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Collateral and Local Lending: Testing the Lender-Based Theory

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Abstract

In this paper we empirically test the recent lender-based theory for the use of collateral in bank lending. Based on a proprietary dataset of loan contracts written by a local bank in competitive credit markets, we use the physical proximity between borrowers and the lending branch of the bank to capture its information advantage and the magnitude of collateral-related transaction costs. Overall, our results seem more consistent with several classic borrower-based explanations rather than with the lender-based view. We show that, conditional on obtaining credit from the local bank, more distant borrowers experience higher collateral requirements and lower interest rates. Moreover, competitive pressure from transaction lenders does not magnify the importance of lender-to-borrower distance. Our findings are also obtained with estimation techniques that allow for endogenous loan contract terms and joint determination of collateral and interest rates.

JEL Classification: G21, G32, L11
Keywords: Distance, Collateral, Interest Rate, Bank lending

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I. Introduction

Collateral pledged by the borrower as a guarantee to the lender is a common feature of bank loan contracts. Theoretical research offers various explanations for the use of collateral, traditionally focused on ex-ante characteristics or ex-post actions of the loan applicants.[1] According to such traditional borrower-based explanations, collateral could be used, among others, as a screening device that allows borrowers to signal ex-ante their private information or as a device that mitigates differences of opinion between borrowers and lenders about project returns (Chan and Kanatas, 1985; Besanko and Thakor, 1987). All else equal, under such circumstances the amount of collateral (interest rate) required by banks is inversely (directly) related to the costs of using collateral, such as costs related to its monitoring and repossession.

Recent theoretical advances have started to shift the paradigm explaining the use of collateral in bank lending from this more established, borrower-based perspective to a lender-based view. According to the latter, collateral is a competitive device used by local banks to attract valuable borrowers when competing with transaction lenders (Inderst and Mueller, 2007). The key distinction in this theory is between local banks, with information advantage and superior ability to assess the value of borrowers' projects, and transaction lenders, with loan underwriting cost advantage. Competition from such lenders limits the ability of the local banks to charge high interest rates and some marginally profitable projects are consequently rejected. Collateral, by increasing the local banks' payoffs in low cash flow states, reduces this inefficiency and makes lending to some firms with small but positive net present value projects feasible. Importantly, the competitive pressure by the transaction lenders is mitigated by the information advantage of the local bank. Thus, the latter can offer credit with lower (higher) collateral, but at higher (lower) interest rates to borrowers who are less (more) likely to be poached by the competing transaction banks, i.e. borrowers for whom the information advantage of the local lender is relatively large (small).

While existing literature generates substantial empirical support for the relevance of both ex-ante and ex-post borrower-based explanations for the use of collateral (e.g., Berger, Frame and Ioannidou, 2011; Berger, Espinosa-Vega and Frame, 2011), insights into the lender-based view are scant and offer only limited evidence for the theoretical predictions (Jimenez et al., 2009). Therefore, in this paper we develop an empirical strategy that allows us to examine the unique predictions of the lender-based view of collateral and compare them with some classic borrower-based arguments.

[1] Extensive reviews of the traditional, borrower-based theoretical and empirical literature on collateral are provided by Coco (2000) and Steijvers and Voordeckers (2009).

At the heart of our strategy is the identification of "local lenders" and their information advantage, as distinct features of the lender-based theory of collateral (and interest rate) advanced by Inderst and Mueller (2007). To this end, we rely on a unique, proprietary dataset provided by a regional Italian bank, hereafter simply *the bank*, which is well-suited to capture the notion of a "local lender". As we describe later when discussing our empirical strategy in detail, the bank has substantial local operations, focused lending activity, and appropriate business mode characteristics. In addition to that, as theoretically specified, our local lender competes with national, transaction banks that have branches in the local credit markets of observation.

Following existing research that shows that proximity to borrower enhances the production and transmission of information and creates a competitive advantage for the lender (Agarwal and Hauswald, 2010; Bellucci et al., 2013), we measure local information advantage of our bank using the physical proximity between the borrower and the lending branch of the bank, i.e. lender-to-borrower distance. This metric allows us to distinguish between two opposing effects: One related to the information advantage of the bank, and one linked to transaction costs associated with the use of collateral, as emphasized by the lender- and borrower-based views of collateral, respectively.

We also examine the impact of our information measure on both collateral requirements and interest rates, and account for their endogenous determination, as predicted by the theory. We start our analysis by examining the association between lender-to-borrower distance and the loan contract terms (collateral requirements and interest rates) within a standard equation-by-equation estimation framework. However, as argued by Brick and Palia (2007) and Bharath et al. (2011), among others, these features cannot be considered in isolation. In addition, it is possible that some ex ante borrower characteristics influencing collateral requirements and loan rates likely reflect soft information available to loan officers but not to the econometricians, thus giving rise to the classic issue of omitted variables. Thus, to address the endogenous nature of the loan contract terms and possible omitted variables, in the main part of the analysis we estimate our models using an instrumental variables (IV) approach. Specifically, we use terms of the loan contract such as non-linear penalty fees to instrument for the interest rate paid by the borrower, while features of the bankruptcy code and associated costs, as well as variation in prices of local properties and real estate, are used for the identification of collateral requirements. Finally, since the existing explanations for collateral identify possible trade-offs between the contract features we study, we adopt a simultaneous equations approach using a 3-Stage Least Squares (3-SLS) model that allows us to incorporate this point and also enhances the efficiency of our estimates. The estimation techniques that endogenize the loan contract features allow us to draw inferences

that address the potentially biased estimates that could be obtained from the equation-by-equation estimation of the underlying economic relationships.

Our analysis shows that collateral requirements decrease with the distance between bank and borrower, i.e. when the costs associated with the use of collateral are relatively higher and the information advantage of the local bank is low. In other words, borrowers located farther away from the lending branch are less likely to pledge collateral as a guarantee to the lender. Consistent with the theoretical trade-offs, we also observe that interest rates are increasing in the physical distance between the contracting parties. Thus, our inferences are not consistent with the lender-based theory for the use of collateral in small business lending, while consistent with alternative views derived from some borrower-based explanations such as those developed by Chan and Kanatas (1985) and Besanko and Thakor (1987). Importantly, our results are robust to instrumenting for the endogenous nature of the loan terms as discussed above.

To the best of our knowledge, Jimenez et al. (2009) is the only other study that offers an empirical examination of the lender-based theory of collateral. Using a sample of loans granted by Spanish banks, and organizational distance (i.e., the distance between borrower's location and the headquarters of the lending bank)[2] as a proxy for the information gap about local market conditions among competing banks, the authors estimate a single-equation model for collateral requirements and observe higher incidence of collateral for loans granted by lenders that are organizationally closer to their borrowers. In addition, consistent with the lender-based theory, the study finds that the effect of organizational distance on the likelihood of collateralized loans is lower (and even positive) for young and small firms and for new bank applicants, i.e. for loans granted to borrowers for which the lending bank has lower information advantage.

Our study improves upon Jimenez et al. (2009) along three main dimensions that allow us to provide a more focused and powerful test. First, we directly observe collateral and interest rate requirements for loans to local firms made by a local bank. As postulated by theory, this type of bank has information advantage vis-à-vis competing transaction banks, which can lend at lower cost. By contrast, Jimenez et al. (2009) use an indirect approach that approximates loans by local lenders with the loans granted by banks that are organizationally close to borrowers. On the one hand, if this approximation is used, loans made by large, hierarchically organized, transaction lenders to firms located nearby their headquarters could be viewed as being made by local lenders. This could lead to the former being imprecisely ascribed an advantage in handling local knowledge. On the other hand, to the extent that bank size and organizational closeness are

[2] Organizational distance has alternatively been labeled in the banking literature as functional distance (Alessandrini et al. 2005, 2009), hierarchical distance (Liberti and Mian, 2009), or branch-to-headquarter distance (DeYoung et al., 2004).

negatively correlated, this variable could capture a bank size effect, in line with the hypothesis, advanced and empirically corroborated by the same authors in a related paper, that (small) banks with a lower level of expertise in screening and monitoring loan applications use collateral more intensively (Jimenez et al., 2006). Second, we jointly estimate collateral requirements and loan rates: The simultaneous determination of these contract terms is fundamental to the arguments advanced by the lender-based (as well as borrowed-based) theoretical model. Lastly, we study the effect of our measure of information advantage not only on the incidence of collateral but also on the magnitude of collateral requirements, with the latter measured by the fraction of the credit line secured by collateral.

The relationship between collateral and borrower-lender distance has been examined by other studies as well, albeit from different angles. Petersen and Rajan (2002) and Berger et al. (2005), for instance, analyze the impact of collateral on the distance from borrower to lender in the United States using the 1993 National Survey of Small Business Finance (NSSBF) and show that, compared to non-collateralized loans, collateralized small business loans are made at a greater distance, even though the estimated differences are only slightly significant. By contrast, and more relevant for our paper, Cerqueiro et al. (2009) consider the impact of distance on the probability that a loan is collateralized. The results are mixed and depend on the sample used in the analysis: The authors confirm that distant loans are more likely to be secured for a sample of borrowers drawn from the 1993 NSSBF, while the effect of distance is negative and statistically insignificant for a sample of Belgian firms.

