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# THE EFFECTS OF BANK BRANCH CLOSURES ON CREDIT RELATIONSHIPS

by Iconio Garrì[*]

**Abstract**

This paper studies the effects of bank branch closures on individual business borrowers, using a sample of events that occurred in Italy between 2010 and 2014. I find that a branch closing down increases the probability of a credit relationship terminating. The impact is weaker the shorter the distance from an alternative branch of the bank, the longer the duration of the relationship and the greater the bank's share of loans to the firm. However, branch closure is not generally associated with a decrease in the total amount of credit available for the firms formerly served by the closed branch. A temporary shrinkage of loans only occurs for small borrowers and short-term credit lines.

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**Contents**



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# 1. Introduction[1]

After the explosion of the global financial crisis the number of branch closures has increased in many countries. In Italy, the number of bank branches declined by 15 percent between 2008 and 2016 (Figure 1), and a similar pattern is also observed in the euro area and in the US (Mistrulli et al. 2019). Understanding the effects of branch closures on the banks and their clients is a timely issue. Whilst branch closures allow banks to cut expenses, they may equally have repercussions for the borrowers, in terms of credit access, and for the banks themselves, in terms of loss of customers (depositors and profitable borrowers). This paper focuses on the loan side of the bank-firm relationship, by evaluating the impact of branch closures on the probability that an existing relationship terminates and, on top of that, upon the total credit available to the borrowing firms.

The literature suggests at least two reasons why a branch closure can affect a credit relationship. The first one is related to geographic proximity. The most immediate consequence of a branch closure is an increase in the distance between the bank and the borrowing firms, which can lead to higher transportation and information costs. Physical proximity can lower the cost of collecting soft information, through repeated interactions with the borrower or simply from the local community, thereby making credit more accessible (Boot 2000, Degryse and Ongena 2009). Recent studies, however, have documented technological changes may have facilitated long-distance lending (e.g., Petersen and Rajan 2002, Felici and Pagnini 2008). The second reason is related to the potential loss of soft information acquired over time by the branch staff. After a branch closure the bank may normally continue serving the same firms on an alternative nearby branch. However, the staff members at the closed branch are not necessarily reallocated to that branch. Many studies have stressed that, unlike hard information, soft information is difficult to store and transmit among individuals (e.g., Drexler and Schoar 2014, Qian et al. 2015).

This paper considers a sample of 500 branch closures occurred in Italy in the period 2010-2014. More specifically, the paper focuses upon those closures implying a full disappearance of a given

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bank from a given municipality. This is necessary as the Italian credit register data allows to identify the municipality, and not the individual branch within a given municipality, originating a given credit relationship. Such a restriction covers about 10 percent of all bank branch closures occurred in the sample period[2]. In the sample period, the sudden increase in branch closures, mainly due to large banking groups, was primarily driven by the need to cut costs[3]. The supervisory authority also pressured banks to rationalize their branch network in order to improve efficiency and profitability. Thus, the decision of the banks to close branches is somewhat exogenous.

Even if the decision to downsize the physical network was completely exogenous, the fact that banks normally choose which of their branches to close gives rise to a potential endogeneity problem. The decision on which branches to close may depend on borrowers and local economy characteristics which may by themselves affect the outcomes. For instance, a local economic shock might induce branch closures as well as a reduction in the demand for credit by local firms. To handle this problem, I consider the firms that borrowed from the closed branches, that I call 'treated', and construct a comparison group of bank-firm relationships by implementing an exact matching on observables. Matches are then selected by means of a nearest neighbor matching using a Normalized Euclidean distance function. The procedure allowed me to find firms located near to the treated ones, belonging to the same (two-digit) industry, having the same class size, and borrowing from a bank branch near to the closed one, which eventually belonged to a bank with comparable size.

Estimations are performed using a two-period panel data set, with a pre- and a post-closing period. Because branch closures occurred at different dates, I pool the data across all the events, and estimate a model including firm fixed effects to control for observed and unobserved, time-invariant differences and industry-size-location-time fixed effects to control for observed and unobserved changes in loan demand (following Degryse et al. 2016). Bank-time fixed effects are included to control for all observed and unobserved bank heterogeneity in each period.

[2] While there is a risk of selecting mainly closures occurred in rural areas, in fact this is not the case. Only one-fifth of the closed branches in the sample were located in areas with a low level of urbanization. Moreover, the closures are spatially well distributed over the country and seem to reflect the distribution of Italian branches.

[3] There are several facts that suggest the sample closures are likely the result of such a process: *(i)* most of these branches belong to large banking groups; *(ii)* they are mostly small-sized; *(iii)* the bank often had a relatively close alternative branch; *(iv)* the nearby branch was often located in more urbanized areas.

The main two results of this paper can be summarized as follows. The first result is that branch closures are associated with a 5.0 percentage points rise in the relationship termination rate during the two-year window around the closing date (from 18.3 to 23.3). The impact is weaker the shorter is the distance from the alternative branch of the bank, the longer is the duration of the relationship and the higher is the bank's share of loans to the firm. The result is highly statistically significant and robust to a number of robustness checks. Two facts are noteworthy. First, there is evidence of a statistically significant effect in the 12-month period ending with the closing date (1.4 percent), while the branch was still operative, which is concentrated in the three months prior to the event. Second, the effect weakens during the second post-closing year, but remains statistically significant.

The second main result is that branch closures is not associated with a decline in the total amount of credit available for the borrowing firms during the 24-month window around the closing date. There is a negative effect on loans in first post-closing year, but only for small firms (with less than 20 employees) and short-term credit lines. The effect seems to be temporary as it vanishes in the second year.

Finally, I also provide some evidence on the effect of branch closure on the cost of credit for the borrowers. Branch closures are associated with a decline in the cost of credit for large firms, which is to some extent related to relationship termination.

The paper is organized as the following. Section 2 briefly discusses the related literature. Section 3 details the data and the matching procedure. Section 4 describes the sample and the empirical model. Section 5 examines the effect of branch closures on the probability of relationship termination. Sections 6 and 7 investigate the consequences of branch closures on (total) credit availability and the cost of credit, respectively. Section 8 concludes.

## 2. Related literature

The empirical literature that has studied the effect of branch closures on credit relationships is scarce. To the best of my knowledge, this paper is the first attempt to examine the impact on existing credit relationships using bank-firm matched data. Nguyen (2019) studies the effect of branch closures in the U.S. using Census tract level data and shows that closures lead to a prolonged decline in (new) loans to local small business. As a solution to the endogeneity problem, Nguyen uses Census tract level variation in exposure to post-merger consolidation. Focusing on branch closures that follow a merger has three drawbacks, which would make my analysis less interesting. First, it is very likely that overlaps will arise in areas with many branches. Second, it is likely that the branches that overlap are very close. Third, it could be difficult to disentangle the effects of the branch closure from those related to the merger. Several studies, using bank-firm matched data, indicate that merger can affect the supply of loans and the probability of relationship termination (e.g., Sapienza 2002, Bonaccorsi Di Patti and Gobbi 2007).

A related strand of the literature looks at the importance of distance to the bank's branch office. For instance, Agarwal and Hauswald (2010) find that more distant borrowers get less credit from the bank. My work allows answering this question: what happens if the distance from the bank changes? The existence of a closing-induced increase in termination rates confirms that the distance plays a role. However, the effect appears to be heterogeneous. In particular, the impact is lower for the most intense relationships. This evidence suggests that once a relationship is created, it is likely to survive to a subsequent increase in distance.

The inertia for more intense bank-firm relationships can be due to the existence of switching costs (see for a survey Farrell and Klemperer 2007). Barone, Felici and Pagnini (2011), using Italian data at bank-firm level, empirically show that firms changing their main lender are exposed to a sizable switching costs. They find that banks charge to new borrowers significant lower interest rates to cover part of the switching costs, as also documented in Ioannidou and Ongena (2010). In a recent paper, Bonfim, Nogueira and Ongena (2016) investigate loan conditions when branches close and banks have otherwise no branches in the vicinity. They find that firms that transfer loans to a nearby branch of another bank do not receive the discount in loan rates that prevails when firms otherwise switch banks. Consistently with the results of this work, I find a statistically significant reduction in the cost of credit only when banks do have other branches in the area where the closures occur.

Several studies have focused on the role of personnel-specific soft information in the credit process (e.g., Drexler and Schoar 2014, Qian et al. 2015). Drexler and Schoar provide evidence that borrowers whose loan officers are on leave are less likely to receive new loans from the bank and more likely to apply for credit from other banks. After a branch closure the staff members are typically reallocated among other branches, and this can result in a loss of soft information. This fact can explain why I find statistically significant effects even when the distance increase caused by a branch closure is small.

## 3. Data and matching procedure

The data cover a sample of Italian firms and bank branch closures over the period from 2010 to 2014. I use two main sources, both coordinated by the Bank of Italy. The first source is the Archive on financial institutions. The database includes very detailed information on bank branches, including the date and the reason of closure (i.e., final closure, branch relocation, M&A). The second source is the Italian Credit Register (CR). The Register contains information on loan contracts granted to each borrower with debt from a bank above the threshold of 30,000 euro. The data set includes other information such as economic activity (ATECO 2007) and institutional sector (ESA 2010).

Unfortunately, CR information is not available at branch level, because banks only report the municipality where the lending branch is located. If a bank has two or more branches in the same municipality, it is not possible to associate the borrowing firms to the lending branch. To bypass this problem, I restrict my sample to the cases where a bank had in a given municipality one branch and then closed it[4]. Such situation is very common in Italy. This was the case for half of all branches operating at the end of 2009. The reason is that there are many small-sized municipalities, even in highly urbanized areas[5].

The closure of a branch may depend on bank's and local economy's characteristics which may by themselves affect the outcomes. For example, the occurrence of an idiosyncratic bank shock may result in branch closures while changing overall bank's credit supply, also in municipalities where the bank is remaining with active branches. Similarly, a local economic shock might induce branch closures as well as a reduction in the demand for credit by local firms. Furthermore, the firms that borrowed from the closed branches could operate in sectors characterized by poor growth prospects. Indubitably, the empirical challenge of this paper is to isolate the casual effect of branch closures. To

[4] The use of administrative borders to select closures should not give rise to a selection problem, since they should not affect the bank's decision to close a branch.

[5] The average extent of Italian municipalities is very low and equal to 37.3 km$^2$ (the median value is also lower, 21.9 km$^2$).

address this, I create a comparison group of bank-firm relationships by implementing an exact matching on observables.

Using the Archive on financial institutions, I detect the branch closures occurred in the period 2010-2014[6]. I only consider final closures, not mere branch relocations. My sample comprises 500 closures, which represent around 10 percent of those that occurred in the period. Using CR information, I then identify the borrowing firms reported by the closed branch exactly 12 months before the closing date. From now on, I will refer to these firms (or relationships) simply as 'treated'. For each of them, I firstly identify a large set of nearby bank-firm relationships, for which the firm is located near to the treated one and borrows from a bank branch near to the closed one[7]. Then, I match (with replacement) on two firm variables: industry (24 sector groups, Table A1) and size (three classes based on the number of employees and legal form, ESA 2010).

As the number of matched pairs is very large, I obtain CR information on firm loans for a (still large) subset. Instead of selecting at random, I conduct a nearest neighbor matching in order to obtain the most appropriate control group of credit relationships. The following three variables are considered: the distance between the firms, the distance between the branches, and the bank size (7 sortable size classes, Bank of Italy)[8]. Using the propensity score matching is not worthwhile at this point, because this would need to break down the exact matching. As an alternative, I use the Euclidean distance normalized (NED) by dividing the 'distance' for each variable by the range of that variable[9]. I obtain loans information for up to 35 nearest neighbors.

