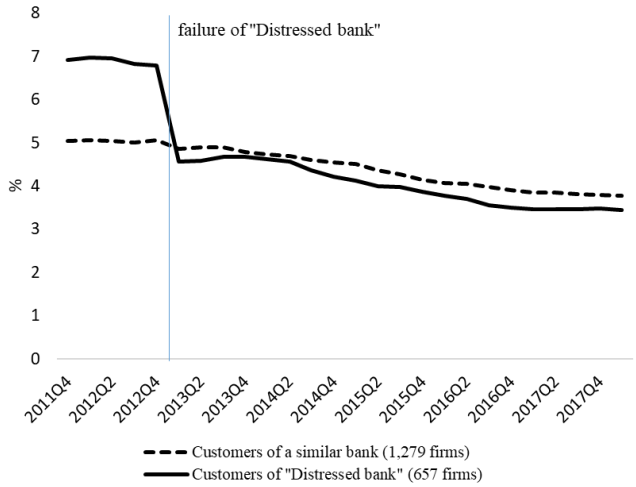

FIGURE **6**.2

Borrowing Costs of Exclusive Customers of "Distressed bank" vs. **a Similar Bank. Leasing Contracts, Term Loans and Credit Lines**

Figure **6**.2 complements the results of Table **6**, regression specification (2a). The figure shows how average borrowing costs of four groups of firms: exclusive and non-exclusive customers of **"Distressed bank"** and exclusive and non-exclusive customers of **a similar bank**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 February 12 (the day of "Distressed bank's" closure)**. If a firm had debts only with that one bank, it is an exclusive customer. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. This day is indicated by the vertical line.

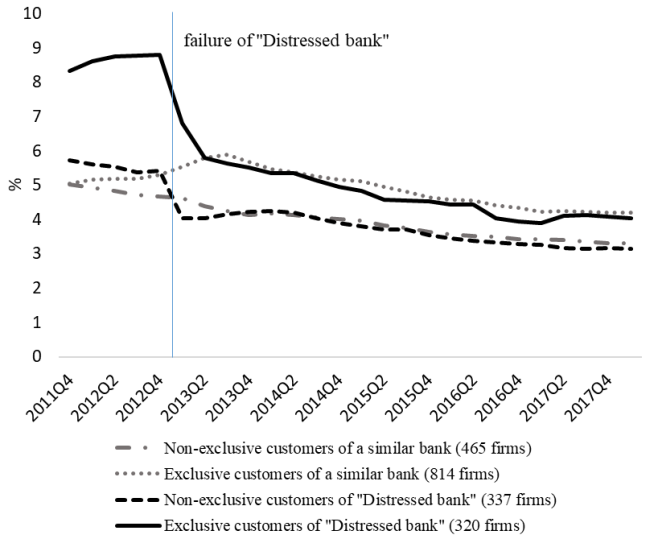

FIGURE **7**.1

Borrowing Costs of Customers of "Healthy bank" vs. All Other Firms. Leasing Contracts

Figure **7.**1 complements the results of Table **7a**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Healthy bank"** and customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 January 30 (the day of "Healthy bank's" decision to stop business)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 January 30 (the day of "Healthy bank's" decision to stop business)**. This day is indicated by the vertical line.

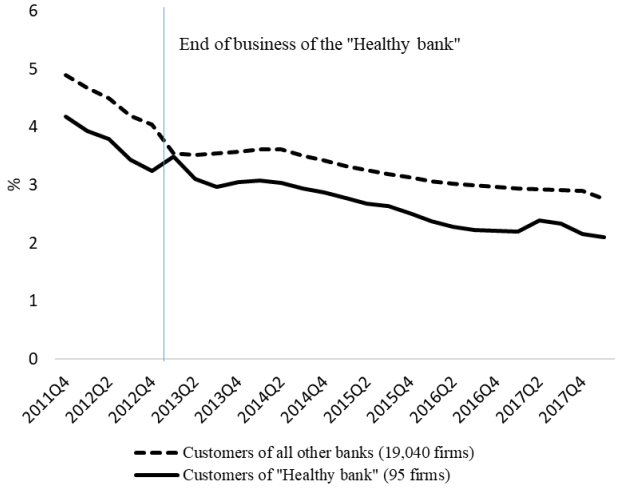

FIGURE **7**.2

Borrowing Costs of Customers of "Healthy bank" vs. All Other Firms. Leasing Contracts, Term Loans and Credit Lines

Figure **7.**1 complements the results of Table **7b**, regression specification (1a). The figure shows how average borrowing costs of two groups of firms: customers of **"Healthy bank"** and customers of **all other banks**, evolve over time. The number of firms in each group is indicated in brackets in the legend. A firm is considered a customer of a bank if it had any debt outstanding with that bank within one year prior to **2013 January 30 (the day of "Healthy bank's" decision to stop business)**. Borrowing costs for each firm are calculated as an average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 January 30 (the day of "Healthy bank's" decision to stop business)**. This day is indicated by the vertical line.