Our paper is also indirectly related to the literature analyzing the relation between collateral requirements and collateral enforcement and monitoring. Relevant studies show that firms that require more intensive monitoring are less likely to pledge collateral (Ono and Uesugi, 2009), the intensity with which collateral is monitored decreases with its value (Cerqueiro et al., 2014), and stronger law enforcement towards certain types of assets is related to a more pronounced use of such assets as collateral (Liberti and Mian, 2010; Calomiris et al. 2014).

The rest of the paper is organized as follows. In the next section, we describe in more detail our empirical strategy and identification approach. Context and data are discussed in section III. We present our main results in section IV. In section V we discuss some extensions. Section VI concludes.

II. Testable implications and empirical strategy

The lender-based theory for the use of collateral developed by Inderst and Mueller (2007) abstracts from borrower characteristics and actions (thus, from moral hazard and adverse

selection problems) and focuses on lender types instead. Specifically, it distinguishes between local lenders and distant transaction lenders, and discusses how the competitive pressure exerted by the latter affects the characteristics of the loan contract offered by the local bank.

The key feature of the local lender is its superior ability to discern the quality of borrower's project when lending is based on soft information. By contrast, distant transaction lenders rely only on hard information when making lending decisions but have a competitive cost advantage in loan underwriting. The competition stemming from the transaction banks limits the interest rate the local lender can charge; as a result, some borrowers are inefficiently denied credit as denial by the local bank implies denial by transaction lenders as well. Within this model, collateral arises as a mechanism that resolves the inefficiency by flattening the payoff function of the local lender, i.e. providing (partial) recovery in adverse states of the world. Consequently, borrower's participation necessities a reduction in the interest rate, hence the trade-off of lower loan rates in exchange for higher collateral requirements. In this setting, transaction lenders compete only along the price dimension, and as the competition by these lenders increases, the local bank faces an ever increasing pressure that prevents it from charging higher rates.

An important factor that allows the local lender to maintain advantage vis-à-vis its distant competitors is related to its knowledge of the local economic environment. In the presence of soft information and local knowledge, transaction lenders cannot compete effectively and their ability to attract borrowers is limited. This, in turn, shields the local lender from the competitive pressure along the price dimension. This also allows the local lender to keep a high interest rate and reduces the usefulness of collateral. As a result, the lender-based view of collateral predicts that, all else equal, loans for which the information advantage of the local lender is lower will be more susceptible to competition from the transaction lenders, and thus characterized by higher collateral requirements and lower interest rates.[3]

As highlighted by the above discussion, the key factor that allows testing the lender-based explanation for the use of collateral is the information advantage of the local bank. In our empirical model we capture this advantage by using the physical proximity between borrowers and our bank. Indeed, the quality of information available to the lending officer is directly related to the proximity between the officer and the economic and social environment of the borrower (Agarwal and Hauswald, 2010; Bellucci et al., 2013). If the lender uses its local information advantage, the collateral requirements should be lower for borrowers in the vicinity of the local lending bank, i.e. for borrowers who are less likely to be subject to competitive

[3] To be precise, Proposition 5 of Inderst and Mueller (2007, p. 841) states that: "Conditional on going to the local lender … borrowers for whom the local lender's information advantage is relatively smaller … face lower loan rates but higher collateral requirements."

pressure from transaction banks. The theory also implies a trade-off in terms of collateral and interest rate for the optimal contract. In sum, as the lender-to-borrower is inversely related to the information advantage, the lender-based model implies that the relationship between distance and collateral - conditional on interest rate - is positive for loans made by the local lender. In other words, as distance increases, these loans should have higher collateral requirements and lower interest rate.

Lender-to-borrower distance is also associated with greater monitoring costs of collateral and disparity in collateral valuation. In addition, well-established and reputable firms, for which lender valuations are likely to be more optimistic, tend to borrow at a greater distance (Petersen and Rajan, 2002; Berger et al., 2005). From this standpoint, some borrower-based theories predict relationships opposite to the ones advanced by the lender-based view. Specifically, they imply that as the lender-to-borrower distance increases, collateral requirements should decrease and interest rates should increase.[4]

To examine these predictions, we estimate an empirical specification, outlined in equations (1) and (2) below, that allows us to model the use of collateral and the price of credit as a function of our measure of information advantage and other determinants:

$$Collateral_{it} = \alpha_C + \beta_C \ Lender\text{-}to\text{-}Borrower\ Distance_{it} + \gamma_C Interest\ Rate_{it} + \sum_{k=1}^{n} \lambda_{C,k} x_{itk} + \varepsilon_{C,it} \quad (1)$$

$$Interest\ Rate_{it} = \alpha_R + \beta_R \ Lender\text{-}to\text{-}Borrower\ Distance_{it} + \gamma_R Collateral_{it} + \sum_{k=1}^{n} \lambda_{R,k} x_{itk} + \varepsilon_{R,it} \quad (2)$$

where *Collateral* is a measure of the collateralization of the credit line and *Interest Rate* is the interest rate charged by the local bank. For our analysis of collateral we use two measures: the fraction of the credit line secured by collateral (*Percentage of Collateral*) and an indicator for presence of collateral (*Collateral*). Terms and coefficients indicated by a sub-script *C* (*R*) refer to our collateral (interest rate) equation. The key variable of interest is *Lender-to-Borrower Distance*, i.e. the physical distance between borrower and the lending branch of the local bank. We also add a

[4] According to Propositions 2 and 3 of Chan and Kanatas (1985), "…whenever the lender's valuation is lower than that of the borrower and … the loan agreement will involve partial collateral …; and the loan rate … is increasing and the collateral level … decreasing in [cost of collateral] …" (pp. 88-89) and "…the less optimistic is the lender … the higher the level of collateral in the loan agreement and the lower the loan rate" (p. 91). Similarly, according to Proposition 2 of Besanko and Thakor (1987), optimal collateral requirements and interest rate are decreasing and increasing, respectively, with the monitoring and dissipative costs of collateral.

set of controls *X*, which includes various characteristics of the borrower, bank-borrower relation, and fixed effects for industry, bank branch, credit market and time.

We begin our analysis with an equation-by-equation estimation, thus assuming independence between equations (1) and (2), and excluding *Interest Rate* from the determinants of *Collateral* and vice versa. We next proceed to the main part of our analysis by taking into account the possible lack of independence between collateral and interest rate. To incorporate the endogenous nature of these variables, we estimate each equation by using an instrumental variables (IV) approach. Lastly, we recognize that the theoretical models predict that both contract terms, interest rate and collateral, are jointly determined. Therefore, we estimate the system of equations (1) and (2) using a 3-SLS approach. This technique improves upon the standard 2-SLS procedure by enhancing the efficiency of the estimates. Identification requires instruments for each endogenous variable and we discuss these in the following section along with the data and control variables.

III. Institutional background, data and variables

A. Italian context

Our tests of the lender-based theory of collateral utilize a unique proprietary dataset of credit lines as of September of 2004 and 2006. The credit lines are extended by a regional Italian bank to a large sample of small and medium sized enterprises (SMEs) in two Italian provinces.[5] The dataset includes a diverse group of firms such as *Sole proprietorships* (43%), *Partnerships* (22%), *Corporations* (33%), and *Cooperatives* (2%) in 23 sectors of economic activity.[6] In this section we shortly introduce the institutional background of the banking sector in Italy and aggregate use of collateral by Italian banks to demonstrate the potential for generalizability of our insights.

In 2004, the first year covered by our dataset, as well as in 2014, the Italian banking sector with its 685 banks is the fourth largest in Europe in terms of total assets.[7] The recent evolution experienced by the banking industry in Italy is representative of developments relevant for many other developed countries. Specifically, the banking sector underwent substantial transformations during the last two decades. First, the sector faced a trend of consolidation and at the same time, an increased local reach of banks. Between 1992 and 2013, the total number of banks decreased by almost 350 (or 33%), while the average number of banks per province increased from 28 in 1992 to 32 in 2013. This increase was driven by the fact that the average number of branches per

[5] For the definition of SMEs we follow the European Commission Recommendation of 6 May 2003 (GUCE L 124/36 del 20/05/2003).

[6] Our bank distinguishes firms according to sectors of economic activity using the 2-digit level classification of the Italian National Institute of Statistics (ISTAT).

[7] See Banking Structure Report of the European Central Bank (October 2014).

bank went up from 180 to 289 during this period (Papi et al., 2015). In the two provinces covered in our dataset, the number of banks went up from 32 and 28 in 1992 to 47 and 34 in 2013, while the number of branches almost doubled (from 188 and 157, to 357 and 293 per province, respectively). As of 2013, the combined branch density for the two provinces, scaled by population (per 10,000 inhabitants) is slightly above the Italian average (7.8 compared to 5.7). Second, while the degree of internationalization of the banking system went up over time, the foreign presence in retail banking is still limited and credit intermediation towards domestic households and SMEs remains central to the Italian banking system. Moreover, the profitability and efficiency of the Italian banks are largely comparable to those of other European countries such as Germany and France (see Drummond et al., 2007).