[6] I exclude from the sample the branches whose bank stopped operating as a standalone entity in the year after the closure, for example because merged with another bank. In such a case, it would be difficult to disentangle the effects of the branch closure and of the merger. I exclude branches belonging to foreign banks and banks specialized in financing to households (with over 90 percent of loans to the private sector provided to families). I also exclude some branch closures carried out by minor banks (with total assets below € 1.3 billion). Such events are unlikely to be related to the 'restructuring' process that characterized the sample period. If I include these branches, the results remain substantially unchanged.

[7] A is considered a 'nearby' relationship for B if: (i) the distance between the municipalities where firms A and B have their legal head office is less than 25 km and (ii) the distance between the municipalities where the bank branches A and B are located is less than 25 km, too.

[8] Banks are classified according to the volume of total assets. The variable used in the nearest neighbor matching is a categorical variable that assumes values from 1 to 7.

[9] For each matched pair, I compute the following coefficient:

Overall, the matching procedure is a sort of combination of exact and nearest neighbor matching. To sum up, the procedure allowed me to find firms located near to the treated ones, belonging to the same industry, having the same class size, and borrowing from a branch near to the closed one, which eventually belonged to a bank with comparable size.

To further mitigate the endogeneity problem, I restrict my sample to those firms that 12 months before the branch closure did not display any NPLs and did not default within the following year. To get a balanced panel, I impose that a firm must be reported in CR (by any bank) at the date of closure and after 12 months. To control for outliers, I drop firms with granted amounts below 30,000 euros[10] or greater than 1 billion euros.

The termination of a bank-firm relationship can be affected by its length and relevance. Such two characteristics, commonly used as proxies for the intensity of the relationship, are not related to any variable already included in the matching. Thus, I further improve the (exact) matching using the following two dummy variables: length and share. The first variable is equal to one if the length of a bank-firm relationship is less than two years; the second variable is equal to one if the value of loans from a bank is greater than the 50 percent of the firm's loans. Table A2 lists all the variables used in the matching procedure.

Finally, for the treated units with at least two controls, I select up to five nearest neighbors[11]. As I will show below, such a choice gives rise to a well-balanced sample. The final sample comprises 5,228 treated units and 22,259 controls. The next section provides a descriptive analysis of the sample and of the empirical model.

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$$\mathrm{NED_{ij}} = \frac{\left[\sum_{\mathrm{v}=1}^{3}\left(\frac{(\mathrm{p_{jv}} - \mathrm{p_{iv}})^2}{\mathrm{md_v}}\right)\right]^{1/2}}{\sqrt{3}}$$

where $\mathrm{md_v} = [\max(\mathrm{var_v}) - \min(\mathrm{var_v})]^2$, *i* is a treated relationship, and *j* a matched control. $\mathrm{md_v}$ is equal to $(25)^2$ for the two distance variables and $(6)^2$ for the bank size. $\mathrm{NED_{ij}}$varies between zero and one. Note that $\mathrm{NED_{ij}} = 0$ when $\mathrm{p_{jv}} = \mathrm{p_{iv}}$ for every v.

[10] A firm is also reported in CR if the amount of collateral is above the threshold.

[11] When more than one credit relationship of the same firm is matched to a same treated unit, only one, the most similar, is picked. Such choice allows preserving the sample balance when I study the effect of branch closures at firm level. Otherwise, the number of control units would decline.

## 4. Sample description and empirical model

### *4.1 Closed branches*

This subsection describes the 500 closed branches in the sample. I provide some descriptive statistics supporting the idea that the closures are unlikely idiosyncratic events, but the result of a wider process aimed at improving banks' efficiency. Indeed, during the sample period, the sudden increase in branch closures was mainly due to large banking groups and was primarily driven by the need to cut costs.

The banks responsible for the sample closures are 55, the 7 percent of all Italian banks at the end of 2009 (Table A3). Their market shares were 57.8 percent for bank branches and 46.5 percent for business loans. About half of the banks were members of one of the top five Italian banking groups. The 76.8 percent of the closed branches in the sample belonged to these banks. This is consistent with the fact that the wave of branch closures in the sample period were mainly due to large banking groups.

The sample branches are mostly small-sized (Table A4). The closed branches have, on average, 3.1 employees, 510 depositors and 263 borrowers. The outstanding deposits and loans amount, respectively, to 4.7 and 9.7 million euros. The small size reflects the fact that in the sample period banks have frequently closed small branches. Mistrulli et al. (2019) find evidence of this behavior in the period 2007-2015.

Figure 2 illustrates the distribution of the municipalities where the 500 branch closures occurred. A first look at the map indicates that branch closures are spatially well distributed over the country. Table A5 provides some statistics to support this point. First, there are few cases where two or more closures occurred in the same municipality. Second, the municipalities were located in 96 out of 110 Italian provinces. Their distribution also seems to reflect the whole distribution of bank branches. The 58.2 percent of the closures occurred in the North area, where it was localized the 58.0 percent of the Italian branches at the end of 2009. Table A6 shows that the sample closures occurred less frequently in very large municipalities (only 6.2 percent was located in municipality with more than 50,000 residents). The reason is that it is unlikely that a bank has only one branch in a very large municipality and decides to close it. Nonetheless, 78.6 percent of sample closures took place in areas characterized by a high or medium level of urbanization (only 20 percent in totally mountain municipalities).

When a bank closes a branch, it normally consolidates the borrowers with a nearby branch, that I call the 'receiving' branch. I define the receiving branch as the branch to which most of the borrowing firms moved after the closure. Due to data availability, it is possible to identify only the municipality in which the receiving branch was located[12]. The median distance between the 'receiving' municipality and the municipality where the branch closure occurred is 8.7 km (the average is 15.5 km, Table A6). The receiving municipality often has a larger population and a higher level of urbanization.

*4.2 Bank-firm relationships*

The bank-firm relationships involved in a branch closure are 5,228, to whom I matched 22,259 controls. Many firms are micro or small. The treated firms have a median amount of (granted) credit of nearly 375,000 euros and a median number of lenders of 3 (the means are 2.5 million and 3.8). The same values for the controls are, respectively, 366,000 euros and 2 lenders (2 million and 3.4). Treated and control samples have a similar share of single-bank firms (26.0 and 26.9 percent, respectively).

In the previous subsection, we have seen that the banks that closed the branches often had (at least) another branch in a nearby municipality. By construction, firms in the control sample borrowed from a bank branch near to the closed one. Thus, it is possible that such a branch belongs to the bank that closed the branch. In fact, this occurs in the 14.5 percent of the matches. Moreover, in 60 percent of cases the nearby branch pertained to another bank in the treated sample. This means that most of the control bank-firm relationships belongs to one of the 55 banks responsible for the sample branch closures.

Table A7 displays the number of treated and control observations by year. Overall, the average number of controls for treated unit is 4.3. Table A8 provides a comparison between the treated and control units. As anticipated above, the choice of a control ratio of 1:5 (with a minimum of 1:2) gives rise to a quite balanced sample (column 2). A two-sample t-test is performed to check the existence of differences in means for the variables used in the matching procedure and no significant differences are found, except for bank size. The control bank-firm relationships are located very close to the

[12] A year after the closing date, the 88 percent of the continuing firms borrowed from a branch located in the receiving municipality. Moreover, in the 90 percent of these cases the receiving municipality is also the nearest to the municipality where the closed branch was placed.

treated ones: the average distance is 4.9 km between the firms and 4.5 km between the lending branches. Note that in both groups the firms are near to their lending branch.

*4.3 The empirical model*

To estimate the effects of branch closure on borrowing firms I consider a two-year window around the branch closure (i.e., exactly 12 months before and after the event date). Thus, the data set is a panel with two observations for each bank-firm relationship. I pull the data across all the branch closures and estimate the average effect using the following model:

$$y_{fbct} = \alpha + \beta CLOSE_{fbct} + \mu \mathrm{NPLFIRM}_{ft} + \gamma_{fc} + w_{islct} + \delta_{bt} + \varepsilon_{fbct} \quad (1)$$

where subscripts *f, b, i, l, s* and *t* denote firm, bank, industry, size, location[13], and (calendar) year. The subscript $c$ indicates the 'cohort' (the closed branch). Each cohort comprises the firms borrowing from the closed branch and the comparison group of controls. *CLOSE* is a dummy equal to one when firm *f* borrowed from closed branch $c$ and the calendar year $t$ is the post-closing year. $\beta$ is the parameter of interest and measures the change in the dependent variable due to branch closure.

I include firm-fixed effects ($\gamma_{fc}$) to control for observed and unobserved, time-invariant differences across firms and industry-size-location-cohort-time fixed effects ($w_{islct}$) to control for observed and unobserved changes in loan demand, following Degryse et al. (2016)[14]. The specification also includes the ratio of nonperforming loans over total loans (NPLFIRM), as a proxy of creditworthiness. Finally, bank-time fixed effects ($\delta_{bt}$) are included to control for all observed and unobserved bank heterogeneity in each period. To account for potential correlation of the errors generated by the matching procedure, the standard errors are clustered by cohort[15]. Despite of many fixed effects, thanks to the matching procedure, the number of singletons is very low (66).

[13] The Local Market Area (LMA) where the treated firm was located. LMAs are computed by the Italian Statistical Institute (ISTAT). They are sub-regional geographical areas where the bulk of the labor force lives and works.

[14] I include 'cohort' in the fixed effects, as in Gormley and Matsa (2011). Allowing fixed effects to vary across cohort is more conservative. Comparable results are obtained if simple fixed effects are included.

[15] Estimations are performed using the Stata package REGHDFE, implemented by Correia (2017), which is capable of estimating models with more than two high-dimensional fixed effects. Specifically, REGHDFE allows reducing computational burdens and it correctly estimates the cluster-robust errors.

My setting mirrors a difference-in-differences approach. However, when the dependent variable is relationship termination, the data set is not suitable for obtaining difference-in-differences estimates, because by construction all bank-firm relationships in the sample were active at the pre-closing date (i.e., 12 months before the event). Thus, in this case, the parameter $\beta$ measures the simple difference in the two-year termination rates between the treated and control group. Even if y is a binary outcome, I employ a linear probability model, because it allows the inclusion of a large number of fixed effects and estimates are much easier to interpret.

## 5. The effects of branch closures on relationship termination

*5.1 Baseline results*

In this subsection, I study the effect of branch closure on relationship termination. Termination is supposed to occur when the bank stops reporting the firm in the Credit Register. The dependent variable in the model (1) is set to one when a bank-firm relationship terminates, zero otherwise. As discussed above, Equation (1) allows me to simply compare the termination rates of treated relationships versus the termination rates of control relationships over the 24-month window around the closing date.

Table 1 reports two-year termination rates for both treated and control samples. Treated relationships are terminated more frequently than control relationships (23.3 percent versus 14.2 percent). Table 2 statistically supports this evidence. The estimate for the parameter β in equation (1) is positive and highly significant (column 1 and 2). The magnitude of the effect is 5.0 percent. This is the first main result of the paper.