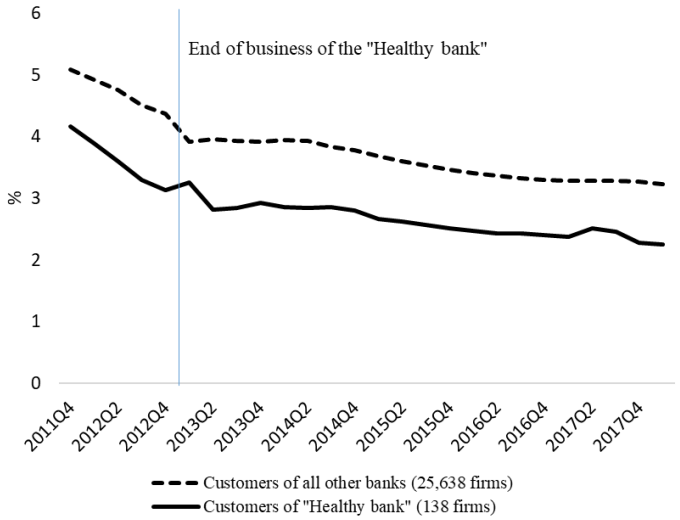

TABLE 2

Difference-in-difference Analysis: Customers of "Distressed bank" vs. All Other Firms. Leasing Contracts

Table 2 reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Distressed bank"** within one year prior to **2013 February 12**, and 0 otherwise; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-1.351***		-1.090***		-0.837***	
	(0.000)		(0.000)		(0.000)	
closed	0.979***		0.893***		0.640***	
	(0.000)		(0.000)		(0.000)	
exclusive			0.290***		0.201***	
			(0.000)		(0.000)	
short_term					0.594***	
					(0.000)	
closed x after	-1.039***	-0.421***	-1.048***	-0.475***	-1.002***	-0.500**
	(0.000)	(0.004)	(0.000)	(0.001)	(0.000)	(0.011)
exclusive x after			-0.438***	-0.194***	-0.528***	-0.121**
			(0.000)	(0.000)	(0.000)	(0.036)
short_term x after					-0.662***	-0.277***
					(0.000)	(0.001)
closed x exclusive			2.826***	0.000	1.529**	0.000
			(0.000)	(1.000)	(0.016)	(1.000)
closed x short_term					0.377	0.000
					(0.162)	(1.000)
exclusive x short_term					-0.025	0.000
					(0.698)	(1.000)
after x closed x exclusive			-2.492***	-1.852**	-0.833	1.856***
			(0.000)	(0.023)	(0.175)	(0.000)
after x closed x short_term					0.096	0.091
					(0.736)	(0.743)
after x exclusive x short_term					0.395***	-0.048
					(0.000)	(0.592)
closed x exclusive x short_term					1.379**	0.000
					(0.039)	(1.000)
after x closed x exclusive x short_term					-2.132***	-4.162***
					(0.004)	(0.000)
Constant	4.442***	3.353***	4.231***	3.413***	3.985***	3.460***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	193,001	192,114	193,001	192,114	193,001	192,114
Adjusted R-squared	0.141	0.855	0.146	0.856	0.157	0.857

TABLE 3

Difference-in-difference Analysis: Customers of "Distressed bank" vs. All Other Firms. Term Loans

Table 3 reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **term loans** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **term loans** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Distressed bank"** within one year prior to **2013 February 12**, and 0 otherwise; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-0.455***		-0.322***		0.305*	
	(0.001)		(0.002)		(0.059)	
closed	2.723***		1.086***		1.755***	
	(0.000)		(0.000)		(0.000)	
exclusive			-0.113		0.597***	
			(0.199)		(0.000)	
short_term					1.292***	
					(0.000)	
closed x after	-2.527***	-0.751***	-1.604***	-0.402*	-2.280***	-0.524
	(0.000)	(0.007)	(0.000)	(0.097)	(0.000)	(0.140)
exclusive x after			-0.582***	0.218**	-1.601***	0.263**
			(0.000)	(0.021)	(0.000)	(0.027)
short_term x after					-1.465***	0.030
					(0.000)	(0.840)
closed x exclusive			3.343***	0.000	0.698	0.000
			(0.000)	(1.000)	(0.226)	(1.000)
closed x short_term					-1.410***	0.000
					(0.001)	(1.000)
exclusive x short_term					-1.508***	0.000
					(0.000)	(1.000)
after x closed x exclusive			-0.966*	-1.022	2.449***	1.237*
			(0.081)	(0.146)	(0.008)	(0.078)
after x closed x short_term					1.550***	0.281
					(0.002)	(0.529)
after x exclusive x short_term					2.228***	-0.100
					(0.000)	(0.618)
closed x exclusive x short_term					4.165***	0.000
					(0.000)	(1.000)
after x closed x exclusive x short_term					-5.530***	-3.613***
					(0.000)	(0.005)
Constant	4.729***	4.486***	4.807***	4.437***	4.201***	4.436***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	81,130	80,454	81,130	80,454	81,130	80,454
Adjusted R-squared	0.043	0.915	0.067	0.916	0.079	0.916