We next demonstrate the representativeness of our sample with regard to the importance and relevance of collateral through aggregate statistics on its use in the Italian banking system. We report in Table 1 the share of collateralized loans in the Italian economy by borrower type for the years preceding our sample period.[8] During this period, the share of unsecured loans to non-financial corporations was well above 40 percent of total loans, showing that collateral is not a necessary condition to obtain credit. In addition to that, the share of collateralized loans grew steadily from 24% to 32%, thus signifying the increasing importance of this contract feature. Consistent with the aggregate data for the Italian economy, almost 30% of the borrowers in our dataset provide collateral, and this share increases (decreases) to 35% (21%) if we consider sole proprietorships (corporations).[9]

B. Local and transaction lenders

The lender-based theory of collateral makes a central distinction between "local lenders" and "transaction lenders" based on their possession of local knowledge, use of soft information, and loan-granting capability. While at the start of the sample period our bank was present in 16 provinces (in 2013, the bank has branches in 23 provinces), our dataset covers the credit lines extended by branches in the province where the bank is headquartered and an adjacent province.[10] Across these two provinces, we distinguish 31 local credit markets, identified with

[8] Data come from the bank supervision reports completed by the Bank of Italy.

[9] Previous studies analyzing the role of bank loan guarantees in the Italian economy are rare, and mainly focus on their impact on interest rates, implicitly assuming that the underlying view is borrower-based. For example, Pozzolo (2004) suggests that collateral seems to be used as a signaling device to solve adverse selection problems, while Calcagnini et al. (2014) find that collateral affects the cost of credit by reducing the interest rate.

[10] The local nature of the bank is also demonstrated by its branch concentration in the two provinces of our study. Namely, 26.5 percent of the branches of our bank are located in these two provinces. The branches of our bank account for almost 10% of all bank branches of the banks operating in both provinces (data available upon request).

respect to the operating activities of the bank. Specifically, we identify as a separate local credit market each municipality where the bank has at least one branch.[11]

Selected characteristics of the local credit markets are presented in Table 2. The table shows that the average local credit market has 15 banks and 32 branches. Out of these, 2.4 banks are "transaction lenders" operating through approximately 7 branches per market. We refer to banks owned by the eight largest Italian banking groups (*Big Groups*) as transaction lenders.[12] These lenders own nearly 23% of the branches, creating non-trivial competitive pressure in the local credit markets.

C. Dependent variables

We derive predictions based on the lender-based theory of collateral for two outcome measures: collateral requirements imposed by the bank and interest rates. We construct two measures to capture collateral requirements. The first measure, *Collateral*, is an indicator that takes the value of 1 if the credit line is secured by collateral and 0 otherwise. However, our preferred measure, *Percentage of Collateral,* captures not simply the presence of collateral but also the degree of loan collateralization. We operationalize this measure by using the amount of collateral expressed as a percentage of the limit on the credit line made available by the bank according to the loan contract. While we do not have detailed information on the type of assets pledged as collateral, informal interviews with bank managers indicate that most of the loans are collateralized by fixed assets, such as commercial, industrial, or residential properties and real estate. By contrast, movable assets such as equipment and vehicles, inventories and financial assets are used as collateral less frequently in our sample. Lastly, we note that loans might be secured by personal guarantees (promise by a third party to assume responsibility for the debt obligation of the borrower) but these are not included in our definition of collateral as the credit files provided by our bank do not contain data on such arrangements.

In Table 3 we provide descriptive statistics for the variables used in our analysis. We note that 31% of our borrowers pledge collateral and this collateral covers 19.2% of the loan amount, on average. From unreported statistics, we note that if we consider *Sole proprietorships*, the incidence of collateral and degree of collateralization become 36% and 24%, respectively. For *Corporations*, the relevant figures are 21% and 12%, respectively. Note that the figures are consistent with the economy-wide statistics reported in Table 1. Interestingly, we note that borrowers located closer to the lending branch (i.e., borrowers whose distance from the branch is below the median for our sample) have credit lines with significantly lower degree of collateralization of 18%,

[11] In the case of micro municipalities, we refer to the geographical area covered by the respective postal code.
[12] Size is measured in terms of capitalization as of 2006.

compared to 20.4% for more distant borrowers. Albeit descriptive in nature, this preliminary insight is in contrast to the theoretical predictions of the lender-based view of collateral.

The second outcome variable we consider is the interest rate charged by the bank. The average *Interest Rate* for our borrowers is 7.04%. On average, the interest rate paid by firms that pledge collateral is 7.26%, while it is 6.95% for unsecured credit. Firms located close to their lending branch tend to pay lower interest rates than borrowers located farther from the bank (6.98% versus 7.1%). This pattern also contradicts the predictions of the lender-based theory.

D. Information advantage measure

The key variable for testing the lender-based theory of collateral is the information advantage of the local lender. A well-established hypothesis in the banking literature is that the physical proximity between the borrower and the bank branch handling the loan application and the on-going credit relationship increases the availability of local knowledge to the lender and improves its capacity to collect accurate soft information and use this information in making lending decisions (Petersen and Rajan, 2002; DeYoung et al., 2008; Agarwal and Hauswald, 2010; Knyazeva and Knyazeva 2012; Bellucci et al. 2013; Ono et al., 2015).[13] In view of these findings, we measure the information advantage of the local bank over its transaction rivals with the lender-to-borrower distance. Specifically, we use the log of the metric distance between the lending branch and each borrower (*Lender-to-Borrower Distance*). The distance is based on the shortest and fastest route obtained through Routemate.[14] From Table 3 we note that the average distance between a borrower and the lending bank branch is almost 5.06 km (3.15 miles).[15]

Other oft-mentioned measures of information advantage are related to the nature of the bank-borrower relationship, such as its exclusivity and length, or the size of the firm (Jimenez et al. 2009). However, relationship-based variables are less suitable for identifying the competitive pressure from transaction lenders as a motive for collateral requirements by local banks, as needed in our context. They are also unlikely to present an exogenous source of information advantage. Thus, they might reflect various additional factors, render nuanced predictions, or be inconsistent with the trade-off between collateral and loan rate related to the information advantage of local banks, as the theory predicts. For instance, existing research (Brevoort and

[13] A similar hypothesis concerning the positive information effects of physical proximity has been tested with regard to investment and activity in financial markets (Coval and Moskowitz, 1999; 2001; Hau, 2001).

[14] Routemate is software for optimization of transportation costs and calculation of distance. For more information about the software, please see http://en.nemsys.it/prodotti.html

[15] This figure is broadly consistent with figures on the average or median borrower-branch distance provided in other studies for other countries: in the USA, for example, the median distance for credit lines was 3 miles in 2003 (Brevoort and Wolken 2009), while in Japan it was even smaller (1.2 miles, according to Ono et al. 2013), likewise in in Belgium (1.4 miles; Degryse and Ongena 2005) and Sweden (1.6 miles; Carling and Lundberg 2005).

Hannan, 2004; Dell'Ariccia and Marquez, 2004; Hauswald and Marquez, 2006; Presbitero and Zazzaro, 2010) documents that local banks tend to lend on a relational basis to local applicants over which these banks have a fundamental information advantage in order to create a competitive wedge against distant, transaction rivals. Thus, relationship variables would be partly influenced by the structure of the local credit market and their possible negative impact on collateral would be a less precise reflection of the lender-based theory. In addition, to the extent that collateral requirement is a costly alternative to ex ante screening (Manove et al. 2001), repeated lending and collateral might be inversely related even if collateral is motivated by adverse selection or moral hazard problems (Boot and Thakor 1994; Karapetyan and Stacescu, 2015). Thus, a test of the lender-based view using such variables might lead to instances of false positive errors. Relationship-based variables might also reflect hold-up problems and soft-budget-constraint effects that could have a positive relationship to both collateral requirements and loan rates (Ono and Uesugi, 2009), thus preventing us from rejecting the lender-based theory, i.e. leading to false negative type of errors. Finally, the nature of the lending relationship has a less clear impact on the monitoring and liquidation costs of collateral and thus does not allow us to gain insights into the relevance of the borrower-based view of collateral.

Moving on to the size of the borrowing firm, we note that this characteristic might also capture other features influencing loan contract terms, such as the bargaining power of the firm (that can be especially relevant when borrowing from small local banks) or its risk. In this case, a lower (higher) collateralization of loans can go together with lower (higher) interest rates. This would not be consistent with the trade-off implied by the lender-based explanation of collateral requirements by local banks, which predicts that the information advantage of the local lender over transaction lenders should have opposite effects on collateral and interest rate.

E. Control variables

Various factors related to borrower characteristics, bank-borrower relationship, credit market and aggregate economy might also influence the use and strictness of collateral. Therefore, we add to our specifications a broad set of control variables capturing such characteristics and chosen to reflect various empirical findings of the existing literature on collateral, which we discuss next. In addition to that, we include industry, bank branch, credit market, and year fixed effects.

Following Brick and Palia (2007) and Ono and Uesugi (2009), among others, we control for borrower's total sales. This variable allows us to capture the size of the borrower and possibly observable risk. Our dataset offers sales categories and therefore we construct a step variable *Sales* that takes the value of 1 if sales are less than .25 million euros (54% of our sample); 2 for

sales between .25 and .5 million euros (10%); 3 for sales between .5 and 1.5 million euros (14 %); 4 for sales between 1.5 and 5 million euros (11%); 5 for sales between 5 and 25 million euros (8%); 6 for sales between 25 and 50 million euros (2%); 7 for sales above 50 million euros (1%). In the multivariate analysis, we use separate indicators denoted by *D(Sales i)* for each sales category *i*, where *i* ranges from 1 to 7. As suggested by Berger and Udell (1995), the idea behind using financial variables such as turnover or assets is to control for observable risk of the borrower, and all else equal, riskier borrowers might be asked for collateral more often as a solution to moral hazard concerns. A related rationale proposed by Leeth and Scott (1989) is that, based on the theoretical arguments of Chan and Kanatas (1985), smaller borrowers will offer collateral more frequently as they are more informationally opaque and find pledging collateral a valuable signal of their quality. Yet, the empirical results in the existing literature are more nuanced. For instance, using assets as a size measure, Berger and Udell (1995) find that loans made to larger firms are more likely to be collateralized, while Jimenez et al. (2009) find the opposite. Other studies such as Brick and Palia (2007) and Ono and Uesugi (2009) show that the effect of firm size depends on the type of collateral, with larger firms pledging more real (inside) collateral but less personal (outside) guarantee. By contrast, Pozzolo (2004) finds that in Italy, firms with a higher turnover are less likely to pledge collateral but more likely to use personal guarantees. Berger et al. (2011) confirm that borrowers with higher observable risk are more likely to be asked for collateral. Thus, to the extent that firm size allows us to proxy for this type of risk, we expect collateral requirements and interest rates to be lower for larger firms.

