When Does Relationship Lending Start To Pay?

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Abstract

This paper empirically characterizes relationship lending using data from more than 20,000 loans of a Spanish bank to small and medium enterprises (SMEs). The study analyzes the pricing determinants of loans to firms based on the entire previous bank-firm relationship, allowing for the identification of nonlinear pricing patterns in the bank-firm relationship. We show that firms only start capitalizing the gains of relationship lending when the relationship extends beyond two years. This reduction in the loan rate spread charged is driven by the opaque firms, for which the acquisition of "soft" information is especially relevant. Finally, we find that relationship lending significantly mitigates the increased costs of refinancing loans along two dimensions: relationship duration and having additional contracts—other than loans—with the bank.

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1. Introduction

Relationships generate valuable private information in asymmetric information environments. Previously acquired knowledge about borrowers can result in more fluent loan contracting and, at the same time, it can foster more affordable loan pricing by banks. Based on canonical models highlighting the role of asymmetric information in financial transactions (Stiglitz and Weiss, 1981), different papers have analyzed the role of repeated lender-borrower interactions on several contracting dimensions: availability of credit, loan interest rate dynamics and collateral pledging. Following the seminal, empirical papers by Petersen and Rajan (1994), Berger and Udell (1995), a large body of literature has proposed relationship variables such as age, intensity, or exclusivity in order to characterize relationship lending.[1] Our study analyzes the pricing determinants of loans to firms based on the entire previous bank-firm relationship, allowing for the identification of nonlinear pricing patterns in the bank-firm relationship.

Our analysis focuses on loan contracts awarded by a Spanish bank to SMEs during the 2013-2014 period. Spain is an economy where most of the credit to firms is provided by banks (78%, CNMV Annual Report (2010))[2] and where SMEs represent 99.9% of the total number of firms. For these reasons, soft information should be especially relevant in the Spanish banking sector and in fact, this is corroborated by its high number of bank branches.[3] This reflects the preferences of both households and firms for close and direct relationships with banks and so, for a high number of bank branches.[4] Thus, understanding the role of relationship lending in banks is of key importance for most Spanish SMEs.

[1] See Boot (2000), Degryse and Ongena (2008) and Elyasani and Goldberg (2004) for detailed reviews of relationship lending literature.

[2] This value is higher than in Italy (70%), Germany (55%), France (45%), the United Kingdom (35%), and the United States (30%).

[3] By 2013 Spain remained as one of the countries with the most bank branches in the world (74.5 per 100,000 adults), only surpassed by small countries such as San Marino or Luxembourg. Despite the on-going restructuring of the Spanish banking industry, which is lowering the number of bank branches, Spain remains as one of the countries with the most bank branches in the world.

[4] Despite the key role of banks in the Spanish economy, there are very few studies focusing on Spanish relationship lending. Jiménez, Salas and Saurina (2006, 2009) analyze the impact of many variables—including relationship lending—on collateral pledged, whereas we focus on the loan interest rate. Hernández-Cánovas and Martínez-Solano (2006, 2007) study the impact of relationship-lending variables on borrowing costs for the 1998-2000 period, but they do not observe the actual loan interest rates and have far fewer observations and variables to measure relationship lending.

In 2008, Spain suffered a remarkable real estate crisis with painful spillovers to the financial sector and the real economy. One of the outcomes of the financial crisis was a deep economic recession—essentially lasting from 2008 to 2013—with unemployment rates jumping to levels above 25%. During this period, credit to the Spanish SMEs exhibited a persistent decline, with an annual drop of 4.4% in 2014 (Bank of Spain Economic Report, 2015). Many savings banks disappeared in the process, and there was a big wave of mergers and acquisitions, often financed via public recapitalizations, and also through credit negotiated by Spanish policy makers with European institutions. Starting in 2011, Spanish banks were subject to stress tests and stringent capital requirements in the context of a massive overhaul of the banking regulation landscape. For the purposes of our study, the 2013-2014 interval—end of crisis and start of recovery—provides a formidable period to gauge the effect of bank-firm relationship resilience.

This paper makes use of a unique proprietary dataset containing the complete historical relations between a Spanish bank and SMEs, and detailed information on more than 20,000 loans granted in the 2013-2014 period. These loans were granted to SMEs that at the loan origination date already had a relationship with the bank. We thus have the rich historical perspective of all loans granted to the SMEs which had new loans in the 2013-2014 period, because our dataset contains full loan information on all the previous loans between the bank and those SMEs. This is important for at least two reasons. First, as firms make their decisions on whether to continue the relationship or to switch to another bank, they need to understand what to expect from the relationship. By knowing when and why benefits, in terms of lower rates, start accruing, the firm can make more informed dynamic decisions regarding loan contracting with a specific bank. Second, historical loan characteristics, such as the sum of previous loan sizes, have direct implications on bank revenues and are thus likely to influence the bank-firm relationship.

The key contribution of this paper is to show that the interconnection between loan rates charged to firms and relationship age is nonlinear based on the duration of the relationship. Indeed, under the lens of a complete history of a bank-firm relationship, this relationship is concave: The interest rates charged increase up to a point, after which they start to decrease. According to our estimates, this tipping point occurs after 25 months. As more information is gathered during the bank-firm relationship, the bank

will progressively reduce the asymmetric information problem with the acquisition of "soft" information. Eventually, when the level of asymmetry is small or non-significant, there will be a reduction of the loan spread charged. After 25 months of relation, there is a reduction of more than 9 (17~~20~~) basis points 10 (20) years after the tipping point. Given that the mean loan rate spread in our sample is 5%, this implies a non-negligible cost reduction for the borrower. We show that this reduction in the spread charged is driven by the most opaque firms, for which the acquisition of "soft" information is especially relevant.