TABLE 4

Difference-in-difference Analysis: Customers of "Distressed bank" vs. All Other Firms. Leasing Contracts, Term Loans and Credit Lines

Table 4 reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Distressed bank"** within one year prior to **2013 February 12**, and 0 otherwise; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-1.175***		-1.028***		-0.560***	
	(0.000)		(0.000)		(0.002)	
closed	2.276***		0.958***		1.050***	
	(0.000)		(0.000)		(0.000)	
exclusive			0.066		0.427***	
			(0.130)		(0.000)	
short_term					1.003***	
					(0.000)	
closed x after	-1.814***	-0.596***	-0.913***	-0.312***	-1.069***	-0.251*
	(0.000)	(0.001)	(0.000)	(0.008)	(0.000)	(0.061)
exclusive x after			-0.366***	-0.049	-0.903***	-0.024
			(0.000)	(0.212)	(0.000)	(0.608)
short_term x after					-1.046***	-0.264***
					(0.000)	(0.001)
closed x exclusive			3.052***	0.000	1.324***	0.000
			(0.000)	(1.000)	(0.004)	(1.000)
closed x short_term					-0.347*	0.000
					(0.086)	(1.000)
exclusive x short_term					-0.822***	0.000
					(0.000)	(1.000)
after x closed x exclusive			-1.763***	-1.069**	0.474	0.479
			(0.000)	(0.015)	(0.353)	(0.247)
after x closed x short_term					0.514**	-0.080
					(0.025)	(0.681)
after x exclusive x short_term					1.169***	0.016
					(0.000)	(0.847)
closed x exclusive x short_term					2.539***	0.000
					(0.000)	(1.000)
after x closed x exclusive x short_term					-3.399***	-2.338***
					(0.000)	(0.002)
Constant	4.619***	3.739***	4.570***	3.753***	4.107***	3.799***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	262,669	261,410	262,669	261,410	262,669	261,410
Adjusted R-squared	0.097	0.843	0.110	0.843	0.118	0.844

TABLE 4b

Difference-in-difference Analysis: Customers of "Distressed bank" vs. All Other Firms (but only those that appear both before and after the "Distressed bank's" closure). Leasing Contracts, Term Loans and Credit Lines

Table 4b reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Distressed bank"** within one year prior to **2013 February 12**, and 0 otherwise; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-1.236***		-1.207***		-1.105***	
	(0.000)		(0.000)		(0.000)	
closed	1.359***		0.796***		0.896***	
	(0.000)		(0.000)		(0.000)	
exclusive			0.158***		0.242***	
			(0.000)		(0.000)	
short_term					0.853***	
					(0.000)	
closed x after	-0.684***	-0.597***	-0.330***	-0.312***	-0.244**	-0.251*
	(0.000)	(0.001)	(0.005)	(0.008)	(0.048)	(0.061)
exclusive x after			-0.040	-0.046	-0.053	-0.021
			(0.295)	(0.233)	(0.242)	(0.654)
short_term x after					-0.251***	-0.265***
					(0.004)	(0.001)
closed x exclusive			2.051***	0.000	1.115**	0.000
			(0.000)	(1.000)	(0.029)	(1.000)
closed x short_term					-0.349*	0.000
					(0.082)	(1.000)
exclusive x short_term					-0.351***	0.000
					(0.000)	(1.000)
after x closed x exclusive			-1.139***	-1.071**	0.231	0.475
			(0.009)	(0.015)	(0.643)	(0.251)
after x closed x short_term					-0.117	-0.079
					(0.536)	(0.684)
after x exclusive x short_term					0.069	0.014
					(0.404)	(0.862)
closed x exclusive x short_term					1.536**	0.000
					(0.024)	(1.000)
after x closed x exclusive x short_term					-2.043***	-2.334***
					(0.007)	(0.002)
Constant	4.431***	3.557***	4.325***	3.579***	3.971***	3.666***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	126,384	126,384	126,384	126,384	126,384	126,384
Adjusted R-squared	0.136	0.697	0.146	0.698	0.171	0.701

TABLE 5

Difference-in-difference Analysis: Customers of "Distressed bank" vs. customers of a Similar Bank. Leasing Contracts