Next, we use three characteristics of the bank-borrower lending relationship. *Relationship Length* is the number of months since the firm has first borrowed from our bank. On average, our sample firms have been clients of the bank for 113 months. This is comparable with findings by Cole (1998), Degryse and Van Cayseele (2000), and Gambini and Zazzaro (2013) for Italy. *Multiple Lending* is a variable that takes the value of 1 if the firm borrows from multiple banks and 0 if it has an exclusive relationship with our bank. Consistent with the well-documented prevalence of multiple lending across Italian firms (Detragiache et al., 2002), only 3% of the firms have an exclusive lending relationship. *Other Services* is a variable that takes value of 1 if a borrower uses additional services provided by the bank, and 0 otherwise. The last two metrics are intended to capture the exclusivity of the bank-borrower interaction and its scope, respectively. Existing research offers several arguments as to why characteristics of the lending relationship are important for loan contract terms in general, and collateral requirements in particular. Based on the theoretical arguments advanced by Boot and Thakor (1994), Berger and Udell (1995) develop an empirical hypothesis that the incidence of collateral should decline with

the duration of the bank-borrower lending relationship and validate it for the case of small US businesses. Similarly, Degryse and Van Cayseele (2000) argue that collateral requirements should decrease with the scope of the relationship. By contrast, Ono and Uesugi (2009) suggest that the predictions might be more ambiguous. Specifically, the association between relationship characteristics (length, scope, and exclusivity) and collateral requirements might be dominated either by a reduction in asymmetric information and enhancement of mutual trust or by an exacerbation of hold-up problems (or a mitigation of possible soft budget) originating from the preferential position of the bank. The existing empirical evidence confirms the variety of effects of bank-firm relationship on collateral. For instance, some observe lower incidence of collateral for borrowers with established lending relationships (e.g., Berger and Udell, 1995; Brick and Palia, 2007; Jimenez et al., 2006, 2011; Berger et al., 2011; Bharath et al., 2011), while others observe the opposite (e.g., Ono and Uesugi, 2009). Studies focusing on the scope and exclusivity of the lending relationship also offer contrasting results. For instance, Degryse and Van Cayseele (2000) and Ono and Uesugi (2009) find that an increase in the scope of the bank-firm relationship makes collateral requirements more likely. Similarly, Elsas and Krahnen (2000) observe higher probability of collateral and personal guarantees when the firm borrows from its "house bank", while Chakraborty and Hu (2006) and Jimenez et al. (2006) show that the incidence of collateral increases in the number of borrowing sources. With regard to Italy, Pozzolo (2004) finds that the length of the bank-firm lending relationship has a positive effect on the incidence of collateral and a negative effect on the use of personal guarantees. Calcagnini et al. (2014, 2015) also confirm the differential effects of relationship length on collateral and personal guarantees but offer opposing evidence by showing that longer relationship length leads to less collateral and more personal guarantees. By contrast, the number of relationships reduces the use of both collateral and personal guarantees. Overall, the effect of the lending relationship characteristics remains an open question, which further strengthens our arguments for the information measure adopted in our analysis.

We also include in our models a control variable *Credit Limit* that measures the size of the loan. Boot et al. (1991) develop a model that predicts an inverse relationship between loan size and collateral, and verify this empirically. By contrast, Leeth and Scott (1989) argue that certain fixed costs exist in setting up appraisals, inspections, documentation, etc. They suggest that as the loan size increases, such costs fall on a per-unit basis, thus enhancing the use of secured debt. Consistently, they show that larger loans are more likely to be collateralized. Similar positive association between loan size and collateral is observed by Degryse and Van Cayseele (2000), Jimenez at al. (2006), and Berger et al. (2011), among others, and by Pozzolo (2004) for Italy.

Hence, in line with most of the extant research, we expect higher credit limits to be associated with higher collateral requirements. We use the natural logarithm of the credit limit of the credit line in the multivariate analysis.

Lastly, Ono and Uesugi (2009) observe that the composition of the lender's portfolio might be relevant for collateral requirements. Based on this observation, we extend the idea by adding a variable, *Portfolio*, which accounts for the segment of the portfolio where a borrower falls. This variable takes the value of 1 if the bank considers the borrowing firm as a part of its *corporate market* and 0 if it is a part of the *small business market*. Note that it is the borrower's characteristics such as business strategy and activity and demand for services that determine the assignment.

Selected summary statistics for all variables used in the analysis are presented in Table 3, while their construction is summarized in the Appendix. In Table 4 we report a correlation table for the variables of interest. As a preliminary insight into our analysis, we note that the distance between our bank and its borrowers is negatively correlated with both measures of collateral: *Collateral* and *Percentage of Collateral*. The correlations are significant at the 1% level. By contrast, the interest rate charged by the bank is positively correlated with distance. Both findings seem inconsistent with the lender-based view for the use of collateral in bank lending. Therefore, we next proceed to examine these correlations in a formal multivariate framework that also allows us to account for the possible interplay between various features of the loan contract.

IV. Results

A. Equation-by-equation estimation

We begin the discussion of our results with the analysis of the impact of the physical proximity between the local lender and each borrower on the collateralization and price of the loans made by the local lender. Table 5 shows results of the estimation of equations (1) and (2) using an equation-by-equation approach that assumes that the bank sets collateral and interest rate independently. The first column presents the OLS estimation of an equation that models the percentage of the loan amount secured by collateral (i.e., the dependent variable is *Percentage of Collateral*), while the second column shows the Probit estimation of an equation that models the incidence of collateral (i.e., the dependent variable is *Collateral*). The main focus is on the point estimate of the coefficient of the measure for bank-borrower physical proximity, i.e. *Lender-to-Borrower Distance*. Our analysis shows that loans to borrowers located farther away from their lending branch have lower degree of collateralization, as the coefficient on *Lender-to-Borrower Distance* is negative and statistically significant in column (1). The likelihood of pledging collateral is also negatively associated with the distance between the borrowing firm and the bank, but the

estimated coefficient is not significant at conventional levels. Lastly, column (3) shows that borrowers located farther away from the lending branch pay higher interest rates. This finding is consistent with the postulated by theory differential impact of the information advantage created by distance on interest rates and collateral requirements.

Our initial multivariate findings seem inconsistent with the lender-based view for the use of collateral. As the quality and quantity of local information are inversely related to the borrower-to-bank distance, the local bank has lower information advantage for borrowers located farther away and is thus more susceptible to competitive pressure from transaction lenders for these borrowers. As a result, the local lender should increase the collateral requirements to compensate for the reduced ability to extract surplus through higher explicit price of credit, i.e. interest rates. In contrast to this lender-based perspective, our estimates show that the local lender reduces its collateral requirements and increases the interest rates for more distant borrowers. These findings are consistent with the signaling model developed by Chan and Kanatas (1985). Greater distance would make pledging collateral more costly and lower collateral requirements (*Proposition 2*). Our findings are also in line with the Besanko and Thakor (1987) model, which shows that the higher the costs of collateral, the lower the collateral requirements and the higher the interest rates charged by banks in a competitive setting (*Proposition 2*). To the extent that the dissipative and monitoring costs of collateral increase with distance, collateral will be a costly selection device for the bank and its use will decrease with the lack of proximity, all else equal.

B. Instrumental variables analysis

Although the equation-by-equation analysis is informative, it has limitations that might affect the insights we are able to generate. Specifically, as both modeled by theory and shown by empirical studies (Brick and Palia, 2007; Bharath et al. 2011; Calcagnini et al., 2014), contract terms such as interest rates and collateral requirements are likely to be set simultaneously at loan approval. If not addressed, this simultaneity might lead to biases in the equation-by-equation estimation and possibly misleading inferences. Furthermore, in the case of simultaneity, determining even the mere direction of the bias might be challenging. To incorporate the endogenous nature of the loan contract terms, we estimate equations (1) and (2) using instrumental variables (IV) estimation. Identification requires at least one instrument for each endogenous variable and the instrumental variables should be (a) uncorrelated with the error term in the estimated equation and (b) partially and sufficiently strongly correlated with the endogenous variable, once the other independent variables are controlled for.