There has been a long debate in the literature on whether the duration of relationship lending represents a cost or a benefit for the firm in terms of funding costs. Some theoretical contributions predict a negative relation between relationship length and the loan interest rate (Boot and Thakor, 1994). This seminal paper emphasizes that banks charge higher rates when the borrower type is unknown and reduce rates when this asymmetric information is reduced or eliminated. In contrast, other theories predict that borrowers should become more locked in to their banks as the duration of the relationship increases leading to a positive relation between duration and loan rates (Sharpe, 1990; Rajan, 1992). While our model is empirical in nature, the non-linear relation found in our results suggests that both theories can be at work and can be reconciled if we take into account the whole life of the bank-firm relationship.

A second contribution of our study is to show that relationship lending also helps to reduce the high interest rates charged to refinancing contracts. Refinancing contracts should, in principle, embed a higher interest rate premium induced by the borrowers' liquidity risk. Surprisingly, the empirical literature on the differential impact of refinancing contracts on loan pricing and about the role played by relationship lending, is still scarce. Our results show that both the duration of the relationship and the existence of other contracts with the bank reduce the interest rate refinancing premium for firms. In particular, having other contracts with the bank or increasing the duration of the relationship from 0 to 5 years reduces the refinancing premium by 25% and 50%, respectively. This finding thus illustrates how relationship lending also operates through lowering the cost of refinancing contracts.

Our results highlight the need to track the full relationship to accurately map the time-varying benefits of relationship lending for the firm, which can accrue after some time in terms of interest rate reductions. This finding suggests that short-run opportunistic

behavior on the part of firms switching to other banks offering more competitive rates may not maximize profit over the long term. The real duration of the relationship and other dimensions of relationship lending, such as the amount previously amortized, are relevant inputs for firms when making their cost-benefit analyses. Finally, we document that two dimensions of relationship lending (i.e., duration and cross-product synergies) provide partial insurance against refinancing costs, and can thus be highly relevant to the firm's financial stability.

The paper is structured as follows. Section 2 describes our empirical regression framework and the variables used in the analysis. Section 3 explains the database used in the paper, emphasizing its differential features. Section 4 presents the research hypotheses and outlines the motivation behind them. Section 5 shows the empirical results related to those hypotheses. Section 6 contains a series of extensions and Section 7 concludes.

2. Empirical Framework

In this section, we lay out the econometric framework which will be the basis to test the paper hypotheses. We also provide the definition of the dependent and independent variables used in our empirical study. Throughout the article, we discuss the motivation for the choice of each specific measure.

We now postulate our empirical regression framework, where ls_j, is the loan *j* nominal annualized interest rate spread (including fees and in percent) over the 3-month Euribor in day the loan is granted. It is regressed on a set of variables containing information on relationship lending, loan and firm characteristics plus industry, municipality, and year-month fixed effects:

$$ls_j = \beta_1 RL_{f,m-1} + \beta_2 L_j + \beta_3 F_{f,y-1} + \gamma_i + \delta_c + \mu_m + \varepsilon_j \,, \quad (1)$$

where *RL* is a vector containing a set of variables measuring the relationship lending of firm *f* one month before the month in which the loan is granted (*m-1*).[5] The vector *L* contains loan *j* characteristics and *F* includes firm *f* characteristics during the previous year to the granting of the loan (*y-1*). The terms γ_i, δ_c, and μ_m represent fixed effects at

[5] Given that there could be several loans within the same month, and to avoid the look-ahead bias in reporting relationship-lending variables, such as accumulated amortized lending, we define relationship-lending variables based on the month before the loan is granted.

industry, municipality, and month level, respectively. The use of municipality fixed effects enables us to control for firm location specific characteristics. Standard errors are clustered at both month and firm levels. We now describe each variable:

***RL*: Relationship lending**

- Duration: natural logarithm of the number of months plus one since the first loan was granted to the firm.
- Duration^2: square of the Duration variable. This variable captures the potential nonlinear relationship between loan rates and relationship age.
- Amortized: amount of loans amortized relative to the firm's total debt.[6]
- Cross-Product: dummy variable that equals one if the firm has alternative outstanding contracts with the bank other than loans (i.e., credit lines, credit cards, or leasing), and zero otherwise.
- Exclusivity: ratio of the outstanding amount of loans for the firm relative to its total debt (in percent).

***L*: Loan characteristics**

- Guarantee: dummy variable that equals one if the loan is guaranteed, and zero otherwise.
- Maturity: natural logarithm of the loan maturity at origination that is defined in months plus one.
- Loan Size: amount of loan granted relative to firm's total assets (in percent).[7]
- Refinancing: dummy variable that equals one if the loan is a refinancing contract, and zero otherwise.

***F*: Firm characteristics**

- Size: natural logarithm of firm's total assets in Euros plus one.
- Profitability: EBITDA relative to total assets (in percent).
- Leverage: ratio of total debt relative to firm's total assets (in percent).

[6] For ease of readability of the coefficients, we do not define the Amortized variable in percent.
[7] We introduce this variable in relative terms to avoid problems of collinearity due to the high correlation between firm and loan sizes (0.55).