Table 3 reports the (cumulative) year-by-year estimates. The treated sample displays a higher termination rate than the control sample in the year ending with the date of the event. Thus, to some extent the effect of branch closure seems to be anticipated. This is very plausible as branch closure is unlikely to be completely unexpected for the borrowers, who probably knew in advance that the bank would have closed their branch. The estimated impact is 1.4 percent, significant at the 5 percent level (column 1). Figure 4 and 5 plot the quarter-by-quarter coefficients, obtained by separately estimating the model (1) over the eight quarters around the date of branch closure. Figure 4 displays the estimates of the cumulative effect, Figure 5 the estimates obtained using only the continuing bank-firm relationships at the beginning of each quarter. Both figures show that the anticipated effect is substantially concentrated in the quarter immediately before the branch closure. Interestingly, the coefficient in the fourth quarter preceding the closure is not statistically different from zero.

The effect of branch closure on relationship termination is stronger after the branch stopped operating. Considering only the continuing relationships at the closing date, the estimated impact is 4.2 percent in the next 12 months (Figure 3). Figure 5 shows the effect is substantially stable in the first three quarters, then decreases in the fourth quarter but remains statistically significant. This seems to indicate the existence of a possible persistence. Indeed, the cumulative impact rises to 6.8 percent after 24 months from the closing date (column 3 of Table 3). Figure 3 confirms the existence of a positive but smaller effect during the second post-closing year.

### *5.2 Robustness*

In this subsection I subject the result in column 2 of Table 2 to a number of robustness tests. I start with addressing the concern that outliers may drive the result. I run the same regression on several subsets of closed branches. I use the closures between the 5 and 95 percentiles. To impose the restriction I alternately consider four branch-level variables: (1) the share of terminations, (2) the number of borrowing firms, (3) the distance from the receiving branch and (4) the (average) distance from the borrowing firms. The results are reported in Table A9. The estimate for the parameter $\beta$ varies from 4.7 to 6.9 percent.

The control sample is constructed by selecting a maximum number of five controls per treated unit. Only the treated units with at least two controls are considered. I replicate the same regressions in column 2 of Table 2 using different values for the (maximum and minimum) matching ratio. Table A10 illustrates the estimates. The estimate for the parameter β varies from 4.4 to 6.6 percent.

The estimates in Table 2 are conducted at the individual bank level. However, the decision to close a branch may be made at the group level, for instance to remove an overlapping resulting from an acquisition[16]. Thus, the consolidation of the closed branch with a nearby branch of a sister bank could explain the result. To provide evidence that this is not the case, I replace bank-time FE with group-time FE (column 1 of Table A11) and then suppose termination occurs when the firm is no

[16] The firms that borrowed simultaneously from two or more banks belonging to the same banking group account for 3 percent of the whole sample.

longer reported in the CR by any bank belonging to the same group (column 2). In both cases, the result still holds.

To control for bank characteristics, bank-time fixed effects are included in the model. I do not perform an exact matching on bank characteristics. Only bank size is used to select the matches to be included in the sample. Yet, as seen above, most of the control relationships (the 75 percent) pertain to the 55 banks responsible for the sample closures. I exclude the control relationships that do not pertain to these banks and the estimate remains unchanged (column 3).

Finally, because the matching is done with replacement, some controls are matched to more than one treated relationship. Table 14 shows that these duplicates do not drive the result. The estimate does not change when duplicates are weighted (column 4) or dropped (column 5).

### *5.3 Heterogeneous effects*

Thus far, the results have shown that branch closure has a statistically significant and robust effect on relationship termination. For further evidence on the nature of this relation, in this subsection I examine the existence of heterogeneity along some relevant bank, firm or credit market characteristics. I interact the variable of interest *CLOSE* in model (1) with two dummy variables and perform an F-test to determine whether the two estimates of the coefficient $\beta$ are statistically different. Table 4 shows the results.

The positive impact of branch closures on the termination rate suggests that physical proximity should matter. If this is the case, the closing-induced increase in the termination rate should be related to the induced increase in the distance from the bank. Table 4 shows this is the case. The effect on relationship termination is weaker when the individual bank has an alternative branch in a nearby municipality (less than 9 km away, column 3).

The effect of branch closures should be related on the ease with which borrowing firms can replace the bank, with a new nearby bank or a bank from which it already borrowed. Actually, branch closures lead to a larger increase in termination rates when there are many branches belonging to rival banks inside the municipality where the closure occurred (3 or more branches, column 4) and when the firms has multiple credit relationships (column 5).

The ease of exiting the relationship may also depend on the type of loans. Contractually, early termination is easier for revolving credit lines and loans backed by accounts receivable than term loans. As shown in Table 4, branch closures lead to a larger increase in termination rates when the share of term loans is low (less than 20 percent of the firm's loans held at the bank; column 9). This indicates that the effects of branch closures may take some time to fully materialize, which is consistent with the existence of a statistically significant effect in the second post-closing year (Figure 3 and Table 3).

Theoretical considerations on relationship banking suggest that the effects of branch closure may be related to the intensity of credit relationship, which can be measured by both the length and the share of firm's debt held at the bank. Indeed, the impact on the termination rate is larger for young relationships (less than 2 years old; column 6) and when the value of loans from the bank is low (less than 50 percent of firm's loans; column 7). In line with this evidence, the induced increase is greater when the firm uses only a small fraction of the granted loans (less than 50 percent, column 8).

Finally, the effects of branch closures on termination rates are similar for small firms (with less than 20 employees) and large firms (column 1). With regards to branch size, the estimated coefficient for large branches (with more than 3 employees, column 2) is lower than that for small ones, but the two coefficients are not statistically different.

## 6. The effects of branch closures on credit

In this section, I investigate whether the decision of a bank to close a branch affects the total credit availability for the borrowing firms. Following Bonaccorsi Di Patti and Gobbi (2007), the dependent variable in model (1) is now the logarithm of the loans granted to the firm (and reported in CR) by all the banks (*LOGCRTOT*). Thus, the estimated effect also captures the reaction of the rival banks. I consider all the firms in the sample, regardless of the fact that the credit relationship with the bank is terminated or not. The bank-time FE is excluded from the estimations.

Table 5 reports the estimates for the entire sample. Branch closures are not associated with a decrease in credit availability in the 24 months around the closure (column 1 and 2). The coefficient of interest $\beta$, which measures the change on credit due to branch closures, is negative but not statistically and economically significant (-0,6 percent). This is the second main result of the paper. Note that no effect is found in the pre-closing year (column 3) or in the post-closing year (column 4).

The coefficient is negative only in the latter case. These estimates suggest that the firms that have terminated the relationship with the bank were able to obtain credit from other banks.

As shown in column 1 of Table 4, branch closures lead to similar increases in relationship exist for large and small firms. Table 6 shows instead there exists a negative effect on credit only for small firms, and only in the year after the event (columns 1 and 2). When I run the model (1) for small firms in the year beginning at the closing date a 2.1 percent reduction in total credit is found, significant at 1 percent level (column 3). However, the effect appears to be temporary as it vanishes in the second year (Figure 6). To some extent, it seems to be related to relationship termination, as borrowers who experience relationship termination and a branch closure are associated with a larger decrease in credit than borrowers who experience only relationship termination (column 4). Interestingly, the adverse effect of branch closures is found to be limited to short-term credit lines (revolving credit lines and loans backed by accounts receivable; Table 7, columns 3). This is consistent with the evidence of a stronger impact on termination rates among credit relationships with a low share of term loans (Table 4, column 9).

To better characterize the result in column 3 of Table 6, I investigate the existence of heterogeneous effects. Table 8 contains the estimates. Consistently with the evidences on relationship termination (Table 4), the adverse effect on credit availability for small firms is found only when the number of bank branches located in the municipality where the closure occurred is high (column 2), the firm has multiple credit relationships (column 3), and the firm holds at the bank less than half of its bank debt (column 4). On the contrary, there is no effect when the length of the relationship with the bank is less than two years (column 6), despite younger relationships experience a higher increase in termination rates, as shown in column 6 of Table 4. Finally, the adverse impact on credit is not related to the distance of the alternative branch of the individual bank (column 1). A negative effect is observed even when the receiving branch is near to the closed one.

## 7. The effects of branch closures on the cost of credit

In this section, I study the effect of branch closures on the cost of credit for the borrowers. I focus on credit lines contracts, because banks can unilaterally modify at any time the interest rates charged to the borrowers. The analysis is performed at firm level. As in the previous section, I estimate the model

(1) by considering all the firms in the sample, regardless the credit relationship with the bank is terminated or not. The bank-time FE is excluded from the estimations.

The dependent variable in model (1) is now the (weighted[17]) average interest rate on the credit lines granted to the firm by its lending banks (*CREDITCOST*). The parameter of interest $\beta$ measures the change in the cost of credit lines associated to a branch closure. Given that the interest rate charged to the firm may also depend on the size of the loans, I also include in the specification the logarithm of the total amount of credit lines (*FIRMLOANS*).

The analysis cannot be conducted on the entire sample, because not all firms have credit lines and interest rate data are not always available. Specifically, information on interest rates are only reported by a subset of banks (the most representative ones) and the reporting threshold (75,000 euros) is higher than that for loans (30,000 euros). The final subsample[18] comprises 1,999 treated units and 7,604 controls (on average, 3.8 controls per treated unit, with standard deviation of 1.22). With reference to firm size, the share of small firms is now lower than in the entire sample (27.1 and 48.7 percent, respectively), most likely due to the higher reporting threshold.

Table 9 shows the results of the estimates. Branch closures are associated with a weak decrease in the cost of credit in the 24 months around the closure (column 1 and 2). The coefficient of interest $\beta$ is -0.12, statistically significant only at the 10 percent level. No effect is found in the pre-closing year (column 3), but only in the post-closing year (column 4). The negative effect is observed only for large firms (Table 10). When I run the model for large firms in the year beginning at the closing date a 17 basis point reduction in the cost of credit is found, significant at 5 percent level (column 1). Figure 7 shows that there is some persistence in the effect during the second year. As shown in column (2) of Table 11, the decrease in the cost of credit associated to branch closure appears to be related to relationship termination. Some studies have empirically shown that firms that switch banks receive a discount in loan rates (Ioannidou and Ongena 2010, Barone, Felici and Pagnini 2011). These

[17] The weighted average is calculated using as a weight the quarterly amount of drawn loan (daily balance) times the number of days, which is used to compute the interests that the borrower has to pay.

[18] Given that data on interest rates are quarterly while those on loans are monthly, I match loans with interest rate information at the end of the calendar quarter. To limit the impact of outliers, the 1% tails of the data are winsorized. To have a balanced sample, I only include the (treated and control) firms that have credit lines at -12, 0 and +12 months relative to the branch closing date. Finally, as for the loan analysis, I consider the treated units with at least 2 controls and a maximum of 5 controls per treated unit.

evidences are consistent with the existence of switching costs. In a recent work, Bonfim, Nogueira and Ongena (2016) find no evidence of a discount in loan rates for firms that switch banks when branches close and banks have otherwise no branches in the vicinity. Consistently with this result, estimation in column (3) of Table 11 shows that the reduction in the cost of credit is statistically significant only when the banks do have other nearby branches.

## 8. Concluding remarks

This paper analyzes the effect of branch closures using bank-firm matched data. The main findings are as follows. Branch closures are associated with an increase in the probability of relationship termination. There is no evidence of an impact on total credit at firm level, a weak effect is found only for small firms. On the credit cost side, I found evidence of a statistically significant decline on loan rate for (large) firms, which seems to be related to relationship termination.