We start with the IV estimation of equation (1), allowing the interest rate charged by the bank to be endogenously determined. To find instruments for the interest rate, we exploit the contractual nature of the credit lines and the industrial organization of the local credit markets. First, borrowers pay a fixed rate if they use funds within a pre-specified limit and a penalty rate (or fee) if they exceed the limit. This rate is increasing in the amount used in excess of the contractual limit. Thus, the actual interest rate depends on whether borrowers exceed the credit limit and by how much. By contrast, the loan contract does not condition collateral requirements on the actual amount of credit used. Hence, our first instrument is *Overdraw-C*, a continuous variable that takes the value of 0 if the borrower uses funds within the credit limit and the natural logarithm of the actual amount of excess funds if the borrower exceeds the limit stipulated in the loan contract. Following Brick and Palia (2007), the second instrument we adopt for the interest rate is the market power of all banks in each credit market captured via a branch-based Herfindhal-Hirschman index (*Branch HHI*). In line with some relationship lending arguments, the idea is that in concentrated markets, banks can use their explicit loan rate as a strategic variable to establish long-term relationships and secure rents on future loans and other related services (Petersen and Rajan, 1995).[16] We note that although one might argue that this measure can partly reflect competitive pressure, it does not capture the specific pressure from transaction lenders, as postulated by theory and operationalized by our measure above in Section III.B.

As stated, an instrument must satisfy two conditions: It must be uncorrelated with the error term and sufficiently correlated with the endogenous variable (after the other independent variables are controlled for). Since we have more than one instrument, we can use the overidentifying restrictions test for instrument validity via a Sargan test (the first condition). The second condition is related to the so-called weak identification problem, which arises if the instruments are correlated with the endogenous regressor but only weakly so. In this case the IV estimator could be misleading.

The results of the IV analysis of equation (1) modeling the determinants of collateral are presented in columns (1) to (3) of Table 6. The estimation in column (1) uses as dependent variable the percentage of the credit line secured by collateral, *Percentage of Collateral*, and OLS estimation in the second stage. Columns (2) and (3) show additional evidence using as dependent variable the *Collateral* indicator. Specifically, the second stage of the estimation in column (2) is a

[16] As an alternative measure, we used the distance between the borrower and branches of other banks in the local credit market. The estimation results, which are available upon request, are robust. In addition, we also re-estimated the model by using only *Overdraw-C* as our preferred instrument for interest rate. Although we cannot test for over-identification in this case, our results (available upon request) are unchanged.

linear probability model, while it is a Probit model in column (3). Interest rate is instrumented with the two variables discussed above. Both instruments have the expected sign, even though only *Overdraw-C* has a statistically significant impact on the interest rate. We note that the tests of the validity of our instruments offer reassuring results. The Sargan test fails to reject the null hypothesis that our instruments are uncorrelated with the residuals from the second stage of our model. Furthermore, the first-stage statistics (F-statistics) are sufficiently high, which suggests that our estimation is unlikely to be subject to the "weak instrument" criticism from a statistical perspective. Thus, both tests suggest that we can draw robust inferences from the IV analysis.

The first stage estimation shows that, consistent with the rationale for our instruments, overdrawing leads to higher rates. The association between market structure and interest rates is positive but not significant. The statistic of the F-test is 27.5, well above the threshold tabulated by Stock and Yogo (2005). With regard to the exclusion restriction, the Sargan test indicates that we cannot reject the null hypothesis that our instruments are uncorrelated with the error term.

The estimation results in columns (1) through (3) indicate that our inferences about the empirical relevance of the lender-based view of the use of collateral in small business lending are statistically and economically stronger after controlling for the endogenous nature of the interest rate. The coefficient on *Lender-to-Borrower Distance* is negative and statistically significant at the 1% level in all three specifications, and its magnitude becomes larger in absolute value, suggesting that the endogeneity of interest rate might undervalue the impact of distance on collateral requirements. To assess the economic magnitude of our estimates, we use the results reported in column (1) to compare the predicted *Percentage of Collateral* for borrowers whose *Lender-to-Borrower Distance* is 6.80, which is the 25th percentile of all distances and corresponds to 921 meters, to the predicted *Percentage of Collateral* for borrowers whose *Lender-to-Borrower Distance* is 8.78, which is the 75th percentile and corresponds to a metric distance of 6,531 meters. The predicted *Percentage of Collateral* for the former is 22.69%, while it is 19.23% for the latter: a difference of more than three percentage points, corresponding to a reduction of 18%. We also note a similar impact of *Lender-to-Borrower Distance* on the likelihood of pledging collateral. Based on the linear probability model estimates in column (2), the predicted probability of *Collateral* is 33.71% for *Lender-to-Borrower Distance* at the 25th percentile and 30.24% for *Lender-to-Borrower Distance* at the 75th percentile. Thus, our results indicate not only statistical significance but also pronounced economic importance of the effects we study.

Next we turn to the IV analysis of interest rates, allowing for endogenous collateral requirements. We develop three potential instruments to implement the IV analysis. The first instrument is *Real Estate Prices*. Indeed, as the majority of collateral pledged by the borrowing

firms in our sample is in the form of commercial, industrial or residential properties and real estate, we consider the average price per square meter for each of these three categories observed during the period 2003-2004 in the municipality of each of our borrowers. Since the correlations among these three price measures are high (correlation coefficients are between 0.77 and 0.96), and we are examining loans made to business enterprises, we focus on the first two categories and use the logarithmic transformation of the average price of commercial and industrial properties and real estate in year 2003 and 2004 as our preferred measure. However, in unreported regressions, we verify the robustness of our results to inclusion in the first stage of the prices of all three types or any two of them.[17] These prices are computed semi-annually by the Real Estate Market Observatory (OMI) of the *Agenzia del Territorio*, now part of the *Agenzia delle Entrate* (Italian Revenue Agency), a State agency under the supervision of the Italian Ministry of Economy and Finance and the Court of Auditors (Corte dei Conti).[18] The OMI database is the most comprehensive source of information about real estate and property prices in Italy and has been widely used by researchers (see, for instance, Bank of Italy, 2008). In particular, OMI divides the area of each municipality in homogeneous zones and conducts a survey of the prices per square meter for each type of real estate within each of these zones. The price data are based on market transactions, recorded by real-estate agents for contracts of sale and valuations produced by Ministry-appointed appraisers. The OMI database provides the minimum and maximum price for each property category within the zone. For each zone we compute the mean value of these prices. The OMI provides data for almost all municipalities represented in our sample: For seven peripheral municipalities not included in the database we use the average prices of the neighboring municipality. In the specific, we adopted the average price of the closest neighbor municipality for 496 observations equivalent to 3,38% of the credit lines in the sample.[19]

The rationale for using real estate prices as an instrument for collateral in business loans is relatively straightforward. Higher real estate prices in a given municipality are associated with higher liquidation values for properties located in this municipality, thus increasing the incentives of the bank to collateralize the loans extended to borrowers in these locations. This is consistent with the collateral channel argument in the financial accelerator theories (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997) and with recent studies suggesting that debt capacity and investment of land-holding companies are more sensitive to variation in real estate prices (Gan

[17] Estimates are available upon requests from the authors.

[18] More detailed information on the procedure for recording and collecting these property prices are available at www.agenziaentrate.gov.it/wps/content/Nsilib/Nsi/Documentazione/omi/

[19] Also excluding the 496 observations with the prices of the closest neighbor municipalities our results continue to be robust (estimates are available upon requests).

2007; Chaney et al. 2012). With respect to the exclusion restriction, while it is plausible to assume that the impact of real estate prices on business loan rates is through the value of pledgeable assets, using more than one instrument allows us to test the validity of the overidentifying restrictions.

As a second instrument, we use a measure of the average costs incurred in bankruptcy, *Bankruptcy Costs*. In particular, *Bankruptcy Costs* is the average cost of bankruptcy procedures in the judicial district where a borrower is located as of 2003 and 2005, respectively.[20] These costs, which are computed annually by the Italian National Institute of Statistics (ISTAT) using data provided by each judicial district, include various items such as salary for the trustee of bankruptcy, legal fees, administrative and procedural costs, etc. The underlying rationale is that an efficient and inexpensive functioning of bankruptcy courts influences the recovery rates and costs of collateral and, in this way, its use in loan contracts (Liberti and Mian, 2010; Degryse et al., 2014). In addition to that, collateral becomes relevant for banks in the "bad states" of the world, when borrowers cannot meet repayment obligations, but the actual realization of a bankruptcy and collateral liquidation, vis-à-vis alternative outcomes such as renegotiation for instance, depends on how costly the bankruptcy procedure may be: Higher costs could imply higher renegotiation chance and lower collateral relevance.

Our third instrument is a dummy variable (*Individual Firm*), which takes the value of 1 if the organizational form of the borrower is sole proprietorship and 0 otherwise. On the one hand, as Berger and Udell (1998) argue, sole proprietorships are informationally more opaque than other types of legal entities, such as corporations or partnerships. Hence, these firms are expected to face higher collateral requirements. On the other hand, sole proprietorships are not protected by limited liability, which facilitates asset redeployment by firms and widens the recoverable assets by banks in a bankruptcy, thus reducing the importance and value of collateral requirements.

The estimation results for the interest rate equation are shown in column (4) of Table 6. We observe that after controlling for the endogenous nature of collateral, our insights remain unchanged: Interest rates are increasing with the distance between the borrower and the local bank. The first-stage estimates confirm that, consistent with the arguments underlying our instruments, higher *Real Estate Prices* are associated with higher level of collateralization of loans, while collateral requirements become lower if the costs of bankruptcy increase. The requirements are also higher for sole proprietorships, which can be viewed by banks as informationally more opaque and more risky. The statistical tests, such as F-test and Sargan test, are consistent with the relevance and validity of our instruments.