3. Dataset

We merge two datasets to perform the empirical analysis. The first one contains loan characteristics matched with the associated firm data for our period of study. Its associated sample span corresponds to that of the regression analysis, which is performed at the loan level, and consists of 22,245 loans granted to 14,835 firms over the period April 1, 2013-September 30, 2014. The time span is determined by the availability of detailed information on loans (including interest rates and fees) and firms' financial statement information. The inclusion of fees in our analysis comes at the cost of a shorter sample and is due to the importance of fees as a relevant part of loan costs, as documented by Berg et al. (2015). Our analysis focuses on loans instead of other contracts due to the greater availability of loan contracts and the richness of information in terms of fees, interest rates, and amount amortized, among other variables. In agreement with Jiménez et al. (2006, 2009), our sample consists of loans with maturity of one year or more, since for shorter maturities we cannot distinguish whether loans are new or rollovers. In addition, given that the goal of this paper is to understand the role of relationship lending, we exclude from the sample the first loan granted to a given firm. This exclusion is in agreement with Bharath et al. (2011) and it allows us to focus exclusively on relationship loans (i.e., those for which there is a previous bank-firm relation).[8] By doing this, we eliminate the effect of the interest rate charged in the first loan, which is influenced by factors different to relationship lending itself.

The second dataset comprises unique information on relationship lending, as it includes all the contracts for each firm with new loans in the 2013-2014 period since the first iteration with the bank. It also contains information on the amount granted, the origination, and the maturity dates of each contract. Additionally, the dataset contains detailed information on the amount amortized of the outstanding loans in a given month.

Our sample consists of SMEs. All of them except one have a total asset size below €100 million. This constitutes the lower boundary of the definition of a large firm for the bank granting the loans, as well as for similar institutions. SMEs are more dependent on banks than large firms since they do not have access to direct finance (Berger and Udell,

[8] In a robustness exercise, we analyze results when first loans are included.

1995). Additionally, they tend to generate much less public information, they have lower quality financial statements, and they are often not audited nor studied by professional analysts. In this sense, the bank-firm information generated throughout the lending relationship—often called "soft" information—may be especially valuable for banks when setting interest rates in loan contracts.

Table 1 contains descriptive statistics of the variables employed in the regression analysis. Both firm variables, based on balance-sheet information, and the two relationship-lending variables defined from accounting data (i.e., Amortized and Exclusivity) are winsorized at the 0.5% level in each tail to avoid the influence of extreme values.

< Insert Table 1 here >

Panel A reports the descriptive statistics for the four relationship-lending measures. Firms have an average relationship of around 74 months with the bank, more than 6 years, while the longest relationship duration is 298 months, almost 25 years. On average, firms have a high amount of amortized loans relative to their current total debt, but this could be due to a few firms having a long relationship with the bank. In fact, the median (15%) reveals the existence of many firms that have not amortized a significant amount of loans. In these instances, the bank should rely on other dimensions of relationship lending and firm characteristics, such as the existence of other types of contracts with the firm. On average, 13% of the firms had additional contracts other than loans when the loan was granted. In terms of the exclusivity variable, the mean is 9.4%, with a relatively large standard deviation of 13.5%.

Panel B contains descriptive statistics on loan characteristics. We observe a wide degree of variation in terms of the dependent variable as the average loan spread varies from 2 to 11.4%, with an average across firms of 5.1%. The average loan size represents more than 5% of the firm size and the average loan time to maturity is slightly above 3.5 years. Most of the loans granted in 2013 and 2014 have a guarantee, whereas 14% of them correspond to refinancing operations.

On average, each firm in our sample has had 1.5 loans with the bank, but there are some firms with a more intense relationship, as the maximum number of loans per firm is 17. There is a wide heterogeneity in terms of firm size ranging from €5,620 of total assets to €113 million. The same heterogeneity is observed in terms of leverage and profitability.

The average firm has €5.7 million total assets, a leverage ratio of 70.6% and an EBITDA to total assets ratio of 5.9%.

4. Relationship Lending Hypotheses

In this section, we describe in detail the hypotheses tested in the paper, relating them to the existing theories and empirical studies in the literature. The underlying idea tested is that a stronger relationship between lender and borrower implies a reduction of the asymmetric information problems in terms of both adverse selection and the bank's perception of the firm's moral hazard. If this is the case, the most opaque firms should be the ones experiencing higher gains due to relationship lending. A key innovation of our work is that we observe the characteristics of all previous loan contracts in the bank-firm relationship for which there is a loan granted during our sample period.

As mentioned above, we measure the relationship strength with four alternative variables. We first use relationship duration in terms of the natural logarithm of relationship months since the first contract. This is the most frequently variable studied in both theoretical and empirical relationship lending studies. This variable was introduced by early relationship-lending studies, such as Petersen and Rajan (1994) and Berger and Udell (1995) and has been used in most of the relationship-lending literature thereafter. Results in the literature on the relationship between the loan duration and loan rate have been mixed. On the theoretical front, there are two theories that make opposite predictions about the role of the duration of relationship on loan rates. Some works predict that it helps to reduce loan rates (Boot and Thakor, 1994), whereas others predict that the loan rates increase as the duration does (Sharpe, 1990; Rajan, 1992).