Table 5 reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Distressed bank"** within one year prior to **2013 February 12**, and 0 otherwise **(only customers of one similar bank are considered)**; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-1.535***		-1.366***		-1.116***	
	(0.000)		(0.000)		(0.000)	
closed	0.288*		0.408***		0.274	
	(0.078)		(0.008)		(0.174)	
exclusive			1.285***		0.785**	
			(0.000)		(0.016)	
short_term					0.822***	
					(0.000)	
closed x after	-0.855***	-0.487***	-0.773***	-0.556***	-0.723***	-0.655***
	(0.000)	(0.009)	(0.000)	(0.003)	(0.002)	(0.009)
exclusive x after			-0.681***	-0.508**	-0.341	-0.555
			(0.004)	(0.050)	(0.366)	(0.257)
short_term x after					-0.542**	-0.424*
					(0.012)	(0.059)
closed x exclusive			1.831***	0.000	0.945	0.000
			(0.000)	(1.000)	(0.124)	(1.000)
closed x short_term					0.149	0.000
					(0.639)	(1.000)
exclusive x short_term					0.342	0.000
					(0.279)	(1.000)
after x closed x exclusive			-2.248***	-1.550**	-1.020	2.190***
			(0.000)	(0.047)	(0.120)	(0.000)
after x closed x short_term					-0.024	0.261
					(0.947)	(0.453)
after x exclusive x short_term					-0.264	0.266
					(0.518)	(0.612)
closed x exclusive x short_term					1.011	0.000
					(0.164)	(1.000)
after x closed x exclusive x short_term					-1.473*	-4.389***
					(0.070)	(0.000)
Constant	5.133***	4.000***	4.715***	4.243***	4.351***	4.341***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	12,664	12,641	12,664	12,641	12,664	12,641
Adjusted R-squared	0.223	0.813	0.281	0.816	0.306	0.818

TABLE 6

Difference-in-difference Analysis: Customers of "Distressed bank" vs. customers of a Similar Bank. Leasing Contracts, Term Loans and Credit Lines

Table 6 reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 February 12 (the day of "Distressed bank's" closure)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Distressed bank"** within one year prior to **2013 February 12**, and 0 otherwise **(only customers of one similar bank are considered)**; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-0.851***		-1.119***		-1.119***	
	(0.000)		(0.000)		(0.000)	
closed	1.854***		0.697***		0.514***	
	(0.000)		(0.000)		(0.003)	
exclusive			0.349**		-0.057	
			(0.010)		(0.693)	
short_term					0.408***	
					(0.001)	
closed x after	-2.137***	-0.997***	-0.822***	-0.463***	-0.510***	-0.282*
	(0.000)	(0.000)	(0.000)	(0.001)	(0.008)	(0.080)
exclusive x after			0.621***	0.441**	1.315***	0.955***
			(0.001)	(0.026)	(0.000)	(0.003)
short_term x after					0.039	0.039
					(0.819)	(0.823)
closed x exclusive			2.769***	0.000	1.808***	0.000
			(0.000)	(1.000)	(0.000)	(1.000)
closed x short_term					0.248	0.000
					(0.268)	(1.000)
exclusive x short_term					0.434**	0.000
					(0.019)	(1.000)
after x closed x exclusive			-2.750***	-1.566***	-1.743***	-0.524
			(0.000)	(0.001)	(0.003)	(0.264)
after x closed x short_term					-0.571**	-0.371
					(0.044)	(0.155)
after x exclusive x short_term					-1.021***	-0.749**
					(0.002)	(0.031)
closed x exclusive x short_term					1.283**	0.000
					(0.026)	(1.000)
after x closed x exclusive x short_term					-1.209*	-1.551**
					(0.090)	(0.048)
Constant	5.041***	4.857***	4.830***	4.726***	4.643***	4.725***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	23,335	23,287	23,335	23,287	23,335	23,287
Adjusted R-squared	0.160	0.774	0.243	0.777	0.262	0.783

TABLE 7a

Difference-in-difference Analysis: Customers of "Healthy bank" vs. All Other Firms. Leasing Contracts

Table 7a reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 January 30 (the day of "Healthy bank's" decision to stop business)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Healthy bank"** within one year prior to **2013 January 30**, and 0 otherwise; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-1.375***		-1.181***		-0.902***	
	(0.000)		(0.000)		(0.000)	
closed	-0.753***		-0.612***		-0.673***	
	(0.000)		(0.002)		(0.002)	
exclusive			0.204***		0.129***	
			(0.000)		(0.006)	
short_term					0.642***	
					(0.000)	
closed x after	0.173	0.245	-0.008	0.148	-0.293	-0.135
	(0.403)	(0.330)	(0.973)	(0.561)	(0.147)	(0.487)
exclusive x after			-0.350***	-0.151***	-0.463***	-0.088
			(0.000)	(0.002)	(0.000)	(0.121)
short_term x after					-0.693***	-0.304***
					(0.000)	(0.000)
closed x exclusive			0.380	0.000	0.788***	0.000
			(0.115)	(1.000)	(0.009)	(1.000)
closed x short_term					0.143	0.000
					(0.686)	(1.000)
exclusive x short_term					-0.051	0.000
					(0.446)	(1.000)
after x closed x exclusive			-0.266	0.373	-0.066	0.480
			(0.535)	(0.576)	(0.916)	(0.460)
after x closed x short_term					0.672	0.681
					(0.186)	(0.230)
after x exclusive x short_term					0.420***	-0.023
					(0.000)	(0.797)
closed x exclusive x short_term					-1.268**	0.000
					(0.019)	(1.000)
after x closed x exclusive x short_term					-	-
Constant	4.474***	3.348***	4.328***	3.388***	4.056***	3.442***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	193,980	193,095	193,980	193,095	193,980	193,095
Adjusted R-squared	0.138	0.855	0.141	0.855	0.152	0.856