[20] The firms in our dataset belong to three different judicial districts whose average bankruptcy costs vary both across districts and over time.

C. Simultaneous equations

The last part of our empirical analysis explicitly incorporates the joint determination of contract features such as collateral requirements and interest rates. Equations (1) and (2) illustrate that collateral and interest rates are determined simultaneously, i.e. we explain interest rates with collateral but collateral is also explained by interest rates and other variables. Thus, in this section we discuss results of the estimation of the system of equations (1) and (2) by means of a 3 Stage Least Squares (3-SLS) regression. Complementing 2-SLS, 3-SLS uses the additional information that both equations could be related through the error terms and enhances the efficiency of the estimation (Zellner and Theil, 1962). Similar to the IV analysis, identification is achieved through variables that appear in one of the equations but not in the other. For purposes of identification, we use the instruments discussed above. Namely, the interest rate equation is identified through *Overdraw_C* and *Branch HHI*, while the collateral equation is identified through *Real Estate Prices, Bankruptcy Costs* and *Individual Firm*.

Table 7 presents the results of the 3-SLS estimation of equations (1) and (2) and confirms our previous findings documented in Tables 5 and 6 that higher *Lender-to-Borrower Distance* is associated with lower collateral requirements and higher interest rates. To interpret, borrowers located farther away from the local lender, i.e. borrowers for whom the information advantage of this lender is lower but the costs of collateral are higher, face lower collateral requirements but end up paying higher interest rates. Thus, our results consistently indicate that collateral seems to be used by (local) banks to mitigate asymmetric information problems, as suggested by borrower-based theories, rather than as a competitive device against transaction lender rivals, as proposed by the lender-based view.

D. Endogenous and other control variables

First, we note with regard to the endogenous variables that the interest rate and collateral tend to move in the same direction. In the single-equation models reported in Table 5, the coefficients on interest rate and collateral are both positive and significant. When we consider in Tables 6 and 7 that price and non-price contract terms are endogenously set by the bank, the estimated shared impact is much greater in magnitude than in unreported non-IV estimates in magnitude even though it is statistically significant only for the interest rate in the collateral equation (1). This result is at odds with the inverse relationship between collateral and interest rate documented by Degryse and Van Cayseele (2000), Agarwal and Hauswald (2010), and Calcagnini et al. (2014), among others. It is consistent with the idea that banks sort borrowers based on risk grade, which

might lead to the result that "observably risky borrowers are required to pledge collateral" (Berger and Udell, 1990, p. 23), and it is in line with evidence reported by Berger and Udell (1990), Brick and Palia (2007) and Bharath et al. (2011), who document that the cost of borrowing for collateralized loans tends to be significantly higher.

Our findings further show that several control variables are relevant for the loan contract terms. Specifically, we observe that larger loans (*Credit Limit*) are associated with lower interest rates but higher collateral requirements, consistent with findings of Degryse and Van Cayseele (2000) and Berger et al. (2011), among others. By contrast, larger firms tend to experience better credit terms as collateral requirements, and interest rates in some estimations, decrease with borrower size.[21] This is consistent with the hypothesis that small firms are informationally more opaque and riskier and have lower bargaining power against lenders (Berger and Udell, 1998), and also confirms the idea that firm size might not capture appropriately the information advantage of the local bank. Lastly, some features of the bank-borrower lending relationship are also related to loan contract terms. Lasting banking relationships seem to benefit the borrowers in terms of lower collateral requirements, while having a negative but insignificant impact on the interest rate. These findings are in line with evidence provided by Brick and Palia (2007), and confirm our intuition and concerns about the suitability of relationship length as a proxy for the advantage of local banks over transaction lenders specific to our context. Similar concerns arise if we consider the scope and exclusivity of the bank-borrower interaction. As with *Relationship Length,* firms that use multiple services from the bank (*Other Services* = 1) pledge less collateral than firms that only have a credit line, but do not face higher interest rates. Similarly, *Multiple Lending* (an inverse measure of the exclusivity of the lending relationship) reduces the degree of collateralization, without affecting interest rate.

V. Extensions

A. Decision-making levels

Our analysis so far suggests that collateral requirements are lower for borrowers located farther away from the bank, i.e. when the information advantage of the local lender is lower. To further examine this point, we recognize that the information advantage of the lender might be impacted by the hierarchical position of the decision-making unit. This position affects the types and quantity of information produced and used in the lending process (Liberti and Mian, 2009). The greater the hierarchical distance between the bank manager(s) called to make the final approval decision and contract design and the loan officer at the local branch where the loan

[21] Recall that firms in the excluded category (*D(Sales 1)*) are the smallest ones, with sales of less than .25 million.

application is submitted and information about the applicant is collected, the greater the information asymmetry and communication problems within the bank. In addition to that, Berger and Udell (2002) view bank lending as a sequence of contracting problems inside the bank and the severity of the related agency problems depends on the complexity of the institution. Thus, for loan contracts managed by bank managers at higher hierarchical levels, the information advantage of the bank might be attenuated (and possibly even eliminated) by problems of information transmission and communication within the bank. This implies that the information advantage of the local bank is broadly limited to loans approved at the branch level, while for decisions made at higher levels such as the bank's headquarters, where concerns about information asymmetry and agency problems tend to be higher, the information advantage over rival transaction lenders might be minimal. In the context of the lender-based theory, the latter argument implies that the effects of lender-to-borrower distance on collateral requirements might depend on the hierarchical position of the unit responsible for the loan decision, namely: magnified for loans approved at the branch level and attenuated for loans handled at the headquarters. By contrast, if collateral is required by banks to solve ex-ante information problems about borrowers' riskiness, and the monitoring costs of collateral are higher when the unit that collects information is remote from the one that approves the loan and monitors the borrower, we expect hierarchical distance to magnify the negative effect of the branch-to-borrower distance on collateral.

To account for the effects discussed above, we construct a dummy variable, *Decisional Level,* which takes the value 1 if the loan is handled at the headquarters and 0 if it is at the branch level. This reflects the structure of our bank, which has seven hierarchical decisional levels. The lowest decisional unit is at the branch level, while the remaining higher units are located within the headquarters. This is also consistent with the analysis of Liberti and Mian (2009) showing that hierarchical distance matters for the use of soft information when hierarchical levels are located in different geographical places. We augment the specifications in equations (1) and (2) with the variable *Decisional Level* and an interaction term *Lender-to-Borrower Distance* × *Decisional Level.*

Results of the estimation of this augmented specification are reported in Table 8. We also include the full set of *Controls* used in Tables 6 and 7 but for the sake of brevity suppress the coefficients in the table. We note that the coefficient on the interaction terms has the same sign as the respective main effects of *Lender-to-Borrower Distance* in each column, and it is statistically significant at the 10% level in column (1). This implies that the negative impact of distance on collateral requirements is magnified when the decision is taken at the headquarters level. This result is inconsistent with the view of collateral as a competitive device used by local lenders. By

contrast, it is consistent with the idea that the two types of distance (i.e., between the bank and borrower and within the banking organization) increase the costs of pledging collateral and decrease its use as predicted by the borrowed-based theories.

B. Competition

The lender-based theory of collateral offers further insights into the effect of local credit market competition by examining how a decrease in the costs of underwriting transaction loans (i.e., an increase in the competitive pressure from transaction lenders) affects collateral and interest rate. Reduction in these costs leads to lower interest rates and higher collateral requirements on loans made by the local lender. In addition to that, the increase in collateral requirements is more pronounced when the information advantage of the local lender is smaller (Inderst and Mueller, 2007, Proposition 6).[22]

To test the implications of Proposition 6, we need a measure of the competitive pressure by transaction lenders. To this end, we use the number of bank branches owned by the 8 largest Italian banks in the local credit markets, described in Section III.B. The underlying rationale is that for this type of lenders, most of the loans are not based on local knowledge. In addition to that, such banks are known to have quite different mode of operation and very "impersonal" interaction with their borrowers (e.g., Berger et al. (2005)).

We augment equations (1) and (2) by introducing the variable *Big Groups* (i.e. the log of 1 plus the number of branches owned by transaction lenders in each local credit market) to capture the competitive pressure of transaction lenders, and its interaction with our measure of the information advantage. Thus, according to the lender-based theory of collateral, the estimated coefficients of this variable should be positive in the collateral equation (1) and negative in the loan rate equation (2), as stronger competition by transaction lenders should increase the use of collateral by the local lender and lower the rate. The interaction term *Lender-to-Borrower Distance* × *Big Groups* captures the second part of Proposition 6 that the impact of the competitive pressure on price and non-price terms for loans extended by the local lender is higher when the information advantage of the latter is lower. Hence, the estimated coefficient on the interaction terms in equations (1) and (2) should be positive and negative, respectively. Table 9 reports the results of this analysis. In contrast to the lender-based view, the estimated coefficients suggest that the stronger presence of transaction lenders is associated with lower collateral requirements

[22] According to Proposition 6 of Inderst and Mueller (2007, p. 843), "a decrease in the costs of transaction lending (lower κ) forces the local lender to lower the loan rate and to increase the collateral requirement. The increase in collateral requirement for a given decrease in κ is greater for borrowers for whom the local lender has a relatively smaller information advantage" (p. 843).

and higher interest rates on the contracts extended by the local bank, and this effect is independent of the information advantage of the local bank.