As a second metric, we introduce a novel variable to capture the relative size of the relationship up to the granting of a contract. Given that we have full information on all previous contracts, we can identify the complete volume of loans contracted and the amount amortized during the relationship to measure its strength. In particular, we compute the sum of the loan amounts amortized in all previous loan contracts between the bank and the borrower. We deem this to be very relevant, as a larger amortized amount typically implies higher past revenues from the bank perspective. We deflate this amount by the total outstanding debt of the firm in order to avoid scale effects. Overall, this variable captures the relationship strength in light of the historical loan volume contracted. Despite the wide array of variables proposed for relationship lending

in the literature, none of the previous studies had proposed this metric for relationship lending.[9] Nevertheless, previously amortized lending, which is a natural driver of a forward-looking relationship, seems to be a key dimension in the bank-firm relationship.

As a third relational variable, we use a dummy variable indicating whether the firm has any other type of contract with the bank, such as credit lines, credit cards, or leasing. As pointed out in Norden and Weber (2010), this greater scope of relationship should, in principle, create synergies between the bank and the firm, with the potential to lower the interest rate of the loan contract. Degryse and Van Cayseele (2000), for instance, find that having this greater scope lowers loan rates. In turn, Bharath et al. (2007) show that relationship lenders are more likely to be chosen as providers of other services, although they find that the economic benefits accruing to banks are small.

Finally, following previous studies (see Petersen and Rajan, 1994, among others) we provide a measurement of relationship exclusivity between firm and bank. In particular, we construct a variable called "exclusivity", which is the ratio between the outstanding debt between the bank and the firm, and the total debt in the firm balance sheet. A larger ratio could indicate a higher level of information generated in the relationship and thus could imply less asymmetric information. In contrast, some studies empirically show that a more exclusive relationship increases the problem of being locked in that relationship (Ongena and Smith, 2000), with firms experiencing higher loan rates.

Hypothesis 1: Relationship lending, along several dimensions including duration, amortized lending, cross-product, and exclusivity, reduces loan interest rates given that the private information shared in the relationship lowers bank-firm asymmetric information.

It is generally accepted that the bank-borrower interactions generate information about the firm credit quality that helps to reduce informational asymmetries. This information should, in the end, influence the loan price and non-price terms. However, theoretical papers offer conflicting predictions on the effect that the bank-firm relationship exerts on the loan rates. Some theoretical contributions predict a negative relation, inspired by the efficiency gains from the bank's improved knowledge of the borrower that are

[9] For more information on relationship lending measures, see the meta-analysis of Kysucky and Norden (2016) which analyses all the variables used in 101 relationship-lending studies.

passed along to the firm over the course of the relationship (Boot and Thakor, 1994). In contrast, other theories predict that loan rates increase with the duration of the relationship. The argument is that the improved knowledge locks the borrower into the relationship such that the borrower cannot transfer to another lender what the bank knows about it without incurring in a cost. The relationship gives the bank an information monopoly that creates a switching cost for the borrower given that if it decides to switch to a new bank, it is pooled with low quality firms and is offered a higher loan rate. This situation enables the bank to charge above-cost interest rates as the relationship continues (Sharpe, 1990; Rajan, 1992).

The empirical literature also offers contradictory results. Berger and Udell (1995), Bharath et al. (2007), and Deng et al. (2014), among others, find that a longer duration of the bank-firm relationship leads to lower interest rates. Other papers such as Degryse and Van Cayseele (2000), Degryse and Ongena (2005), Ioannidou and Ongena (2011), and Santos and Winton (2008), among others, find that the loan rate increases with the duration of the relationship. There are also many examples of papers that fail to find an effect of the duration of the relationship on the interest rates charged to loans (see Petersen and Rajan, 1994; Blackwell and Winters, 1997; Cole, 1998; Elsas and Krahnen, 1998, among others).

The results are also mixed depending on the countries under study. Thus, most of the studies based on US data find that loan rates decrease as the duration of the relationship increases, whereas studies based on European data usually find that loan rates are either unaffected or slightly increase with the duration of the relationship.[10] We concur with Degryse and Ongena (2008) who state that the divergent results could be explained by the definition of control variables, the measure of bank-firm relationship, the dependent variable (i.e., depending on whether it refers to rates or spreads, includes fees or not,…), the pool of borrowers, the degree of competition, the degree of development of financial markets and the analysis of the joint decision on pledging collateral on the loan. A

[10] Although there are several explanations for the difference between the U.S. and Europe, the literature is not conclusive. For instance, Kysucky and Norden (2016) find a significantly positive and robust linear relation between banking competition and the average relationship benefits per country. Thus, the benefits accrued to borrowers in the U.S. exceed those observed in Europe, Asia and Latin America, where the level of competition is shown to be lower. However, as Kysucky and Norden (2016) recognize, "this result does not indicate that relationship lending is less prevalent in these regions, but that the benefits for borrowers are, ceteris paribus, lower in these regions". Other potential explanation relies on the idea that European firms depend to a higher extent on bank loans because the access to funding through other financial markets is less developed.

proper comparison of results across studies should consider all potential differences in terms of the dimensions enumerated above.

One advantage of our dataset is that we are able to trace the bank-firm relationship to the very beginning, to the first loan contracted by the firm and the bank. Given this longer perspective, we are in a good position to uncover the complete pattern on the dynamic relationship duration effects on interest rates. This effect can be nonlinear and potentially concave, as it takes time for the bank to gather and process corporate information. When the reduction of asymmetric information is sufficient and the bank has confidence in the firm, it can implement a reduction of the spread charged. We postulate that this reduction should be faster when the marginal information needed decreases.