P-values in parentheses. Standard errors are clustered multiway within firms and quarters

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

TABLE 7b

Difference-in-difference Analysis: Customers of "Healthy bank" vs. All Other Firms. Leasing Contracts, Term Loans and Credit Lines

Table 7b reports coefficient estimates from difference-in-difference panel regressions without fixed effects (specifications 1a, 2a and 3a) and with quarter-fixed effects and firm-fixed effects (specifications 1b, 2b and 3b). The data used in the analysis is at quarter-firm level. The dependent variable "borrowing_costs" is a firm's average interest rate weighted by loan outstanding amounts at each quarter. In quarters 2011q4 - 2012q4 we consider only **leasing contracts, term loans and credit lines** issued up to 2012 December 31. In quarters 2013q1 - 2018q1 we consider only **leasing contracts, term loans and credit lines** issued from **2013 January 30 (the day of "Healthy bank's" decision to stop business)**. The explanatory variables are four dummies: "after" - equal to 1 if an observation is from quarters 2013q1 - 2018q1, and 0 otherwise; "closed" – equal to 1 if a firm belongs to the treatment group, i.e. had any debt outstanding with the closed **"Healthy bank"** within one year prior to **2013 January 30**, and 0 otherwise; "exclusive" – equal to 1 if a firm had debts only with one bank within the same prior year, and 0 otherwise; "short_term" equal to 1 if a firm's average relationship length measured in quarters with its banks at the end of 2012 q4 was shorter than 6 years, and 0 otherwise. Other explanatory variables are interactions between these four variables. Robust standard errors are clustered multiway at the firm and quarter levels. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	Dependent variable: borrowing_costs					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
after	-1.270***		-1.144***		-0.675***	
	(0.000)		(0.000)		(0.000)	
closed	-1.119***		-1.204***		-1.192***	
	(0.000)		(0.000)		(0.000)	
exclusive			0.049		0.339***	
			(0.295)		(0.000)	
short_term					0.985***	
					(0.000)	
closed x after	0.231	0.128	0.157	0.181	-0.292**	0.119
	(0.112)	(0.376)	(0.374)	(0.285)	(0.044)	(0.412)
exclusive x after			-0.325***	-0.037	-0.808***	-0.001
			(0.000)	(0.347)	(0.000)	(0.986)
short_term x after					-1.009***	-0.299***
					(0.000)	(0.000)
closed x exclusive			0.428*	0.000	0.592	0.000
			(0.079)	(1.000)	(0.235)	(1.000)
closed x short_term					0.008	0.000
					(0.975)	(1.000)
exclusive x short_term					-0.671***	0.000
					(0.000)	(1.000)
after x closed x exclusive			0.069	-0.332	0.527	-0.538
			(0.798)	(0.252)	(0.249)	(0.201)
after x closed x short_term					0.910**	0.158
					(0.013)	(0.655)
after x exclusive x short_term					1.029***	-0.001
					(0.000)	(0.989)
closed x exclusive x short_term					-0.320	0.000
					(0.573)	(1.000)
after x closed x exclusive x short_term					-0.923	0.302
					(0.133)	(0.608)
Constant	4.738***	3.728***	4.702***	3.738***	4.235***	3.791***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Quarter-fixed effects		YES		YES		YES
Firm-fixed effects		YES		YES		YES
Number of observations	264,056	262,801	264,056	262,801	264,056	262,801
Adjusted R-squared	0.083	0.842	0.087	0.842	0.094	0.843

TABLE 9

Results of the Loan Matching Analysis: Spreads Between Regular-Switching Loans and Non-Switching Loans