This paper uses a sample of branch closures occurred in Italy from 2010 to 2014. Due to limited data availability, the sample does not include all the closures (only 500, about the 10 percent). Specifically, the sample does not comprise branch closures occurred in the municipalities where the bank had two or more branches. Consequently, the result of this paper likely overestimates the impact of branch closures occurred in Italy in the sample period, as a weaker effect on relationship termination is found when the bank had an alternative branch in a nearby municipality.

The absence of a negative effect on credit available for firms formerly served by the closed branch does not necessarily mean that there is no effect at all. In fact, branch closures cause changes to the local banking structure (e.g., by reducing the intensity of bank competition), which may lower access to credit in the area in the future. In a recent paper, Nguyen (2019) finds evidence for the U.S. of a prolonged decline in (new) loans to local small business. I leave this question for future research.

# References

Agarwal, S. and Hauswald, R. (2010), “Distance and Private Information in Lending,” *The Review of Financial Studies*, 23 (7), 2757–2788.

Barone, G., Felici, R. and Pagnini, M. (2011), “Switching Costs in Local Credit Markets”, *International Journal of Industrial Organization*, 29 (6), 694-704.

Bonaccorsi Di Patti, E. and Gobbi, G. (2007), “Winners or Losers? The Effects of Banking Consolidation on Corporate Borrowers,” *Journal of Finance*, 62 (2), 669-695.

Bonfim, D., Nogueira, G. and Ongena, S. (2016), “Sorry, We're Closed: Loan Conditions When Bank Branches Close and Firms Transfer to Another Bank,” Working Papers w201607, *Banco de Portugal*.

Boot, A.W. (2000), “Relationship Banking: What Do We Know?”, *Journal of Financial Intermediation*, 9 (1), 3-25.

Correia, S. (2017), “Linear Models with High-Dimensional Fixed Effects: An Efficient and Feasible Estimator,” Working Paper.

Degryse, H., De Jonghe, O., Jakovljević, S., Mulier, K., and Schepens, G. (2016), “The Impact of Bank Shocks on Firm-level Outcomes and Bank Risk-taking,” Working Paper.

Degryse H., Kim, M., and Ongena, S. (2009), Microeconometrics of Banking, Oxford: Oxford University Press.

Drexler, A. and Schoar, A. (2014), “Do Relationships Matter? Evidence from Loan Officer Turnover,” *Management Science*, 60 (11), 2722-2736.

Farrell, J. and Klemperer, P. (2007), “Coordination and Lock-in: Competition with Switching Costs and Network Effects. In: Armstrong, M., Porter, R.H. (Eds.),” *Handbook of Industrial Organization*, Volume 3. North Holland.

Felici, R. and Pagnini, M. (2008), “Distance, bank heterogeneity and entry in local banking markets,” *The Journal of Industrial Economics*, 56 (3), 500-534.

Gormley, T. A. and Matsa, D. A. (2011), “Growing Out of Trouble: Corporate Responses to Liability Risk”, *Review of Financial Studies*, 24 (8), 2781-2821.

Ioannidou, V. P. and Ongena, S., (2010), “Time for a Change: Loan Conditions and Bank Behavior When Firms Switch Banks,” *Journal of Finance*, 65, 1847-1878.

Mistrulli, P. E., Antelmo, L., Galardo, M., Garrì, I., Pellegrino, D., Revelli, D. and Savino, V., (2019), “Why Do Banks Close? The Geography of Branch Pruning,” *mimeo*.

Nguyen, Hoai-Luu Q. (2019), “Are credit market still local? Evidence from Bank Branch Closings,” *Applied economics*, 11 (1), 1-32.

Petersen, M. A., and Rajan, R.G. (2002), “Does distance still matter? The information revolution in small business lending,” *The Journal of Finance*, 57 (6), 2533-2570.

Qian, J., Strahan, P.E., and Yang, Z. (2015), “The Impact of Incentives and Communication Costs on Information Production and Use: Evidence from Bank Lending,” *Journal of Finance*, 70 (4), 1457-1493.

Sapienza, P. (2002), “The effects of banking mergers on loan contracts”, *Journal of Finance*, 57, 329-368.