Hypothesis 2: The connection between the loan interest rate and relationship-lending duration is nonlinear. Interest rate reductions based on relationship duration start happening some years after the beginning of the relationship, so that firms do not necessarily benefit from relatively short-lived relationships.

Information acquired through the bank-firm relationship is especially valuable for banks in the case of the most opaque firms. Since there is lack of reliable information on these firms, relationship lending brings about relevant reductions of asymmetric information as the relationship continues. This reduction in asymmetric information can be translated into lower loan spreads for banks over time. In contrast, for more transparent, well-known firms, the value of acquiring "soft" information in the context of the relationship can be more limited and, as a consequence, its effect on loan rates. Opacity could then affect the pricing of loans, even for firms with low information opacity. In this line, Mosk (2014) shows that opaque firms have less bargaining power in credit negotiations, given the standard informational frictions. On a related contribution, Bhattacharya et al. (2013) find that poor earnings quality has a more pronounced impact on firms operating in poor information environment, such as small firms and those with low institutional ownership and low analyst following.

Opacity is usually higher for private firms, given that financial reports from private firms are published less frequently and are subject to less scrutiny and discipline from public markets (Peek et al., 2010). Additionally, there is less "hard" information about them, such as share prices, earnings forecasts, and stock recommendations (Petersen,

2004; Sunder, 2006). Given that private firms are more opaque than public firms, there is an optimal borrowing solution where private firms engage in a continuing long-term relationship with one or a few relatively small institutions (Berger and Udell, 2004; Berger et al., 2005). Furthermore, private shareholders have strong incentives to preserve their borrowing relationships with creditors given that they care about the future access to debt markets (Anderson, Mansi and Reeb, 2003; Wang, 2006).

Under this scenario, the creditor of a private firm is willing to invest in acquiring "soft" information and the firm wishes to reveal proprietary information to the creditor in order to reduce the loan price. As a result, the firm and its creditor can engage in implicit debt contracts (Boot, 2000), exchanging soft information, and relying less on public financial reports given their lower value.

Hypothesis 3: The relationship-lending concave loan spread cycle is driven by the set of opaque firms, for which "soft" information is more valuable.

We finally analyze the impact of refinancing contracts on interest rate dynamics. In principle, refinancing loans should be charged a higher interest rate as these contracts typically imply a higher risk of default due to the liquidity risk faced by the firms. While refinancing costs are often mentioned in the literature, very few studies tackle the issue of refinancing, probably due to the lack of information in their datasets. Bharath et al. (2011) study the relationship between refinancing and the subsequent loan maturity. However, they do not study the actual impact of refinancing on loan rates and how relationship lending can lower the cost of refinancing.

Hypothesis 4: Refinancing loans carry a significantly higher loan rate premium, but this is mitigated by the different relationship-lending variables.

5. Empirical Results

In this section, we present the main results of the paper. We structure this section in terms of the four hypotheses outlined in the previous section. We first present our baseline results, where we show the influence of the alternative relationship-lending variables on interest rates. The impact of the control variables is also commented on. We then analyze the potentially changing relation between the interest rate spread and relationship length over time, and the role of firm opacity behind the potential nonlinear interconnection between the relationship age and spread rate. Finally, we show how

refinancing affects loan rates depending on the different relationship-lending dimensions.

5.1 Baseline Results: Relationship Lending and Interest Rates

Table 2 presents the empirical results associated with Hypothesis 1. Columns 1 through 4 show the results for regressions with each relationship-lending dimension separately. Column 5 shows results with all relationship-lending dimensions jointly. Whether looking at the regressions with one or several relationship dimensions, the results speak with a single voice: A longer relationship, a higher previously amortized amount, and a more exclusive relationship imply significantly lower loan rates. This is however not the case for the cross-product dummy variable, which has a non-significant effect across regressions.

< Insert Table 2 here >

Control variables appear significant in most cases, with the expected signs. At the loan level, refinancing contracts carry higher interest rates. In turn, a higher contract time to maturity and a lower loan size increase the loan interest rate. Posting collateral makes the borrower pay higher interest rate spreads, in agreement with Berger and Udell (1990) and Bharath et al. (2011). Thus, we do not find a tradeoff between the use of collateral and interest rates. As a result, borrowers assessed as having a higher risk are required both to provide collateral and to pay higher loan rates. As for firm-level controls, greater firm size together with higher profitability and lower leverage imply lower interest rates in loan contracts.

Column 6 in Table 2 shows the economic impact of each of the variables based on the regression with all relationship-lending variables. The economic impact is computed as the product of each coefficient and the standard deviation of the associated right-hand-side variable. Results show that exclusivity has the highest impact among the relationship-lending variables, followed by the amortized amount and the relationship duration. A standard deviation increase of the relationship duration variable results in a lowering of the loan spread of 1.7 basis points. As for overall economic significance, measured by increasing in one standard deviation of the variables, time to maturity, size of the firm, and the refinancing dummy have the strongest effects on interest rates.