We estimate a spread between an interest rate on a switching loan and an interest rate on a similar non-switching loan taken by a similar firm in the same quarter from the same bank. Definitions of switching and non-switching loans and inside and outside banks are provided in Table 8a. We pair every switching loan with as many as possible non-switching loans based on matching variables described in Table 8b. Columns I and II consider leasing contracts, term loans and credit lines, while column III considers only leasing, column IV – only term loans, and column V – only credit lines. Window used for matching continuous variables are relaxed in columns II to V from +-30% to +-70%. Estimated interest rate spreads are regressed on a constant. The estimated coefficients on the constant are reported in the bottom row. Robust standard errors are clustered at switching loan level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	I	II	III	IV	V
Loan types considered	All three	All three	Leasing	Term loans	Credit lines
Window used for matching	+-30%	+-70%	+-70%	+-70%	+-70%
Year & quarter	Yes	Yes	Yes	Yes	Yes
Outside bank	Yes	Yes	Yes	Yes	Yes
Repayment troubles last year	Yes	Yes	Yes	Yes	Yes
Economic activity (sector)	Yes				
Total bank debt (+-30% or 70%)	Yes	Yes	Yes	Yes	Yes
Loan type	Yes	Yes	Yes	Yes	Yes
Proportion of loan collateralized (+-30% or 70%)	Yes	Yes	Yes	Yes	Yes
Loan maturity (+-30% or 70%)	Yes	Yes	Yes	Yes	Yes
Loan amount (+-30% or 70%)	Yes	Yes	Yes	Yes	Yes
Floating loan rate	Yes				
Loan rate on prior inside loans (+-30% or 70%)	Yes				
Prior relationship length (+-30% or 70%)	Yes				
Prior multiple bank relationships	Yes				
Prior primary lender	Yes				
Prior scope of the bank relationship	Yes				
Number of switching loans	86	7,951	6,450	1,139	362
Number of non-switching loans	66	33,690	31,165	2,022	503
Number of observations (matched pairs)	112	285,453	281,309	3,431	713
Spread in basis points	-26.3***	-25.9***	-26.1***	-7.0**	-28.1***
	(7.5)	(1.0)	(1.0)	(3.5)	(4.7)

TABLE 10

Results of the Loan Matching Analysis: Spreads Between Forced-Switching Loans and Non-Switching Loans. Customers of all three closed banks

We estimate a spread between an interest rate on a forced-switching loan and an interest rate on a similar non-switching loan taken by a similar firm in the same quarter from the same bank. Definitions of forced-switching and non-switching loans and inside and outside banks are provided in Table 8a. We pair every forced-switching loan with as many as possible non-switching loans based on matching variables described in Table 8b. Columns I and IV consider all firms, columns II and V consider only those non-switching firms that on average had relationships with banks longer than 6 years, and columns III and VI – only those non-switching firms that on average had relationships with banks shorter than 6 years. Estimated interest rate spreads are regressed on a constant. The estimated coefficients on the constant are reported in the bottom row. Robust standard errors are clustered at switching loan level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	I	II	III	IV	V	VI
Loan types considered	All three	All three	All three	All three	All three	All three
Window used for matching	+-70%	+-70%	+-70%	+-70%	+-70%	+-70%
Subsample	All firms	Nonswitchers with long relationships (>6 years)	Nonswitchers with shorter relationships (<6 years)	All firms	Nonswitchers with long relationships (>6 years)	Nonswitchers with shorter relationships (<6 years)
Year & quarter	Yes	Yes	Yes	Yes	Yes	Yes
Outside bank	Yes	Yes	Yes	Yes	Yes	Yes
Repayment troubles last year	Yes	Yes	Yes	Yes	Yes	Yes
Total bank debt (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan type	Yes	Yes	Yes	Yes	Yes	Yes
Proportion of loan collateralized (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan maturity (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan amount (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Prior relationship length (+-70%)				Yes	Yes	Yes
Number of switching loans	106	23	83	68	22	46
Number of non-switching loans	780	238	542	328	137	191
Number of observations (matched pairs)	1,018	275	743	383	158	225
Spread in basis points	-3.9	12.8*	-19.5**	-5.4	19.9**	-24.7***
	(8.2)	(6.6)	(9.5)	(8.0)	(7.5)	(8.6)

TABLE 11

Results of the Loan Matching Analysis: Spreads Between Forced-Switching Loans and Non-Switching Loans. Only customers of "Distressed bank"

We estimate a spread between an interest rate on a forced-switching loan and an interest rate on a similar non-switching loan taken by a similar firm in the same quarter from the same bank. Definitions of forced-switching and non-switching loans and inside and outside banks are provided in Table 8a. We pair every forced-switching loan with as many as possible non-switching loans based on matching variables described in Table 8b. Columns I, II and III consider former customers of "Bank 3", and columns IV, V and VI – "Distressed bank". Columns I and IV consider all firms, columns II and V consider only those non-switching firms that on average had relationships with banks longer than 6 years, and columns III and VI – only those non-switching firms that on average had relationships with banks shorter than 6 years. Estimated interest rate spreads are regressed on a constant. The estimated coefficients on the constant are reported in the bottom row. Robust standard errors are clustered at switching loan level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	I	II	III	IV	V	VI
Customers forced to switch from:	"Distressed bank"	"Distressed bank"	"Distressed bank"	"Distressed bank"	"Distressed bank"	"Distressed bank"
Loan types considered	Leasing	Leasing	Leasing	All three	All three	All three
Window used for matching	+-70%	+-70%	+-70%	+-70%	+-70%	+-70%
Subsample	All firms	Nonswitchers with long relationships (>6 years)	Nonswitchers with shorter relationships (<6 years)	All firms	Nonswitchers with long relationships (>6 years)	Nonswitchers with shorter relationships (<6 years)
Year & quarter	Yes	Yes	Yes	Yes	Yes	Yes
Outside bank	Yes	Yes	Yes	Yes	Yes	Yes
Repayment troubles last year	Yes	Yes	Yes	Yes	Yes	Yes
Total bank debt (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan type	Yes	Yes	Yes	Yes	Yes	Yes
Proportion of loan collateralized (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan maturity (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan amount (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Prior relationship length (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Number of switching loans	15	6	9	40	19	19
Number of non-switching loans	159	100	59	199	118	75
Number of observations (matched pairs)	196	113	83	248	139	99
Spread in basis points	5.6	20.4**	-16.4**	3.1	19.7**	-23.5**
	(7.6)	(5.1)	(6.9)	(8.2)	(8.5)	(10.0)