VI. Conclusion

In this paper we examine empirically the lender-based explanation of the use of collateral in bank lending. We first identify a *local lender* and then construct a measure of its *information advantage* as these are fundamental elements of the theory. We next examine how collateral requirements and interest rates charged by the local lender vary with its information advantage. The lender-based view implies that collateral (interest rate) should increase (decrease) with the information advantage and local knowledge.

We operationalize these concepts using the physical distance between the bank and its borrowers, i.e. lender-to-borrower distance. We argue that this metric is inversely related to the information advantage of the local bank and directly related to the magnitude of transaction costs associated with the use of collateral such as costs related to monitoring and repossession. Using both equation-by-equation and 3-SLS estimation of simultaneous equations approaches, we find that collateral requirements decrease with the distance between the local bank and borrower, i.e. when the costs associated with the use of collateral tend to be high and the information advantage of the lender is low. Consistently, interest rates are increasing in this distance. Thus, our results seem more consistent with some borrower-based explanations for the use of collateral rather than with the recent lender-based view.

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Table 1
Composition of Loans by Type of Guarantee

The table reports the fraction of collateralized and unsecured loans in Italy for each year during the period 1999-2005 using aggregate data from the supervisory reports issued by the Bank of Italy. The reported figures are in percentages.

	1999	2000	2001	2002	2003	2004	2005
				All customers			
Collateral	28.3	29.5	29.9	31.7	35.6	38.7	42.7
Personal Guarantees	20.8	20.4	19.1	18.8	17.6	17.8	15.7
Unsecured	50.9	50.1	51.0	49.4	46.8	43.5	41.6
				Sole proprietorships			
Collateral	33.7	35.6	36.2	38.2	43.1	46.1	45.4
Personal Guarantees	39.3	38.6	36.3	34.6	30.8	30.2	28.0
Unsecured	27.0	25.8	27.4	27.2	26.1	23.7	26.6
				Firms			
Collateral	24.0	24.9	24.6	26.6	29.7	32.0	32.2
Personal Guarantees	27.1	27.4	25.2	25.6	24.1	24.3	23.6
Unsecured	48.8	47.7	50.2	47.8	46.2	43.7	44.2

Table 2
Characteristics of the Local Credit Markets

The table shows characteristics of the local credit markets of operation of the bank. Big Groups are defined as banks that belong to the largest 8 Italian Banking Groups, where bank size is measured in terms of capitalization as of 2006. The local credit markets are defined with respect to the operations of our bank.

Local credit markets characteristics	Mean	Min	Max	Std. Dev.
Number of Banks	14.8	1	39	11.4
Number of Banks of Big Groups	2.4	0	6	2.2
Number of Bank Branches	32.3	1	108	32.9
Number of Bank Branches of Big Groups	7.2	0	33	10.5
Number of Bank Branches of other Banks	10.6	0	27	6.9

Table 3
Summary Statistics

The table presents summary statistics for the sample used in the analysis. Definition and construction of each variable is provided in the Appendix. The sample consists of 14,672 observations.

	Mean	St. Dev.	Median
Dependent Variables			
Collateral	0.31	0.46	0.00
Percentage of Collateral	19.2	33.6	0.00
Interest Rate	7.04	2.43	6.34
Information Advantage			
Lender-to-Borrower Distance (km)	5.06	2.57	7.34
Lender-to-Borrower Distance (log, metric)	7.72	1.41	7.85
Control Variables			
Sales (€)	2.17	1.52	1.00
D(Sales 1)	0.54	0.50	1
D(Sales 2)	0.10	0.30	0
D(Sales 3)	0.14	0.35	0
D(Sales 4)	0.11	0.31	0
D(Sales 5)	0.08	0.27	0
D(Sales 6)	0.02	0.14	0
D(Sales 7)	0.01	0.09	0
Big Groups	7.17	10.52	3
Multiple Lending	0.97	0.18	1
Other Services	0.91	0.28	1
Relationship Length (months)	113.33	90.75	83.63
Portfolio	0.10	0.29	0
Decisional Level	0.17	0.37	0
Credit Limit(€)	104,383	417,766	27,500
Instruments			
Overdraw-C	0.27	0.63	0
Branch HHI	0.21	0.15	0.15
Bankruptcy Cost	38.30	9.85	35.68
Individual Firm	0.43	0.50	0
Real Estate Prices	6.92	0.22	7.03

Table 4
Correlation Matrix

The table reports pairwise correlation coefficients for the variables used in the analysis. * indicates statistical significance at the 1% level.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Collateral	(1)	1									
Percentage of Collateral	(2)	0.900*	1								
Lender-to-Borrower Distance	(3)	-0.025*	-0.023*	1							
Interest Rate	(4)	0.057*	0.082*	0.054*	1						
Sales	(5)	-0.132*	-0.162*	0.087*	-0.078*	1					
Credit Limit	(6)	0.052*	0.025*	0.018	-0.066*	0.252*	1				
Relationship Length	(7)	-0.021	-0.072*	-0.079*	-0.047*	0.114*	0.109*	1			
Multiple Lending	(8)	-0.074*	-0.068*	0.011	0.011	-0.049*	-0.045*	-0.046*	1		
Other Services	(9)	-0.092*	-0.153*	-0.018	-0.067*	0.117*	0.045*	0.173*	-0.011	1	
Portfolio	(10)	-0.109*	-0.111*	0.081*	-0.081*	0.547*	0.274*	0.068*	0.001	0.059*	1

Table 5
Equation-by-Equation Analysis of Collateral and Interest Rates

The table reports results of the equation-by-equation estimation of equations (1) and (2). Column (1) shows results of the OLS estimation of a specification in which the dependent variable is the percentage of the credit line secured with collateral (*Percentage of Collateral*). Column (2) shows results of the Probit estimation of a specification in which the dependent variable is the indicator variable *Collateral* that takes the value of1 if the credit line is collateralized and 0 otherwise. Column (3) shows results of the OLS estimation for a specification in which the dependent variable is the interest rate on the credit line (*Interest Rate*). Description of the variables used in the analysis is provided in the Appendix. The table reports coefficient estimates followed by robust standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

	Percentage of Collateral	Collateral	Interest Rate
	(1)	(2)	(3)
Lender-to-Borrower Distance	-0.003*	-0.010	0.058***
	(0.002)	(0.009)	(0.015)
D(Sales 2)	-0.028***	-0.097**	-0.117*
	(0.009)	(0.041)	(0.067)
D(Sales 3)	-0.078***	-0.354***	-0.128**
	(0.007)	(0.039)	(0.057)
D(Sales 4)	-0.115***	-0.615***	0.096
	(0.008)	(0.048)	(0.068)
D(Sales 5)	-0.124***	-0.765***	-0.061
	(0.012)	(0.075)	(0.093)
D(Sales 6)	-0.161***	-1.155***	-0.298**
	(0.017)	(0.145)	(0.139)
D(Sales 7)	-0.199***	-1.334***	-0.723***
	(0.025)	(0.208)	(0.176)
Multiple Lending	-0.062***	-0.083	-0.081
	(0.017)	(0.068)	(0.105)
Other Services	-0.193***	-0.446***	-0.338***
	(0.013)	(0.042)	(0.084)
Relationship Length	-0.000***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Portfolio	-0.086***	-0.623***	-0.401***
	(0.011)	(0.078)	(0.089)
Credit Limit	0.063***	0.407***	-0.184***
	(0.002)	(0.012)	(0.016)
Constant	0.127***	-1.848***	6.651***
	(0.048)	(0.160)	(0.311)
Year FE	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes
Market FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	14,672	14,659	14,672
R2	0.22	0.21	0.09

Table 6
IV Analysis of Collateral and Interest Rate

The table reports results of the instrumental variables (IV) estimation of equations (1) and (2). Columns (1) through (3) refer to the collateral equation (1). The dependent variable in column (1) is the percentage of the credit line secured with collateral (*Percentage of Collateral*), while the dependent variable in columns (2) and (3) is an indicator *Collateral* that takes the value of 1 if the credit line is collateralized and 0 otherwise. Column (2) shows the results of an OLS estimation of a linear probability model, while column (3) shows results of the estimation of Probit model. Column (4) is the interest rate specification in which the dependent variable is the interest rate on the credit line (*Interest Rate*). Description of the variables used in the analysis is provided in the Appendix. The table reports coefficient estimates followed by standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

Table 6 continued.