As in Kysucky and Norden (2016), our study analyzes the effect of three specific relationship-lending dimensions on loan rates: Relationship duration, a variable capturing the existence of other contracts between the bank and firm, and a measure of relationship exclusivity. Column 7 in Table 2 contains representative effects from Kysucky and Norden (2016). Concretely, it reports the continuous partial correlation coefficients that summarize the degree of association between the loan rate and the relationship lending variables (see Panel B of Table 2 in their paper). These coefficients are negative and significant for the exclusivity and the cross-product synergies variables, whereas it is positive and non-significant for the relationship duration variable. Our results are thus consistent with theirs in terms of the exclusivity variable. However, we do not find a significant effect of our cross-product synergies measure. This could be because all other contracts are included in a dummy variable and it may be that not all types of contracts display synergies with loans, as analyzed in detail later. Related to the duration, their result could be consequence of the mixed results obtained by the literature with some studies reporting a positive slope and others a negative one. This difference may also arise due to the different durations of the relationship lending studies used in Kysucky and Norden (2016) for their meta-analysis.

We also check for relationship-lending regressor endogeneity, which has the potential to bias our results. In short, it could be that the bank chooses to engage in relations with firms because they have low (or high) credit risk (see Deng et al., 2013, 2014). To test for this endogeneity, we conduct the Durbin (1954) and Wu and Hausman (Wu, 1973; Hausman, 1978) tests for each relationship-lending dimension. The instrumental variable approach relies on the use of the distance between the bank and the borrower as an instrument for the likelihood of relationship information. This instrument has the potential to be correlated with relationship lending variables, even though it does not impact upon loan rates directly. Results, which are available in the Internet Appendix, do not reject the null hypotheses of no-endogeneity in the regressor for any dimension. Hence, we do not find evidence of self-selection in our set of relationship lending variables, they key object of study in this paper.

5.2 When do Firms Start to Benefit from Relationship Lending?

While relationship duration turned out to be a significant driver in reducing loan rates, this relationship may be nonlinear and may vary over time. We now provide a detailed analysis of the results obtained when we allow for these nonlinear effects.

In Table 3 we examine Hypothesis 2 and enhance the benchmark regression analysis by including, as an additional variable, the square of the natural logarithm of relationship duration. The first column only includes duration variables in the relationship-lending set, whereas the second column controls for all relationship-lending variables. In both frameworks, the remaining firm and loan control variables are included and their estimated coefficients are fully consistent with the previous results. Across regressions, a nonlinear pattern emerges between the interest rate spread and relationship duration. While the coefficient on duration is positive and significant, the one on duration squared is negative and significant. Therefore, the interconnection between relationship duration and the loan interest rate is clearly concave. During the first months and years of the relationship, the loan rate increases up to a certain time, when it starts to decrease.[11]

This non-linear relation found in our results suggests that both theories predicting positive and negative effects of the bank-firm relationship duration on loan rates can be at work and can be reconciled if we take into account the whole life of that relationship. In agreement with Boot (2000), we consider that the improvement in contract terms over the relationship does not mean that the hold-up problem is absent, but rather that it is dominated by other factors.

Given the coefficients in the last column of Table 3, the loan rate reaches a maximum after 25 months of the relationship. For instance, there is an increase in 1.6 basis points in the interest rate charged to a firm with 25 months of relationship vs a firm with 12 months of relationship. When the relationship lasts longer, the firm starts to be charged lower rates. In terms of economic impact, an increase in 2, 5, and 10 years of relationship with respect to a 25-month relationship results in a decrease of 1.3, 4.5, and 9.4 basis points, respectively, in the interest rate spread. Although these effects may appear modest, they should be interpreted relative to the average loan rate in our

[11] We check the robustness of this age-loan rate concave pattern by conducting an additional exercise where we introduce instead the square of the demeaned relationship age logarithm. We find that the coefficient for that variable is negative and significantly different from zero, also supporting the existence of a concave shape.

sample, which is relatively low (around 5%); and so, they definitely imply lower costs for firms engaging in continuous relationship lending. This is consistent with Kysucky and Norden (2016) who document that, although lower than in the United States, relationship-lending benefits are positive in Spain.

In unreported analyses -available in the Internet Appendix-, we also verify that results are unaffected by the potential joint determination of the loan rate and other loan terms used as explanatory variables (i.e. size, guarantee and maturity). To do so, we perform three exercises. First, we exclude these three loan characteristics from the benchmark regression analysis. Second, following Brick and Palia (2007), we run a two-stage least squares (2SLS) regression where we instrument the existence of guarantees with appropriate variables (the amount of tangible assets over total assets and the average solvency risk in the sector). Third, besides considering the joint determination of loan guarantees and spreads, we extend our analysis, following the methodology in Bharath et al. (2011), to deal with the joint determination of three loan terms: Loan rate spread, existence of guarantees, and loan maturity. In this case, the instruments for loan maturity are similar to the ones employed in Bharath et al. (2011) (i.e., the ratio of long-term assets over long-term liabilities and a dummy that takes the value one in case the industry is regulated). Across the three exercises, results are robust and consistent with our benchmark estimates.

< Insert Table 3 here >

We complement the results in Table 3 with an analysis based on the specific matching estimators technique developed in Abadie and Imbens (2002). This technique implements a nearest neighbor matching estimation for average treatment effects. The goal of this analysis is to estimate the average effect of relationship age on the loan rate spread with respect to the 3-month Euribor rate (including fees). To do so, we compare outcomes between treated and control observations, using the nearest neighbor matching approach across firm characteristics. We implement exact matching in terms of industry, year-month of loan granting, and several loan characteristics (i.e., refinancing, collateralization, and time to maturity). To deal with the time to maturity, we create two buckets that contain loans with maturity of less or more than 5 years at origination. Additionally, firms are matched using the nearest neighbor in terms of size, profitability, leverage, and loan size relative to total assets. Treated and control groups correspond to each quintile of the distribution of the relationship-lending age over the

sample period. The control group is the third quintile and includes loans granted to firms with a relationship-lending duration between 37 and 64 months. The first and second quintiles include loans granted to firms with a relationship up to 16 months and between 17 and 36 months, respectively. Finally, the fourth and fifth quintiles span relationships between 65 and 134 months, and more than 134 months, respectively.