TABLE 12

Results of the Loan Matching Analysis: The Development of Interest Rates Over Time

We estimate a spread between an interest rate on a non-switching loan and an interest rate on a similar switching loan taken by the same firm from the same bank, when they started the lending relationship. Definitions of switching and non-switching loans and inside and outside banks are provided in Table 8a. We pair every switching loan with as many as possible non-switching loans based on matching variables used in Table 9, column II, except that instead of matching on firms' size we match on the firm's identity. Estimated interest rate spreads are regressed on a set of dummy variables which indicate yearly time gaps between the switching and the non-switching loans. We control for time trends by subtracting 3 months Euribor rate from every interest rate and by including switching loans' time fixed effects. The estimated coefficients on the time-gap dummies are reported in the bottom row. Robust standard errors are clustered at switching loan level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

Time gaps between a non-switching loan and a switching loan	Up to 1 year	From 1 to 2 years	From 2 to 3 years	From 3 to 4 years	From 4 to 5 years	More than 5 years
Loan types considered	All three	All three	All three	All three	All three	All three
Window used for matching	+-70%	+-70%	+-70%	+-70%	+-70%	+-70%
Outside bank	Yes	Yes	Yes	Yes	Yes	Yes
Repayment troubles last year	Yes	Yes	Yes	Yes	Yes	Yes
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Loan type	Yes	Yes	Yes	Yes	Yes	Yes
Proportion of loan collateralized (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan maturity (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Loan amount (+-70%)	Yes	Yes	Yes	Yes	Yes	Yes
Number of switching loans	2,495	1,563	1,011	797	340	136
Number of non-switching loans	2,877	2,116	1,922	1,209	523	323
Number of observations (matched pairs)	33,168	60,495	145,640	106,740	5,790	922
Coefficient on the time-gap dummy	49.3***	55.2***	46.1***	37.6***	31.3***	-41.6***
	(7.8)	(8.0)	(8.0)	(8.0)	(8.1)	(10.8)
Considering only those firms which never had any repayment delays:						
Number of switching loans	2,184	1,467	941	776	327	116
Number of non-switching loans	2,540	1,915	1,840	1,168	512	211
Number of observations (matched pairs)	32,250	60,132	145,430	106,688	5,775	432
Coefficient on the time-gap dummy	53.4***	59.8***	50.2***	41.6***	35.7***	-40.9*
	(7.1)	(7.3)	(7.3)	(7.3)	(7.4)	(22.9)

FIGURE **8**

Results of the Loan Matching Analysis: The Development of Interest Rates After Switching

Figure **8** complements the results of Table 9 and Table 12. The figure shows the development of average interest rates throughout the relationship time. The first observation (taken from Table 9, column II) indicates an average discount firms receive when they voluntarily switch to other banks and start new lending relationships. The rest of observations (taken from Table 12) show how on average the rate at a new bank develops throughout years after switching.

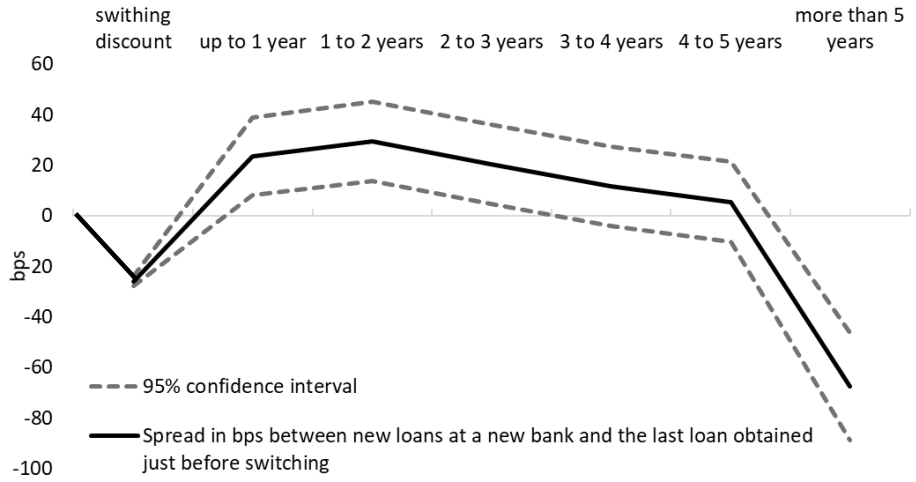

TABLE 13

Panel Regression: Relationship between interest rate and firm-bank relationship length