**Figure 1. The number of bank branches in Italy**

*(thousands)*

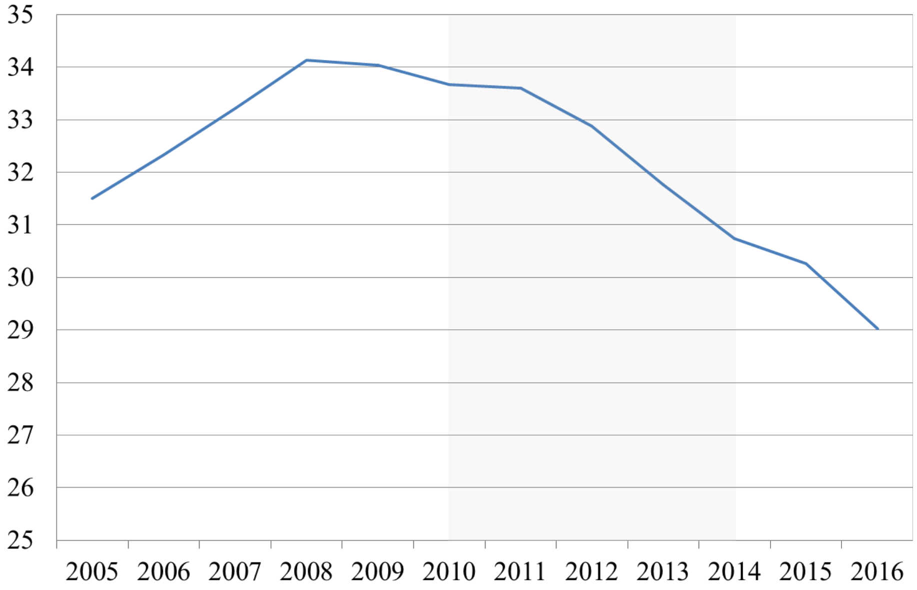


**Figure 2. The distribution of the sample branch closures**

**Figure 3. The effect of branch closure on termination**

*(year by year)*

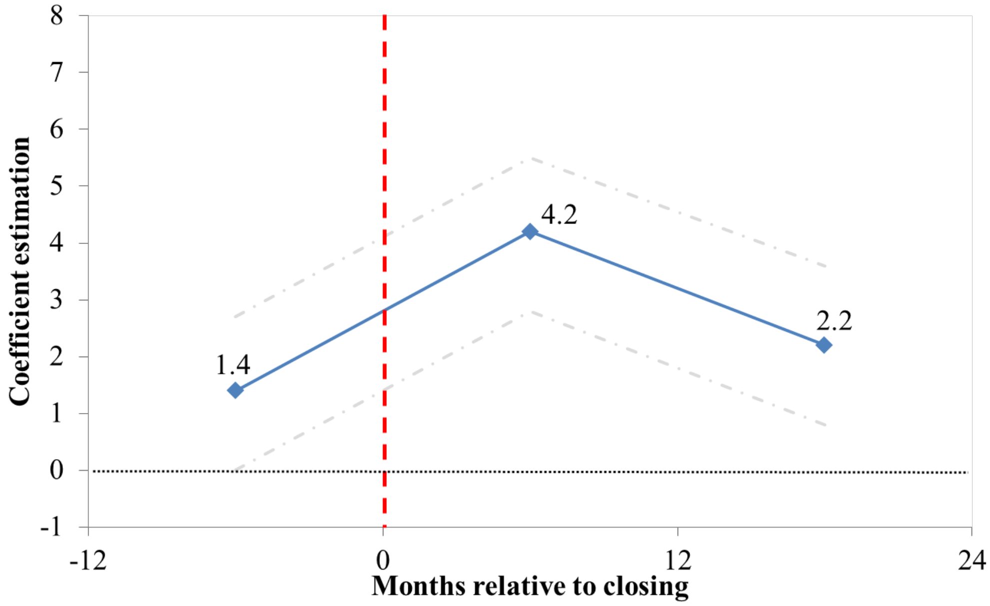



**Figure 4. The (cumulative) effect of branch closure on termination**

*(quarter by quarter)*

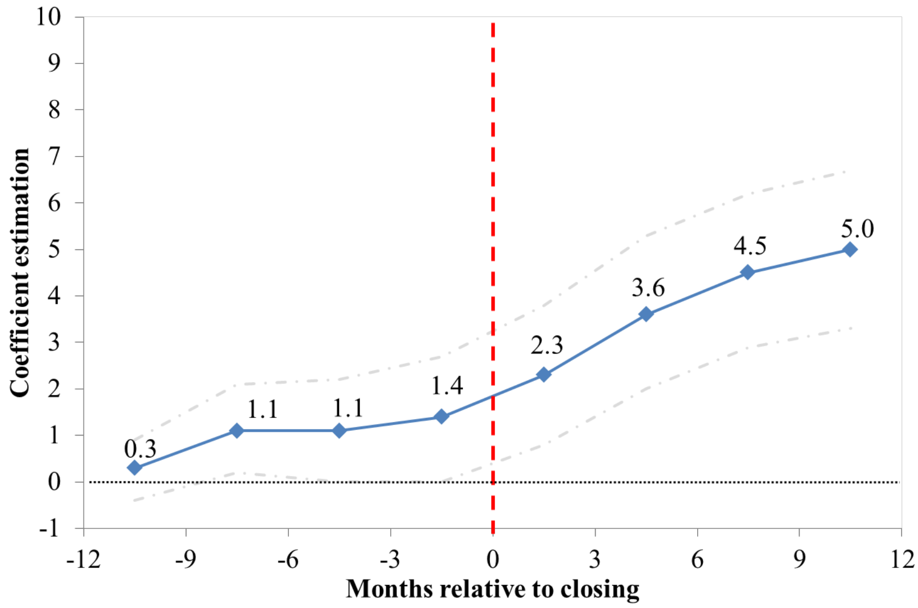


**Figure 5. The effect of branch closure on termination**

*(quarter by quarter)*

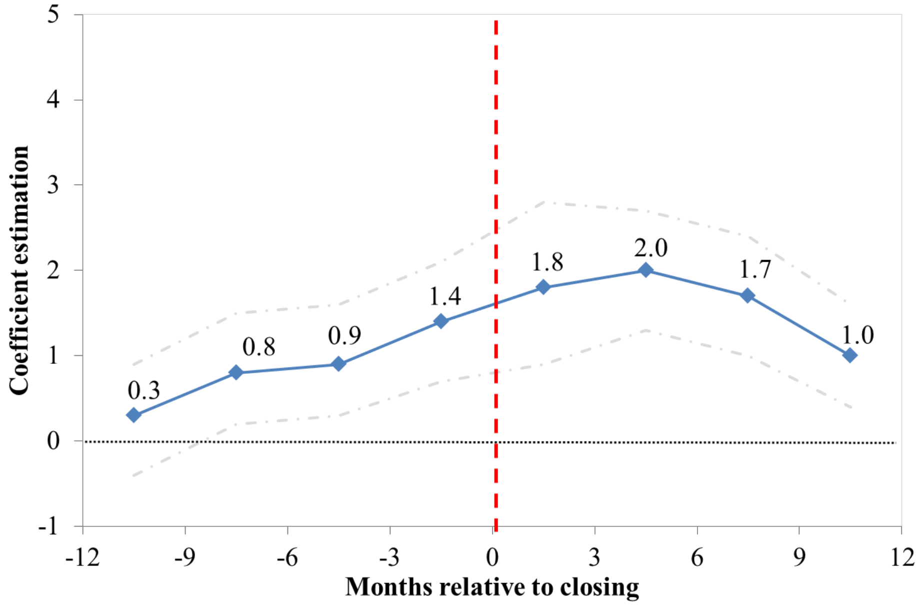



**Figure 6. The effect of branch closure on small firm loans**

*(year by year)*

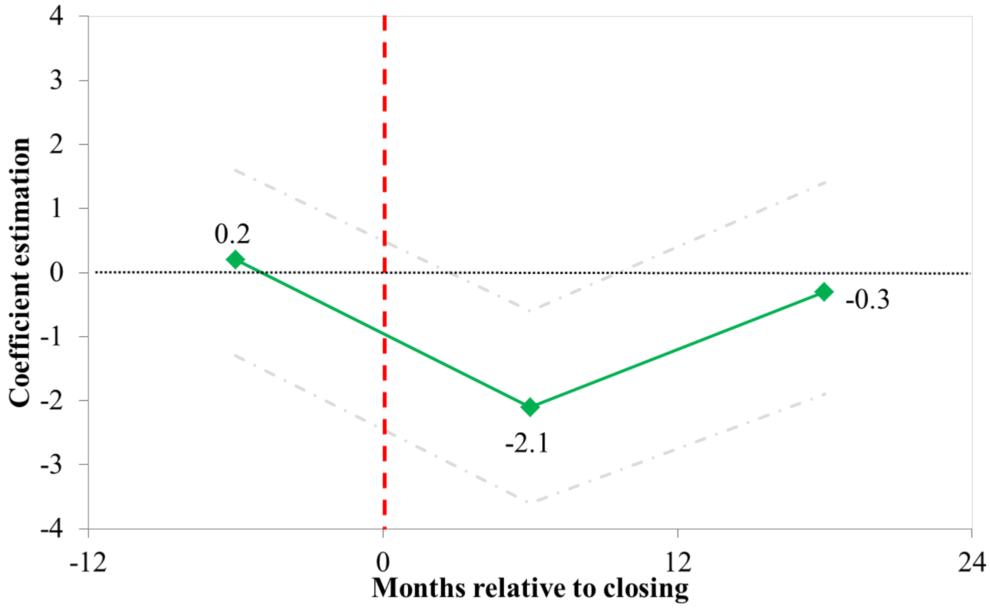
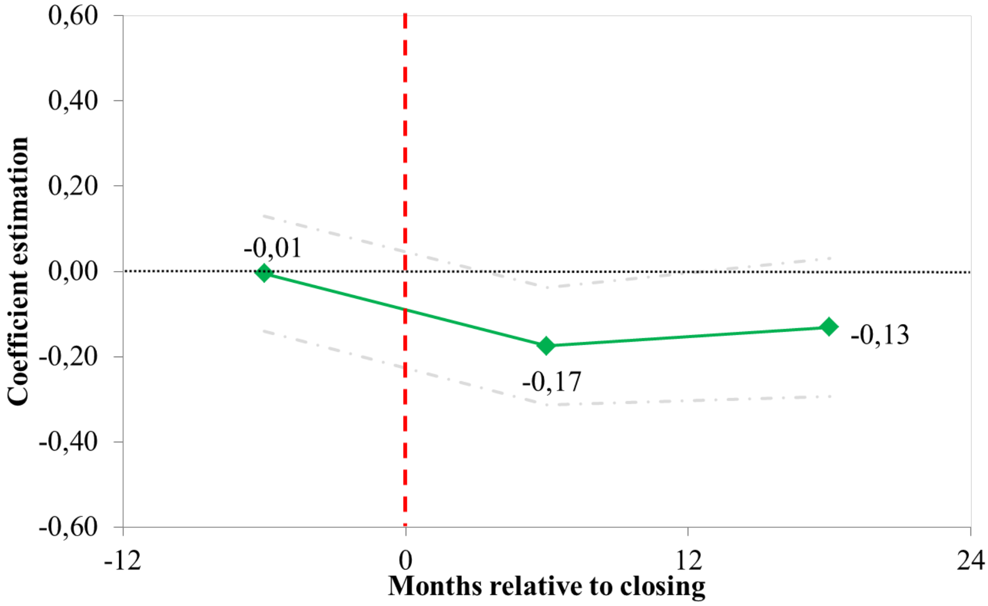


**Figure 7. The effect of branch closure on the cost of credit lines for large firms**

*(year by year)*



## Table 1. Descriptive statistics

| | Treated | | Controls | | Whole sample | | |
|---|---|---|---|---|---|---|---|
| Name of the variable: | Mean | SD | Mean | SD | Mean | SD | Obs. |
| **Relationship termination** | | | | | | | |
| ( -12,+12) window | 0.233 | 0.423 | 0.142 | 0.349 | 0.159 | 0.366 | 27,487 |
| **Log of firm's granted credit** | | | | | | | |
| - 12 months | 13.01 | 1.583 | 12.99 | 1.562 | 12.98 | 1.566 | 27,487 |
| +12 months | 12.86 | 1.655 | 12.85 | 1.616 | 12.86 | 1.624 | 27,487 |
| **NPL ratio** | | | | | | | |
| - 12 months | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 27,487 |
| +12 months | 0.051 | 0.197 | 0.039 | 0.174 | 0.041 | 0.179 | 27,487 |
| -share of firms | 0.094 | 0.291 | 0.069 | 0.255 | 0.074 | 0.262 | 27,487 |

## Table 2. The effect of branch closure on termination

*(after 12 months)*

Dependent variable: RELBREAK

| | (1) | (2) |
|---|---|---|
| CLOSE | 0.050*** | 0.050*** |
| | (0.009) | (0.009) |
| NPLFIRM | | -0.002 |
| | | (0.016) |
| Firm-Cohort FE | yes | yes |
| Industry-Size-Location-Year-Cohort FE | yes | yes |
| Bank-Year FE | yes | yes |
| No. of observations | 54,974 | 54,974 |
| No. of relationships | 27,487 | 27,487 |
| No. of treated | 5,228 | 5,228 |
| No. of branch closures | 500 | 500 |
| R-squared | 0.654 | 0.654 |

Standard errors clustered at the cohort level are in parentheses. ***p<0.01, **p<0.05, *p<0.1.

## Table 3. The effect of branch closure on termination

*(0, 12 and 24 months after the closing date)*

Dependent variable: RELBREAK

| | Months after the closing date: | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | +0 months | +12 months | +24 months |
| CLOSE | 0.014** | 0.050*** | 0.068*** |
| | (0.007) | (0.009) | (0.010) |
| NPLFIRM | -0.006 | -0.002 | 0.011 |
| | (0.018) | (0.016) | (0.015) |
| No. of observations | 54,974 | 54,974 | 52,860 |
| No. of relationships | 27,487 | 27,487 | 26,287 |
| No. of treated | 5,228 | 5,228 | 4,997 |
| No. of branch closures | 500 | 500 | 500 |
| R-squared | 0.632 | 0.654 | 0.678 |

Standard errors clustered at the cohort level are in parentheses. ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort, Industry-Size-Location-Year-Cohort, and Bank-Year fixed effects are included.

## Table 4. The effect of branch closure on termination: heterogeneous effects

Dependent variable: RELBREAK

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Firm size | Branch size | Distance | Munipality's branches | Multiple lending |
| CLOSE x LARGEFIRM | 0.049*** | | | | |
| | (0.011) | | | | |
| CLOSE x SMALLFIRM | 0.051*** | | | | |
| | (0.011) | | | | |
| CLOSE x LARGEBRH | | 0.037*** | | | |
| | | (0.013) | | | |
| CLOSE x SMALLBRH | | 0.059*** | | | |
| | | (0.011) | | | |
| CLOSE x HIGHDIST | | | 0.084*** | | |
| | | | (0.013) | | |
| CLOSE x LOWDIST | | | 0.026** | | |
| | | | (0.011) | | |
| CLOSE x MANYBRH | | | | 0.059*** | |
| | | | | (0.011) | |
| CLOSE x FEWBRH | | | | 0.030** | |
| | | | | (0.013) | |
| CLOSE x MULTI | | | | | 0.058*** |
| | | | | | (0.010) |
| CLOSE x SINGLE | | | | | 0.030** |
| | | | | | (0.013) |
| F-TEST | 0.02 | 1.71 | 13.60 | 3.02 | 3.85 |
| PROB>F | 0.89 | 0.19 | 0.00 | 0.08 | 0.05 |
| No. of observations | 54,974 | 54,974 | 54,878 | 54,974 | 54,974 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort, Industry-Size-Location-Year-Cohort, and Bank-Year fixed effects are included. NPLFIRM is included. SMALLFIRM is equal to one when the firm has less than 20 employees. SMALLBRH is equal to one when the branch has more 3 or less employees. LOWDIST is equal to one if the distance of the 'receiving' from the municipality where the closed branch was located is less than 9 km. FEWBRAN is equal to one if there were 3 or less branches in the municipality where closure occurred.

## Table 4. The effect of branch closure on termination: heterogeneous effects *(continued)*

Dependent variable: RELBREAK

| | (6) | (7) | (8) | (9) |
|---|---|---|---|---|
| | Length | Bank share | Drawn loans | Type of loans |
| CLOSE x OLD | 0.042*** | | | |
| | (0.009) | | | |
| CLOSE x YOUNG | 0.072*** | | | |
| | (0.017) | | | |
| CLOSE x HIGHSHARE | | 0.029*** | | |
| | | (0.011) | | |
| CLOSE x LOWSHARE | | | | |
| | | 0.065*** | | |
| | | (0.011) | | |
| CLOSE x HIGHDRAWN | | | 0.028*** | |
| | | | (0.010) | |
| CLOSE x LOWDRAWN | | | 0.096*** | |
| | | | (0.014) | |
| CLOSE x TERMLOANS | | | | 0.031*** |
| | | | | (0.010) |
| CLOSE x OTHERLOANS | | | | 0.071*** |
| | | | | (0.011) |
| F-TEST | 2.92 | 6.51 | 22.88 | 9.11 |
| PROB>F | 0.09 | 0.01 | 0.00 | 0.00 |
| No. of observations | 54,974 | 54,974 | 54,974 | 54,974 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort, Industry-Size-Location-Year-Cohort, and Bank-Year fixed effects are included. NPLFIRM is included. YOUNG is equal to one if the length of the bank-firm relationship is less than two years. LOWSHARE is equal to one if the value of loans from the bank is less than the 50 percent of the firm's loans. LOWDRAWN is equal to one when the firm used less than the 50 per cent of the credit granted by the bank. TERMLOANS is equal to one when the share of term loan at the individual bank is lower than 20 percent (the median).

## Table 5. The effect of branch closure on firm loans

Dependent variable: LOGCRTOT

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | | | Year before | Year after |
| CLOSE | -0.010 | -0.006 | 0.002 | -0.009 |
| | (0.008) | (0.007) | (0.005) | (0.005) |
| NPLFIRM | | -0.405*** | -0.174*** | -0.289*** |
| | | (0.027) | (0.023) | (0.027) |
| Firm-Cohort FE | yes | yes | yes | yes |
| Industry-Size-Location-Year-Cohort FE | yes | yes | yes | yes |
| No. of observations | 54,974 | 54,974 | 54,974 | 54,974 |
| No. of relationships | 27,487 | 27,487 | 27,487 | 27,487 |
| No. of treated | 5,228 | 5,228 | 5,228 | 5,228 |
| No. of branch closures | 500 | 500 | 500 | 500 |
| R-squared | 0.982 | 0.982 | 0.992 | 0.990 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1.