A negative coefficient in Table 4 indicates that the loan spread of the corresponding quintile is, on average, lower than the one for the control group (third quintile). For each analysis we report the average treatment effect together with the Z-statistic and the number of observations. When comparing the first and third quintile spreads, we observe that they are significantly lower, on average, for the first quintile. The second and third quintile spreads are statistically indistinguishable. However, both the fourth and fifth quintile spreads are significantly lower than the third quintile, with the fifth quantile exhibiting the largest negative difference with respect to the third quintile. These results are thus consistent with a nonlinear concave relationship between the loan spread and relationship duration.

< Insert Table 4 here >

Finally, to gain further economic intuition about this concave relationship pattern, in Figure 1, we perform a different exercise. We plot the average loan spread with respect to the 3-month Euribor rate (including fees) for the same five relationship age intervals as described in the previous exercise. The figure also reflects the nonlinear concave pattern described above. From the first to the second quintile, the spread increases. Consistent with previous results, as the relationship continues for the first 3 years, firms do not seem to benefit from the relationship with the bank in terms of lower interest rates. However, beyond 3 years, the loan rate-Euribor spread becomes lower along relationship quintiles. In particular, when the relationship goes beyond 135 months (11 years), the interest rate spread is 21.4 basis points lower compared to the highest spread quintile, the second (between 1.5 and 3 years).[12]

< Insert Figure 1 here >

[12] It is important to take into account that in Figure 1 we work with 5 duration intervals and the implied maximum obtained in Table 3 is located in the second quintile (from 17 to 36 months of duration). Notice also that this graphical analysis does not control for loan terms and firm variables as we do in Table 3, thus the reported maximum is not inconsistent with the results shown in Table 3.

5.3 Nonlinear Concave Relationship-Lending Pattern and Opaque Firms

The nonlinear concave relationship found may be consistent with alternative, contrasting, relationship lending theories, which point at both positive and negative relationship duration-loan rate effects. One possible explanation for this nonlinear concave relationship is that it takes time for the bank to gather and fully process the private and public information. In turn, when the bank is confident about the reliability of the firm, it reduces the loan rate charged. Since this hypothesis is especially relevant for the most opaque firms, we now discuss whether this concavity applies to them more strongly.[13]

In order to test the way in which opacity and relationship lending affect the pricing of loans, we consider two measures of firm opacity that are based on two definitions of a firm's accruals. Earnings can be split into cash-flows and accruals. Earnings quality is a concept related to earnings' persistence (ability to predict future earnings based on the information of current earnings). Sloan (1996) shows that the persistence of accruals is much lower than that of cash-flows. So, firms with extreme positive and negative discretionary accruals are considered to have poor earnings quality (Bhattacharya et al., 2013) that, as a consequence, damage the information that lenders can infer from the earnings. Thus, we use discretionary accruals as a measure of firm to bank asymmetry. Concretely, we define opacity on the basis of the modified Jones model of Kothari et al. (2005) that relies on the following regression equation:

$$\frac{\mathrm{ACC}_{i,j,t}}{\mathrm{Assets}_{i,j,t-1}} = \beta_{0j} + \beta_{1j}\frac{1}{\mathrm{Assets}_{i,j,t-1}} + \beta_{2j}\frac{\Delta\mathrm{Sales}_{i,j,t}}{\mathrm{Assets}_{i,j,t-1}} + \beta_{3j}\frac{\mathrm{PPE}_{i,j,t}}{\mathrm{Assets}_{i,j,t-1}} + \varepsilon_{i,j,t}, \quad (2)$$

where ACC_{ijt} refers to the total accruals (change in non-cash current assets minus the change in current liabilities excluding the current portion of long-term debt, minus depreciation and amortization) of firm i in sector j (2 digit NACE code) at year t. $\mathrm{Assets}_{i,j,t-1}$ represents the total assets of the same firm one year ago. Regarding the

[13] In a related paper, Kim et al. (2012) focus on the relationship between the loan interest rate markup (over the zero-profit interest rate) and the age of the firm. They propose a complementary perspective, whereby banks also display an inter-temporal strategy to set interest rates. Banks first set a low interest rate markup, but as the age of the firm increases, they use their informational advantage and progressively raise interest rates. When the information about the firm gets more dispersed over the banking industry, interest rate markups decline.

information used to define the explanatory variables, $\Delta Sales_{ijt}$ is the change in sales relative to the previous year and PPE_{ijt} is property plant and equipment. The absolute value (Abs) of the residual ε_{ijt} (i.e., Abs(ε_{ijt})) represents the discretionary accrual, the proxy for opacity (Opacity1).

The second measure of discretionary accruals used to represent firm opacity, following Leuz et al. (2003), is obtained from the following ratio (Opacity2):

$$\text{Disc. Acc}_{i,t} = \frac{\frac{\text{Abs}(\text{ACC}_{i,t})}{\text{Assets}_{i,t-1}}}{\frac{\text{Abs}(\text{CFO}_{i,t})}{\text{Assets}_{i,t-1}}}, \quad (3)$$

where $CFO_{i,t}$ is the difference between net operating income and accruals.