Table 13 reports coefficient estimates from the panel regressions where the dependent variable "loan rate" is an interest rate charged on a loan *l* issued by bank *b* to firm *f* in quarter *q*, and the explanatory variable is the logarithm of the length of the relationship between firm *f* and bank *b* in quarter *q* measured in quarters. In order to capture the non-linear dynamics we also add the square of the explanatory variable. We use newly issued leasing contracts, term loans and credit lines between 2011 q4 and 2018 q1. Relationship lengths are measured from 1995 to 2018. Each column presents coefficients obtained using different level of controls. We control for loan characteristics, i.e. time to maturity, loan amount and collateralized proportion of loan amount, firm fixed effects, quarter fixed effects, bank fixed effects, loan type fixed effects and interactions between these fixed effects. Robust standard errors are clustered at the firm level. P-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, two-tailed, respectively.

	1	2	3	4	5	6
Log(relationship length)	-0.147	0.144***	0.305**	0.598***	0.717***	0.710***
	(0.504)	(0.000)	(0.010)	-0.009	(0.000)	(0.000)
Log(relationship length)^2	-0.036	-0.035***	-0.078***	-0.179*	-0.216***	-0.213***
	(0.492)	(0.000)	(0.005)	(0.098)	(0.007)	(0.008)
Constant	4.078***					
	(0.000)					
Controls for loan characteristics	YES	YES	YES	YES	YES	
Firm - FE		YES				
Quarter - FE		YES				
Bank - FE		YES				
Loan type - FE		YES		YES		
Firm x Quarter - FE			YES	YES	YES	YES
Firm x Bank - FE				YES	YES	YES
Bank x Quarter - FE				YES	YES	YES
Loan type x Quarter - FE					YES	YES
Loan type x Firm - FE					YES	YES
Loan type x Bank - FE					YES	YES
Number of observations	95,400	86,045	58,679	57,769	56,123	56,130
Adjusted R-squared	0.106	0.803	0.936	0.950	0.955	0.955

FIGURE **9**

Panel Regressions: Relationship between interest rate and firm-bank relationship length

Figure **9** complements the results of Table 13. It plots predicted values of the panel regressions estimated in Table 13 columns 5, 6 and 8. The regressions estimated a non-linear link between interest rate charged on loans and the relationship length between a bank and a firm. Specifications 5 and 6 consider all newly issued leasing contracts, term loans and credit lines between 2011 q4 and 2018 q1.

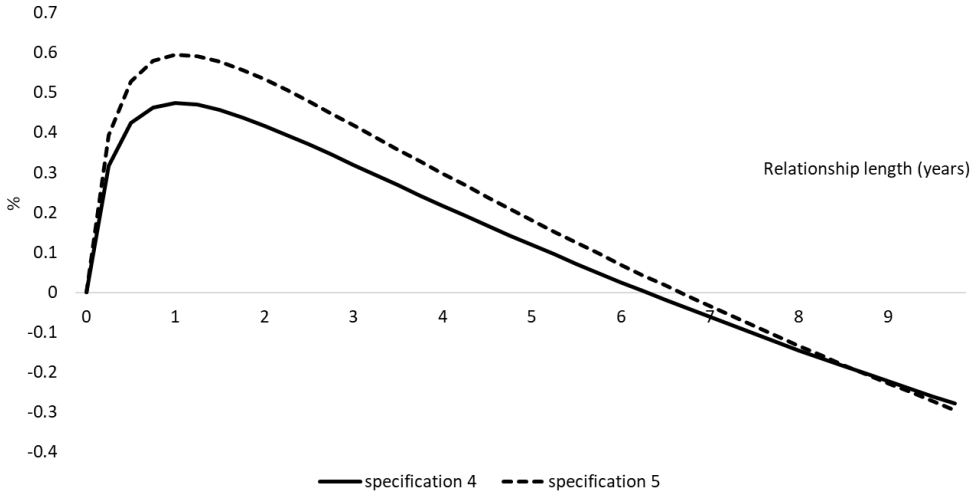

FIGURE **10**

(Uncontrolled) relationship between interest rate and firm-bank relationship length

Figure **10** shows the relationship between firm-bank relationship length and the interest rates charged. All new debt contracts issued in 2011 q4 – 2012 q3 were grouped by years of relationship between a lender and a borrower. The sample period in this graph is limited to one year in order to avoid the influence of the downward interest rate trend over time. Average interest rate and a 95% confidence interval is plotted for each group.