## Table 6. The effect of branch closure on firm loans: firm size

Dependent variable: LOGCRTOT

| | (1) | (2) |
|---|---|---|
| | | Year after |
| CLOSE x LARGEFIRM | 0.005 | 0.003 |
| | (0.011) | (0.008) |
| CLOSE x SMALLFIRM | -0.017 | -0.021*** |
| | (0.011) | (0.008) |
| CLOSE | | |
| | | |
| No. of observations | 54,974 | 54,974 |
| No. of relationships | 27,487 | 27,487 |
| No. of treated | 5,228 | 5,228 |
| No. of branch closures | 500 | 500 |
| R-squared | 0.982 | 0.990 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort and Industry-Size-Location-Year-Cohort are included. NPLFIRM is included.

## Table 7. The effect of branch closure on small firm loans

*(12 months after the closing date)*

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Dependent variable (LOG): | Total loans | Total loans | Credit lines and receivables | Term loans |
| CLOSE | -0.021*** | | -0.043*** | 0.012 |
| | (0.008) | | (0.014) | (0.019) |
| TREAT x POST x BREAK | | -0.117*** | | |
| | | (0.016) | | |
| CTRL x POST x BREAK | | -0.090*** | | |
| | | (0.013) | | |
| No. of observations | 26,768 | 26,768 | 20,795 | 17,674 |
| No. of relationships | 13,384 | 13,384 | 10,083 | 8,058 |
| No. of treated | 2,574 | 2,574 | 1,900 | 1,546 |
| No. of branch closures | 475 | 475 | 473 | 472 |
| R-squared | 0.981 | 0.981 | 0.981 | 0.966 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort and Industry-Size-Location-Year-Cohort are included. NPLFIRM is included.

**Table 8. The effect of branch closure on small firm loans: heterogeneous effects**

*(12 months after the closing date)*

Dependent variable: LOGCRTOT

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Distance | Munipality's branches | Length | Bank share | Multiple lending |
| CLOSE x HIGHDIST | -0.024** | | | | |
| | (0.011) | | | | |
| CLOSE x LOWDIST | -0.020* | | | | |
| | (0.011) | | | | |
| CLOSE x MANYBRH | | -0.030*** | | | |
| | | (0.009) | | | |
| CLOSE x FEWBRH | | -0.004 | | | |
| | | (0.014) | | | |
| CLOSE x OLD | | | -0.023*** | | |
| | | | (0.009) | | |
| CLOSE x YOUNG | | | -0.014 | | |
| | | | (0.015) | | |
| CLOSE x HIGHSHARE | | | | -0.012 | |
| | | | | (0.010) | |
| CLOSE x LOWSHARE | | | | -0.033** | |
| | | | | (0.013) | |
| CLOSE x MULTI | | | | | -0.037*** |
| | | | | | (0.011) |
| CLOSE x SINGLE | | | | | 0.000 |
| | | | | | (0.011) |
| F-TEST | 0.05 | 2.33 | 0.29 | 1.57 | 5.63 |
| PROB>F | 0.82 | 0.13 | 0.59 | 0.21 | 0.01 |
| No. of observations | 26,702 | 26,768 | 26,768 | 26,768 | 26,768 |
| R-squared | 0.981 | 0.981 | 0.981 | 0.981 | 0.981 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort and Industry-Size-Location-Year-Cohort are included. NPLFIRM is included. LOWDIST is equal to one if the distance between the 'receiving' and the 'previous' municipalities is less than 9 km. FEWBRAN is equal to one if there were 2 or less branches in the 'previous' municipalities, excluding the closed branch. YOUNG is equal to one if the length of the bank-firm relationship is less than two years.

## Table 9. The effect of branch closure on the cost of credit lines

Dependent variable: CREDITCOST

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | | | Year before | Year after |
| CLOSE | -0.11 | -0.12* | -0.01 | -0.12** |
| | (0.07) | (0.07) | (0.06) | (0.06) |
| NPLFIRM | | 1.56*** | 1.46*** | 1.50*** |
| | | (0.26) | (0.30) | (0.31) |
| FIRMLOANS (log) | | -0.51*** | -0.44*** | -0.28** |
| | | (0.10) | (0.13) | (0.12) |
| Firm-Cohort FE | yes | yes | yes | yes |
| Industry-Size-Location-Year-Cohort FE | yes | yes | yes | yes |
| No. of observations | 19,206 | 19,206 | 19,206 | 19,206 |
| No. of relationships | 9,603 | 9,603 | 9,603 | 9,603 |
| No. of treated | 1,999 | 1,999 | 1,999 | 1,999 |
| No. of branch closures | 404 | 404 | 404 | 404 |
| R-squared | 0.847 | 0.850 | 0.895 | 0.892 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1.

## Table 10. The effect of branch closure on the cost of credit lines: firm size

Dependent variable: CREDITCOST

| | (1) | (2) | (3) |
|---|---|---|---|
| | | Year before | Year after |
| CLOSE x LARGEFIRM | -0.18** | -0.00 | -0.17** |
| | (0.08) | (0.07) | (0.07) |
| CLOSE x SMALLFIRM | 0.02 | -0.02 | 0.03 |
| | (0.12) | (0.09) | (0.10) |
| No. of observations | 19,206 | 19,206 | 19,206 |
| No. of relationships | 9,603 | 9,603 | 9,603 |
| No. of treated | 1,999 | 1,999 | 1,999 |
| No. of branch closures | 404 | 404 | 404 |
| R-squared | 0.850 | 0.895 | 0.892 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort and Industry-Size-Location-Year-Cohort are included. NPLFIRM and FIRMLOANS are included.

## Table 11. The effect of branch closure on the cost of credit lines for large firms

*(12 months after the closing date)*

Dependent variable: CREDITCOST

| | (1) | (2) | (3) |
|---|---|---|---|
| CLOSE | -0.17** | | |
| | (0.07) | | |
| TREAT x POST x BREAK | | -0.46** | |
| | | (0.18) | |
| CTRL x POST x BREAK | | -0.11 | |
| | | (0.12) | |
| CLOSE x HIGHDIST | | | -0.14 |
| | | | (0.10) |
| CLOSE x LOWDIST | | | -0.22** |
| | | | (0.10) |
| No. of observations | 14,006 | 14,006 | 13,996 |
| No. of relationships | 7,003 | 7,003 | 6,998 |
| No. of treated | 1,410 | 1,410 | 1,409 |
| No. of branch closures | 340 | 340 | 339 |
| R-squared | 0.884 | 0.884 | 0.884 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort and Industry-Size-Location-Year-Cohort are included. NPLFIRM and FIRMLOANS are included.

# Appendix

## Table A1. Industry Definition

| No. | Description | Classification Ateco 2007 |
|---|---|---|
| 1 | Agriculture, forestry and fishing | 01-03 |
| 2 | Mining and quarrying | 05-09 |
| | Manufacturing | |
| 3 | *Food, beverages and tobacco products* | 10-12 |
| 4 | *Textiles, clothing and leather products* | 13-15 |
| 5 | *Wood and wood products and furnishings* | 16, 31 |
| 6 | *Paper, paper products and printing* | 17-18 |
| 7 | *Refined petroleum products, chemical products and pharmaceuticals* | 19-21 |
| 8 | *Rubber and plastic products* | 22 |
| 9 | *Basic metals, fabricated metal products and nonmetallic mineral products* | 23-25 |
| 10 | *Electronics products, electrical and non-electrical equipment and apparatus* | 26-27 |
| 11 | *Machinery and equipment* | 28 |
| 12 | *Motor vehicles and other transport equipment* | 29-30 |
| 13 | *Other products of manufacturing* | 32-33 |
| 14 | Electricity, gas, steam and air conditioning supply. Water supply, sewerage, waste management and remediation activities | 35-39 |
| 15 | Construction | 41-43 |
| | Services | |
| 16 | *Wholesale and retail trade, repair of motor vehicles and motorcycles* | 45-47 |
| 17 | *Transportation and storage* | 49-53 |
| 18 | *Accommodation and food service activities* | 55-56 |
| 19 | *Information and communication* | 58-63 |
| 20 | *Real estate activities* | 68 |
| 21 | *Professional, scientific and technical activities* | 69-75 |
| 22 | *Administrative and support service activities* | 77-82 |
| 23 | *Other service activities* | 84-98 |
| 24 | All remaining activities | |

## Table A2. Matching variables

| Variables | Description |
|---|---|
| | **Exact matching** |
| Firm's geographical position | The distance between the municipalities where the two firms have their legal head office is less than 25 km. |
| Branch's geographical position | The distance between the municipalities where the two branches are located is less than 25 km. |
| Firm's creditworthiness | Firms that did not display any NPLs 12 months before closure and did not default after one year. |
| Firm's industry | 24 industries (two-digit, see Table A1) |
| Firm's size | 1 if limited company or firms with more than 20 employees, 2 if firms with less than 20 and more than 5 employees, and 3 if firms with less than 5 employees. |
| Relationship's length | 1 if the length of a credit relationship is less than 2 years, 0 otherwise. |
| Relationship's relevance | 1 if the loans from the bank is larger than the 50 percent of the firm's loans, 0 otherwise. |
| **Nearest neighbor matching*** | |
| Distance between the firms | The distance between the municipalities where the two firms have their legal head office. |
| Distance between the branches | The distance between the municipalities where the two branches are located. |
| Bank's size | 7 orderable size classes, according to the volume of total assets. |

* Euclidean distance normalized by the range of each variable (see footnote 9). This coefficient is used to select a given number of matches for each treated unit.

## Table A3. Sample description: banks

| | Closing year | | | |
|---|---|---|---|---|
| | 2010-12 | 2013 | 2014 | 2010-14 |
| **Banks** | | | | |
| No. of banks | 32 | 28 | 32 | 55 |
| Share in a large banking group | 62.5 | 53.6 | 40.6 | 49.1 |
| Share of Italian banks | 4.1 | 4.0 | 4.7 | 7.0 |
| Share of Italian bank branches | 44.2 | 49.4 | 56.5 | 57.8 |
| Share of private sector's loans | 34.2 | 45.7 | 54.1 | 46.5 |
| **Closed branches** | | | | |
| No. of branches | 126 | 153 | 221 | 500 |
| Share of the bank's branches (mean) | 2.7 | 1.6 | 2.2 | 2.3 |
| Share in a large banking group | 79.4 | 80.4 | 72.9 | 76.8 |
| Large banks | 31.7 | 51.6 | 54.8 | 48.0 |
| Medium banks | 46.0 | 26.1 | 23.1 | 29.8 |
| Small banks | 22.3 | 22.3 | 22.1 | 22.2 |

The size classes 'large', 'medium' and 'small' refer to banks with total assets, respectively, greater than €26 billion, between €9 billion and €26 billion, and below €9 billion.