	Percentage of Collateral	Collateral	Collateral	Interest Rate
	(1)	(2)	(3)	(4)
Lender-to-Borrower Distance	-0.016***	-0.016***	-0.052***	0.061***
	(0.004)	(0.005)	(0.016)	(0.015)
Interest Rate	0.227***	0.218***	0.729***	
	(0.034)	(0.038)	(0.126)	
Percentage of Collateral				0.935
				(0.855)
D(Sales 2)	-0.002	0.007	-0.015	-0.090
	(0.018)	(0.019)	(0.066)	(0.072)
D(Sales 3)	-0.049***	-0.062***	-0.265***	-0.055
	(0.016)	(0.018)	(0.060)	(0.090)
D(Sales 4)	-0.137***	-0.182***	-0.697***	0.203*
	(0.018)	(0.019)	(0.068)	(0.120)
D(Sales 5)	-0.110***	-0.181***	-0.733***	0.054
	(0.026)	(0.029)	(0.103)	(0.148)
D(Sales 6)	-0.094**	-0.186***	-0.961***	-0.147
	(0.045)	(0.049)	(0.186)	(0.220)
D(Sales 7)	-0.034	-0.181**	-0.834***	-0.537*
	(0.067)	(0.073)	(0.267)	(0.298)
Multiple Lending	-0.044	-0.046	-0.025	-0.023
	(0.029)	(0.031)	(0.105)	(0.125)
Other Services	-0.117***	-0.055**	-0.201**	-0.157
	(0.021)	(0.023)	(0.078)	(0.180)
Relationship Length	-0.000***	-0.000*	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Portfolio	0.005	-0.055*	-0.325***	-0.320**
	(0.030)	(0.032)	(0.115)	(0.127)
Credit Limit	0.105***	0.147***	0.545***	-0.244***
	(0.008)	(0.008)	(0.029)	(0.057)
Constant	-1.292***	-1.427***	-7.259***	6.532***
	(0.232)	(0.254)	(0.972)	(0.477)
Year FE	Yes	Yes	Yes	Yes
Branch FE	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	14,672	14,672	14,659	14,672
Instruments				
Overdraw-C	0.233***	0.233***	0.234***	
	(0.031)	(0.031)	(0.031)	
Branch HHI	0.158	0.158	0.158	
	(0.313)	(0.313)	(0.313)	
Bankruptcy Costs				-0.004***
				(0.001)
Individual Firm				0.049***
				(0.006)
Real Estate Prices				0.053**
				(0.023)
Diagnostics				
F-test 1st Stage	27.51	27.51		28.00
Sargan Test (p-value)	0.166	0.300		0.284

Table 7
Simultaneous Equations Analysis of Collateral and Interest Rate

The table reports results of the simultaneous equations estimation of equations (1) and (2) using 3-Stage Least Squares (3SLS) approach. Column (1) is the collateral specification in which the dependent variable is the percentage of the credit line secured with collateral (*Percentage of Collateral*). Column (2) is the interest rate specification in which the dependent variable is the interest rate on the credit line (*Interest Rate*). Description of the variables used in the analysis is provided in the Appendix. The table reports coefficient estimates followed by standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

Table 7 continued.

	Percentage of Collateral	Interest Rate
	(1)	(2)
Lender-to-Borrower Distance	-0.015***	0.059***
	(0.004)	(0.015)
Interest Rate	0.219***	
	(0.033)	
Percentage of Collateral		0.902
		(0.983)
D(Sales 2)	(0.007)	(0.065)
	0.009	-0.102
D(Sales 3)	(0.017)	(0.072)
	-0.034**	-0.079
D(Sales 4)	(0.016)	(0.094)
	-0.116***	0.159
D(Sales 5)	(0.018)	(0.128)
	-0.091***	0.019
D(Sales 6)	(0.026)	(0.153)
	-0.078*	-0.187
D(Sales 7)	(0.043)	(0.225)
	-0.020	-0.601**
Multiple Lending	-0.046*	-0.038
	(0.028)	(0.125)
Other Services	-0.119***	-0.207
	(0.021)	(0.190)
Relationship Length	-0.000***	-0.001
	(0.000)	(0.001)
Portfolio	0.007	-0.365***
	(0.029)	(0.133)
Credit Limit	0.103***	-0.207***
	(0.007)	(0.065)
Constant	0.000	6.543***
	(0.000)	(0.489)
Year FE	Yes	Yes
Branch FE	Yes	Yes
Market FE	Yes	Yes
Industry FE	Yes	Yes
N	14,672	14,672
Instruments		
Individual Firm		0.039***
		(0.011)
Bankruptcy Cost		-0.004**
		(0.001)
Real Estate Prices		0.045*
		(0.023)
Branch HHI	-0.120	
	(0.152)	
Overdraw_C	0.207***	
	(0.059)	
Diagnostics		
Sargan Test (p-value)	0.30	0.30

Table 8
Headquarters Decision-making Process

The table reports results of the instrumental variables (IV) estimation of equations (1) and (2). Column (1) refers to the collateral equation in which the dependent variable is the percentage of the credit line secured with collateral (*Percentage of Collateral*). Column (2) refers to the interest rate specification in which the dependent variable is the interest rate on the credit line (*Interest Rate*). The estimations include the full set of controls used in Tables 6 and 7 but the coefficients are not reported. Description of the variables used in the analysis is provided in the Appendix. The table reports coefficient estimates followed by standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

	Percentage of Collateral	Interest Rate
	(1)	(2)
Lender-to-Borrower Distance	-0.014***	0.051***
	(0.004)	(0.016)
Lender-to-Borrower Distance × Decisional Level	-0.019*	0.067
	(0.011)	(0.041)
Decisional Level	0.202**	-0.598*
	(0.087)	(0.340)
Interest Rate	0.230***	
	(0.035)	
Percentage of Collateral		0.891
		(0.824)
Controls	Yes	Yes
Year FE	Yes	Yes
Branch FE	Yes	Yes
Market FE	Yes	Yes
Industry FE	Yes	Yes
N	14,672	14,672
Instruments		
Individual Firm		0.052***
		(0.006)
Bankruptcy Cost		-0.004**
		(0.001)
Real Estate Prices		0.052**
		(0.023)
Branch HHI	0.161	
	(0.313)	
Overdraw_C	0.233***	
	(0.031)	
Diagnostics		
F-test 1st Stage	27.53	30.22
Sargan Test (p-value)	0.172	0.277

Table 9
Effect of Competitive Pressure

The table reports results of the instrumental variables (IV) estimation of equations (1) and (2). Column (1) refers to the collateral equation in which the dependent variable is the percentage of the credit line secured with collateral (*Percentage of Collateral*). Column (2) refers to the interest rate specification in which the dependent variable is the interest rate on the credit line (*Interest Rate*). The estimations include the full set of controls used in Tables 6 and 7 but the coefficients are not reported. Description of the variables used in the analysis is provided in the Appendix. The full set of control variables used in the estimations in Tables 6 and 7 is included. The table reports coefficient estimates followed by standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1%, respectively.

	Percentage of Collateral	Interest Rate
	(1)	(2)
Lender-to-Borrower Distance	-0.020***	0.070***
	(0.006)	(0.023)
Lender-to-Borrower Distance × Big Groups	0.004	-0.009
	(0.005)	(0.020)
Big Groups	-0.377***	1.137**
	(0.140)	(0.561)
Interest Rate	0.228***	
	(0.034)	
Percentage of Collateral		1.337
		(0.901)
Controls	Yes	Yes
Year FE	Yes	Yes
Branch FE	Yes	Yes
Market FE	Yes	Yes
Industry FE	Yes	Yes
N	14,672	14,672
Instruments		
Individual Firm		0.045***
		(0.006)
Bankruptcy Cost		-0.004***
		(0.001)
Real Estate Prices		0.059**
		(0.023)
Branch HHI	0.126	
	(0.313)	
Overdraw_C	0.233***	
	(0.031)	
Diagnostics		
F-test 1st Stage	27.45	27.58
Sargan Test (p-value)	0.222	0.162

Appendix
List of Variables

Variable	*Definition*
Collateral	An indicator variable that takes the value of 1 if the credit line is collateralized and 0 otherwise.
Percentage of Collateral	A continuous variable that captures the fraction of the credit line secured by collateral.
Interest Rate	The interest rate charged by the bank, expressed as percentage.
Lender-to-Borrower Distance	The natural logarithm of the metric distance between borrower and lending branch.
Sales	A step variable that takes value of 1 if borrower's sales are below €.25M; 2 for sales between €.25M and €.5M; 3 for sales between €.5M and €1.5M; 4 for sales between €1.5M and €5M; 5 for sales between €5M and €25M; 6 for sales between €25M and €50M; and 7 for sales that exceed €50M.
D(Sales i)	An indicator variable that takes the value of 1 if the firm's sales fall in the *i*-th category (1 through 7) and 0 otherwise.
Multiple Lending	An indicator variable that takes the value of 1 if a borrower maintains lending relationships with multiple banks and 0 if the borrower has an exclusive lending relationship with the bank.
Other Services	An indicator variable that takes the value of 1 if the bank branch provides other services (besides the credit line) to the borrower and 0 otherwise.
Relationship Length	A continuous variable that measures the length of the bank-borrower lending relationship expressed in months.
Decisional Level	An indicator variable that takes the value of 1 if the credit line is managed at the bank headquarters and 0 if this happens at a local bank branch.
Portfolio	An indicator variable that takes the value of 1 if the bank considers the credit line as part of its corporate portfolio and 0 if it is part of the small-business portfolio.
Credit Limit	A continuous variable that measures the amount of credit granted by the bank. Constructed as the natural logarithm of the total credit line amount.
Individual Firm	An indicator variable that takes the value of 1 if the borrower is a sole proprietorship and 0 otherwise.
Overdraw-C	A continuous variable which takes the value of 0 if the borrower uses funds within the credit limit and the natural logarithm of the actual amount of excess funds if the borrower exceeds the limit stipulated in the loan contract
Bankruptcy Costs	Measure of the average costs incurred in bankruptcy proceedings in the local credit market.
Branch HHI	Measure of market power of the banks in each credit market captured via a branch-based Herfindhal-Hirschman index.
Real Estate Prices	Natural logarithm of the average price per m^2 of industrial and commercial real estate over the period 2003-2004.
Big Groups	Natural logarithm of 1 plus the number of branches within the local market owned by the 8 largest (in terms of capitalization as of 2006) Italian banking groups.