## Table A4. Sample description: closed branches

| | Means | | | | Medians | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010-12 | 2013 | 2014 | 2010-14 | 2010-12 | 2013 | 2014 | 2010-14 |
| No. of branches | 124 | 148 | 217 | 489 | 124 | 148 | 217 | 489 |
| No. of employees | 2.9 | 3.3 | 3.1 | 3.1 | 3.0 | 3.0 | 3.0 | 3.0 |
| No. of depositors | 439.2 | 506.1 | 553.3 | 510.1 | 349.5 | 443.0 | 394.0 | 394.0 |
| No. of borrowers | 221.0 | 286.6 | 271.8 | 263.4 | 194.0 | 268.5 | 242.0 | 226.0 |
| Amount of deposits | 4.1 | 4.8 | 5.0 | 4.7 | 3.1 | 3.9 | 3.8 | 3.6 |
| Amount of loans | 8.6 | 10.5 | 9.9 | 9.7 | 5.3 | 7.7 | 7.7 | 7.2 |

Source: Supervisory reports. End-of-year data. Statistics refer to the second year before or, if not available, the year before the branch closure. Data are missing for 11 branches.

## Table A5. Sample description: geographic area

| | Closing year | | | |
|---|---|---|---|---|
| | 2010-12 | 2013 | 2014 | 2010-14 |
| No. of branches | 126 | 153 | 221 | 500 |
| No. of munipalities | 125 | 149 | 220 | 476 |
| No. of provinces | 59 | 63 | 84 | 96 |
| No. of regions | 18 | 17 | 20 | 20 |
| **Geographic area** (%) | | | | |
| North-East | 19.8 | 30.7 | 26.2 | 26.0 |
| North-West | 36.5 | 28.8 | 32.1 | 32.2 |
| Centre | 13.5 | 17.6 | 12.2 | 14.2 |
| South and Islands | 30.2 | 22.9 | 29.4 | 27.6 |

## Table A7. Branch closures: treated and control units

| | Closing year | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2010-14 |
| No. of brances | 40 | 17 | 69 | 153 | 221 | 500 |
| No. of treated | 392 | 242 | 695 | 1,642 | 2,257 | 5,228 |
| No. of controls | 1,635 | 1,022 | 2,922 | 7,244 | 9,436 | 22,259 |
| Control ratio | 4.2 | 4.2 | 4.2 | 4.4 | 4.2 | 4.3 |

## Table A6. Sample description: municipalities

| | 'Previous' municipality | 'Receiving' municipality |
|---|---|---|
| No. of branches | 500 | 495 |
| **Population** | | |
| < 5.000 | 27.4 | 10.7 |
| 5.000 - 15.000 | 45.6 | 27.5 |
| 15.000 - 50.000 | 20.8 | 39.6 |
| > 50.000 | 6.2 | 22.2 |
| **Level of urbanization** | | |
| Low | 21.4 | 10.7 |
| Medium | 54.4 | 52.3 |
| High | 24.2 | 37.0 |
| **Mountain area** | | |
| None | 67.2 | 74.1 |
| Partially | 12.8 | 13.1 |
| Totally | 20.0 | 12.7 |
| **Distance** (km) | | |
| 25th perc. | - | 5.1 |
| median | - | 8.7 |
| 75th perc | - | 15.1 |
| mean | - | 15.5 |

The 'previous' municipality is the municipality where was located the closed branch. The 'receiving' municipality is the municipality where was placed the branch that received the borrowers. The receiving branch is defined as the bank's branch to which most of its borrowing firms moved a year after the closure.

## Table A8. Comparison between treated and control credit relationships

| | Number of controls per treated relationship | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) Min 1 - Max 5 | | | (2) Min 2 - Max 5 | | | (3) Min 2 -Max 6 | | |
| | Treated | Controls | Diff. | Treated | Controls | Diff. | Treated | Controls | Diff. |
| No. of rel. | 6,107 | 23,138 | - | 5,228 | 22,259 | - | 5,228 | 25,079 | - |
| **Distances** | | | | | | | | | |
| own branch | 8.6 | 5.5 | - | 7.1 | 5.1 | - | 7.1 | 5.0 | - |
| - median | 3.0 | 0.0 | - | 2.8 | 0.0 | - | 2.8 | 0.0 | - |
| between firms | - | 5.1 | - | - | 4.9 | - | - | 5.1 | - |
| between branches | - | 4.6 | - | - | 4.5 | - | - | 4.6 | - |
| **Firm's employees** | | | | | | | | | |
| 20 or more | 0.502 | 0.513 | 0.011 | 0.508 | 0.514 | 0.007 | 0.508 | 0.517 | 0.009 |
| between 5 and 20 | 0.221 | 0.219 | -0.002 | 0.218 | 0.218 | 0.000 | 0.218 | 0.217 | -0.001 |
| 5 or less | 0.277 | 0.269 | -0.008 | 0.275 | 0.268 | -0.007 | 0.275 | 0.266 | -0.008 |
| **Industry** | | | | | | | | | |
| Agricolture | 0.082 | 0.083 | 0.002 | 0.084 | 0.084 | 0.000 | 0.084 | 0.084 | 0.000 |
| Manufacturing | 0.270 | 0.279 | 0.009 | 0.271 | 0.280 | 0.009 | 0.271 | 0.283 | 0.012* |
| Construction | 0.143 | 0.140 | -0.003 | 0.142 | 0.139 | -0.003 | 0.142 | 0.139 | -0.004 |
| Services | 0.497 | 0.492 | -0.005 | 0.496 | 0.491 | -0.005 | 0.496 | 0.490 | -0.006 |
| **Bank size** | | | | | | | | | |
| Large | 0.430 | 0.400 | -0.030*** | 0.420 | 0.399 | -0.021*** | 0.420 | 0.396 | -0.024*** |
| Medium | 0.286 | 0.276 | -0.009 | 0.292 | 0.277 | -0.015** | 0.292 | 0.281 | -0.012* |
| Small | 0.284 | 0.323 | 0.040*** | 0.288 | 0.324 | 0.037*** | 0.288 | 0.323 | 0.035*** |

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

## Table A9. Robustness check: subsamples

Dependent variable: RELBREAK

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Share of term. | No. of firms | Distance receiving branch | Distance from firms |
| CLOSE | | | | |
| | 0.069*** | 0.055*** | 0.049*** | 0.047*** |
| | (0.010) | (0.009) | (0.009) | (0.009) |
| NPLFIRM | 0.001 | 0.002 | 0.016 | 0.003 |
| | (0.018) | (0.018) | (0.017) | (0.017) |
| No. of observations | | | | |
| | 47,824 | 44,760 | 49,322 | 50,660 |
| No. of relationships | 23,912 | 22,380 | 27,487 | 25,330 |
| No. of treated | 5,228 | 4,696 | 4,685 | 4,800 |
| No. of branch closures | 358 | 446 | 450 | 424 |
| R-squared | 0.653 | 0.661 | 0.655 | 0.655 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort, Industry-Size-Location-Year-Cohort, and Bank-Year fixed effects are included. Regressions are run using closures between the 5th and 95th percentile. The restriction is imposed on the following branch–level variables: (1) the share of relationship terminations occurred in the two-year period around the closing date, (2) the number of borrowing firms, (3) the distance between the receiving municipality and the previous one where the closed branch was placed and (4) the average distance from the borrowing firms.

## Table A10. Robustness check: matching ratio

Dependent variable: RELBREAK

| | Number of controls per treated unit | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| | Min 1 - Max 5 | Min 2 - Max 6 | Min 1- Max 1 | Min 5 - Max 5 | Min 10 - Max 10 |
| CLOSE | 0.049*** | 0.053*** | 0.048*** | 0.044*** | 0.066*** |
| | (0.009) | (0.009) | (0.012) | (0.010) | (0.015) |
| NPLFIRM | -0.002 | 0.001 | -0.006 | 0.000 | -0.037 |
| | (0.016) | (0.016) | (0.024) | (0.019) | (0.026) |
| No. of observations | 58,490 | 60,614 | 24,428 | 40,248 | 27,874 |
| No. of relationships | 29,245 | 30,307 | 12,214 | 20,124 | 13,937 |
| No. of treated | 6,107 | 5,228 | 6,107 | 3,354 | 1,267 |
| No. of branch closures | 507 | 500 | 507 | 448 | 313 |
| R-squared | 0.662 | 0.647 | 0.761 | 0.649 | 0.628 |

Standard errors clustered at the cohort level are in parentheses; ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort, Industry-Size-Location-Year-Cohort, and Bank-Year fixed effects are included.

## Table A11. Further robustness checks

Dependent variable: RELBREAK

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | FE group level | Break group level | 'Treated' banks only | Duplicates weight | Duplicates drop |
| CLOSE | 0.054*** | 0.060*** | 0.048*** | 0.051*** | 0.049*** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
| NPLFIRM | -0.001 | -0.000 | -0.032* | -0.001 | -0.000 |
| | (0.016) | (0.016) | (0.018) | (0.015) | (0.015) |
| Group-Year FE | yes | yes | no | no | no |
| Bank-Year FE | no | no | yes | yes | yes |
| No. of observations | 54,974 | 54,974 | 42,828 | 54,974 | 48,392 |
| No. of relationships | 27,487 | 27,487 | 21,414 | 27,487 | 24,209 |
| No. of treated | 5,228 | 5,228 | 4,869 | 5,228 | 5,228 |
| No. of branch closures | 500 | 500 | 494 | 500 | 500 |
| R-squared | 0.649 | 0.644 | 0.670 | 0.656 | 0.659 |

Standard errors clustered at the cohort level are in parentheses. ***p<0.01, **p<0.05, *p<0.1. Firm-Cohort and Industry-Size-Location-Year-Cohort fixed effects are included.

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*2018*

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ADAMOPOULOU A. and E. KAYA, *Young adults living with their parents and the influence of peers,* Oxford Bulletin of Economics and Statistics,v. 80, pp. 689-713, **WP 1038 (November 2015).**

ANDINI M., E. CIANI, G. DE BLASIO, A. D'IGNAZIO and V. SILVESTRINI, *Targeting with machine learning: an application to a tax rebate program in Italy,* Journal of Economic Behavior & Organization, v. 156, pp. 86-102, **WP 1158 (December 2017).**

BARONE G., G. DE BLASIO and S. MOCETTI, *The real effects of credit crunch in the great recession: evidence from Italian provinces,* Regional Science and Urban Economics, v. 70, pp. 352-59, **WP 1057 (March 2016).**

BELOTTI F. and G. ILARDI *Consistent inference in fixed-effects stochastic frontier models,* Journal of Econometrics, v. 202, 2, pp. 161-177, **WP 1147 (October 2017).**

BERTON F., S. MOCETTI, A. PRESBITERO and M. RICHIARDI, *Banks, firms, and jobs,* Review of Financial Studies, v.31, 6, pp. 2113-2156, **WP 1097 (February 2017).**

BOFONDI M., L. CARPINELLI and E. SETTE, *Credit supply during a sovereign debt crisis,* Journal of the European Economic Association, v.16, 3, pp. 696-729, **WP 909 (April 2013).**

BOKAN N., A. GERALI, S. GOMES, P. JACQUINOT and M. PISANI, *EAGLE-FLI: a macroeconomic model of banking and financial interdependence in the euro area,* Economic Modelling, v. 69, C, pp. 249-280, **WP 1064 (April 2016).**

BRILLI Y. and M. TONELLO, *Does increasing compulsory education reduce or displace adolescent crime? New evidence from administrative and victimization data,* CESifo Economic Studies, v. 64, 1, pp. 15–4, **WP 1008 (April 2015).**

BUONO I. and S. FORMAI *The heterogeneous response of domestic sales and exports to bank credit shocks,* Journal of International Economics, v. 113, pp. 55-73, **WP 1066 (March 2018).**

BURLON L., A. GERALI, A. NOTARPIETRO and M. PISANI, *Non-standard monetary policy, asset prices and macroprudential policy in a monetary union,* Journal of International Money and Finance, v. 88, pp. 25-53, **WP 1089 (October 2016).**

CARTA F. and M. DE PHLIPPIS, *You've Come a long way, baby. Husbands' commuting time and family labour supply,* Regional Science and Urban Economics, v. 69, pp. 25-37, **WP 1003 (March 2015).**

CARTA F. and L. RIZZICA, *Early kindergarten, maternal labor supply and children's outcomes: evidence from Italy,* Journal of Public Economics, v. 158, pp. 79-102, **WP 1030 (October 2015).**

CASIRAGHI M., E. GAIOTTI, L. RODANO and A. SECCHI, *A "Reverse Robin Hood"? The distributional implications of non-standard monetary policy for Italian households,* Journal of International Money and Finance, v. 85, pp. 215-235, **WP 1077 (July 2016).**

CECCHETTI S., F. NATOLI and L. SIGALOTTI, *Tail co-movement in inflation expectations as an indicator of anchoring,* International Journal of Central Banking, v. 14, 1, pp. 35-71, **WP 1025 (July 2015).**

CIANI E. and C. DEIANA, *No Free lunch, buddy: housing transfers and informal care later in life,* Review of Economics of the Household, v.16, 4, pp. 971-1001, **WP 1117 (June 2017).**

CIPRIANI M., A. GUARINO, G. GUAZZAROTTI, F. TAGLIATI and S. FISHER, *Informational contagion in the laboratory,* Review of Finance, v. 22, 3, pp. 877-904, **WP 1063 (April 2016).**

DE BLASIO G, S. DE MITRI, S. D'IGNAZIO, P. FINALDI RUSSO and L. STOPPANI, *Public guarantees to SME borrowing. A RDD evaluation,* Journal of Banking & Finance, v. 96, pp. 73-86, **WP 1111 (April 2017).**

GERALI A., A. LOCARNO, A. NOTARPIETRO and M. PISANI, *The sovereign crisis and Italy's potential output,* Journal of Policy Modeling, v. 40, 2, pp. 418-433, **WP 1010 (June 2015).**

LIBERATI D., *An estimated DSGE model with search and matching frictions in the credit market,* International Journal of Monetary Economics and Finance (IJMEF), v. 11, 6, pp. 567-617, **WP 986 (November 2014).**

LINARELLO A., *Direct and indirect effects of trade liberalization: evidence from Chile,* Journal of Development Economics, v. 134, pp. 160-175, **WP 994 (December 2014).**

NUCCI F. and M. RIGGI, *Labor force participation, wage rigidities, and inflation,* Journal of Macroeconomics, v. 55, 3 pp. 274-292, **WP 1054 (March 2016).**

RIGON M. and F. ZANETTI, *Optimal monetary policy and fiscal policy interaction in a non_ricardian economy,* International Journal of Central Banking, v. 14 3, pp. 389-436, **WP 1155 (December 2017).**

SEGURA A., *Why did sponsor banks rescue their SIVs?,* Review of Finance, v. 22, 2, pp. 661-697, **WP 1100 (February 2017).**

*2019*

ALBANESE G., M. CIOFFI and P. TOMMASINO, *Legislators' behaviour and electoral rules: evidence from an Italian reform,* European Journal of Political Economy, v. 59, pp. 423-444, **WP 1135 (September 2017).**

ARNAUDO D., G. MICUCCI, M. RIGON and P. ROSSI, *Should I stay or should I go? Firms' mobility across banks in the aftermath of the financial crisis,* Italian Economic Journal / Rivista italiana degli economisti, v. 5, 1, pp. 17-37, **WP 1086 (October 2016).**

BASSO G., F. D'AMURI and G. PERI, *Immigrants, labor market dynamics and adjustment to shocks in the euro area,* IMF Economic Review, v. 67, 3, pp. 528-572, **WP 1195 (November 2018).**

BUSETTI F. and M. CAIVANO, *Low frequency drivers of the real interest rate: empirical evidence for advanced economies,* International Finance, v. 22, 2, pp. 171-185, **WP 1132 (September 2017).**

CAPPELLETTI G., G. GUAZZAROTTI and P. TOMMASINO, *Tax deferral and mutual fund inflows: evidence from a quasi-natural experiment,* Fiscal Studies, v. 40, 2, pp. 211-237, **WP 938 (November 2013).**

CARDANI R., A. PACCAGNINI and S. VILLA, *Forecasting with instabilities: an application to DSGE models with financial frictions,* Journal of Macroeconomics, v. 61, **WP 1234 (September 2019).**

CIANI E., F. DAVID and G. DE BLASIO, *Local responses to labor demand shocks: a re-assessment of the case of Italy,* Regional Science and Urban Economics, v. 75, pp. 1-21, **WP 1112 (April 2017).**

CIANI E. and P. FISHER, *Dif-in-dif estimators of multiplicative treatment effects,* Journal of Econometric Methods, v. 8. 1, pp. 1-10, **WP 985 (November 2014).**

CHIADES P., L. GRECO, V. MENGOTTO, L. MORETTI and P. VALBONESI, *Fiscal consolidation by intergovernmental transfers cuts? The unpleasant effect on expenditure arrears,* Economic Modelling, v. 77, pp. 266-275, **WP 985 (July 2016).**

COLETTA M., R. DE BONIS and S. PIERMATTEI, *Household debt in OECD countries: the role of supply-side and demand-side factors,* Social Indicators Research, v. 143, 3, pp. 1185–1217, **WP 989 (November 2014).**

COVA P., P. PAGANO and M. PISANI, *Domestic and international effects of the Eurosystem Expanded Asset Purchase Programme,* IMF Economic Review, v. 67, 2, pp. 315-348, **WP 1036 (October 2015).**

GIORDANO C., M. MARINUCCI and A. SILVESTRINI, *The macro determinants of firms' and households' investment: evidence from Italy,* Economic Modelling, v. 78, pp. 118-133, **WP 1167 (March 2018).**

GOMELLINI M., D. PELLEGRINO and F. GIFFONI, *Human capital and urban growth in Italy,1981-2001,* Review of Urban & Regional Development Studies, v. 31, 2, pp. 77-101, **WP 1127 (July 2017).**

MAGRI S, *Are lenders using risk-based pricing in the Italian consumer loan market? The effect of the 2008 crisis,* Journal of Credit Risk, v. 15, 1, pp. 27-65, **WP 1164 (January 2018).**

MIGLIETTA A, C. PICILLO and M. PIETRUNTI, *The impact of margin policies on the Italian repo market,* The North American Journal of Economics and Finance, v. 50, **WP 1028 (October 2015).**

MONTEFORTE L. and V. RAPONI, *Short-term forecasts of economic activity: are fortnightly factors useful?,* Journal of Forecasting, v. 38, 3, pp. 207-221, **WP 1177 (June 2018).**

MERCATANTI A., T. MAKINEN and A. SILVESTRINI, *The role of financial factors for european corporate investment,* Journal of International Money and Finance, v. 96, pp. 246-258, **WP 1148 (October 2017).**

NERI S. and A. NOTARPIETRO, *Collateral constraints, the zero lower bound, and the debt–deflation mechanism,* Economics Letters, v. 174, pp. 144-148, **WP 1040 (November 2015).**

RIGGI M., *Capital destruction, jobless recoveries, and the discipline device role of unemployment,* Macroeconomic Dynamics, v. 23, 2, pp. 590-624, **WP 871 (July 2012).**

*FORTHCOMING*

ALBANESE G., G. DE BLASIO and P. SESTITO, *Trust, risk and time preferences: evidence from survey data,* International Review of Economics, **WP 911 (April 2013).**

APRIGLIANO V., G. ARDIZZI and L. MONTEFORTE, *Using the payment system data to forecast the economic activity,* International Journal of Central Banking, **WP 1098 (February 2017).**

ARDUINI T., E. PATACCHINI and E. RAINONE, *Treatment effects with heterogeneous externalities,* Journal of Business & Economic Statistics, **WP 974 (October 2014).**

BRONZINI R., G. CARAMELLINO and S. MAGRI, *Venture capitalists at work: a Diff-in-Diff approach at late-stages of the screening process,* Journal of Business Venturing, **WP 1131 (September 2017).**

BELOTTI F. and G. ILARDI, *Consistent inference in fixed-effects stochastic frontier models,* Journal of Econometrics, **WP 1147 (October 2017).**

CIANI E. and G. DE BLASIO, *European structural funds during the crisis: evidence from Southern Italy,* IZA Journal of Labor Policy, **WP 1029 (October 2015).**

COIBION O., Y. GORODNICHENKO and T. ROPELE, *Inflation expectations and firms' decisions: new causal evidence,* Quarterly Journal of Economics, **WP 1219 (April 2019).**

CORSELLO F. and V. NISPI LANDI, *Labor market and financial shocks: a time-varying analysis,* Journal of Money, Credit and Banking, **WP 1179 (June 2018).**

COVA P., P. PAGANO, A. NOTARPIETRO and M. PISANI, *Secular stagnation, R&D, public investment and monetary policy: a global-model perspective,* Macroeconomic Dynamics, **WP 1156 (December 2017).**

D'AMURI F., *Monitoring and disincentives in containing paid sick leave,* Labour Economics, **WP 787 (January 2011).**

D'IGNAZIO A. and C. MENON, *The causal effect of credit Guarantees for SMEs: evidence from Italy,* Scandinavian Journal of Economics, **WP 900 (February 2013).**

ERCOLANI V. and J. VALLE E AZEVEDO, *How can the government spending multiplier be small at the zero lower bound?,* Macroeconomic Dynamics, **WP 1174 (April 2018).**

FEDERICO S. and E. TOSTI, *Exporters and importers of services: firm-level evidence on Italy,* The World Economy, **WP 877 (September 2012).**

FERRERO G., M. GROSS and S. NERI, *On secular stagnation and low interest rates: demography matters,* International Finance, **WP 1137 (September 2017).**

GERALI A. and S. NERI, *Natural rates across the Atlantic,* Journal of Macroeconomics, **WP 1140 (September 2017).**

GIACOMELLI S. and C. MENON, *Does weak contract enforcement affect firm size? Evidence from the neighbour's court,* Journal of Economic Geography, **WP 898 (January 2013).**

LIBERATI D. and M. LOBERTO, *Taxation and housing markets with search frictions,* Journal of Housing Economics, **WP 1105 (March 2017).**

LOSCHIAVO D., *Household debt and income inequality: evidence from italian survey data,* Review of Income and Wealth, **WP 1095 (January 2017).**

NATOLI F. and L. SIGALOTTI, *Tail co-movement in inflation expectations as an indicator of anchoring,* International Journal of Central Banking, **WP 1025 (July 2015).**

PANCRAZI R. and M. PIETRUNTI, *Natural expectations and home equity extraction,* Journal of Housing Economics, **WP 984 (November 2014).**

PEREDA FERNANDEZ S., *Teachers and cheaters. Just an anagram?,* Journal of Human Capital, **WP 1047 (January 2016).**

RAINONE E., *The network nature of otc interest rates,* Journal of Financial Markets, **WP 1022 (July 2015).**

RIZZICA L., *Raising aspirations and higher education. evidence from the UK's widening participation policy,* Journal of Labor Economics, **WP 1188 (September 2018).**

SEGURA A., *Why did sponsor banks rescue their SIVs?,* Review of Finance, **WP 1100 (February 2017).**