To deal with the role of firm opacity on relationship lending, we form five portfolios of loans depending on the firm level of opacity. We consider as the least opaque firms those whose levels of discretionary accruals are in the first quintile of the distribution of discretionary accruals. The most opaque firms are those whose levels of discretionary accruals are in the fifth quintile of that distribution.

Then we run two separate regressions for each of the two measures using firms in each of the two groups of opacity (low and high).[14] Results are reported in Table 5 and confirm that the nonlinear effect of relationship lending is specific to more opaque firms, in agreement with Hypothesis 3.[15]

< Insert Table 5 here >

To sum up, the benchmark estimates together with two alternative exercises confirm the nonlinear concave loan rate pattern as a function of relationship age. Consistent with Hypothesis 3, we show that this concave pattern is driven by the opaque firms, for which asymmetric information is higher at the beginning of the relationship. Our study thus highlights the need to track the full relationship to accurately map the variation over time of the benefits of relationship lending for the firm.

[14] Note that the number of observations is slightly lower because the accounting information necessary to obtain the accruals is not available for all the firms in our sample.

[15] We perform an additional regression that also uses the second, third, and fourth quintiles to confirm the robustness of our results where we compare the loans granted to the most transparent firms (i.e., those in the first quintile) with the remaining loans (firms in the second, third, fourth or fifth quintile). Results are fully consistent with those in Table 5.

5.4 Relationship Lending, Refinancing, and Loan Rates

To deal with hypothesis 4 we study how refinancing affects loan pricing in a context where relationship lending can potentially mitigate this effect. To do so, we examine the interaction between refinancing and relationship lending in loan pricing. This is a relevant question, not addressed by the previous literature, and we test whether relationship lending acts as a partial insurance against refinancing premiums.

Column 1 of Table 6 reports the coefficients for the refinancing dummy, the four relationship-lending variables, and the interactions of the dummy with these variables. As in the benchmark results, refinancing loans are charged a relevant positive premium clearly above 1%. However, this positive premium can be partially mitigated under two forms of relationship lending: Longer relationship age and having contracts other than loans with the bank.

< Insert Table 6 here >

In economic terms, an increase in our relationship age variable of around 5 years substantially reduces the refinancing premium by almost 50%. In turn, having other contracts with the bank also reduces the refinancing penalty significantly (by 25% of the refinancing premium). In this case, the bank may decide to alleviate the firm's burden so as not to hurt the overall relationship. In contrast, exclusivity does not significantly alleviate refinancing costs, even if it was the most important relationship variable in terms of economic impact in the benchmark regressions. As a result, a higher level of dependence on a specific bank does not reduce refinancing costs.

Column 2 includes the squared term and its interaction with the refinancing dummy. We observe that the interactions of duration and its squared with the refinancing dummy are not statistically significant. However, the sum of each duration coefficient and the respective ones interacted with the refinancing dummy exhibit significant effects. It suggests that the concavity holds for both non-refinanced and refinanced firms, since the interactions with the refinancing dummy do not affect the concavity. To sum up, relationship lending along two dimensions, duration and other contracts, acts as significant partial insurance against refinancing costs, and can thus be of high relevance for the firm's financial stability.

6 Extensions

6.1 Nonlinear Relationship Lending and the Hold-Up Theory

We study now in more detail the bank-firm behavior when the firm interacts with the bank by the first time and right after the first interaction. According to the hold-up theory, the bank offers the firm very competitive loan rates during the first months of a relationship. After that, the bank starts to charge higher spreads over time to the firm, which gets locked in a relationship because of switching costs. Ionannidou and Ongena (2010) study the loan-rate cycle of firms based on the Bolivian credit registry since 1999 to 2003. They first show that rates of switching loans (the first loans in a new bank) are significantly lower than similar non-switching loans.[16]

We first characterize the effects of first loans on loan rate spreads in our dataset. Because of our focus on relationship lending, we did not include first loans in the baseline estimates. In Table 7 we introduce all the first loans between firms and banks to account for the first interaction. Adding these observations increases the sample size to 30,616 loans. The results obtained for the new sample (Column 1 of Table 7) are fully consistent with the ones obtained for the benchmark regression (Column 2 in Table 7), which are included for ease of comparison.

< Insert Table 7 here >

Besides finding that loan rates are lower for switching loans than for similar non-switching loans, Ioannidou and Ongena (2010) show that banks subsequently lower the loan rates to firms for about 16 months. However, after approximately 3 years, loan rates are considerably higher than those associated with the first switching loan. This is shown with the dynamics of the loan rates associated with the first and subsequent loans of the switching firm. These authors rationalize this finding through a hold-up theory related to switching. The bank-firm relationships analyzed by Ioannidou and Ongena (2010) are up to 4 years and 9 months long whereas our dataset spans relations up to a 25-year period. Thus, we have a considerably larger relationship-lending perspective, which enables us to draw implications for long-term relations.

[16] Note that this is not the case when the bank branch closes and firms subsequently transfer to a branch of another bank in the vicinity (see Bonfim et al., 2016).

Despite the differences across analyses, countries, samples, and periods, we now show that our results can be reconciled with theirs.[17] To do so, we use the same matching estimators technique described earlier, which is also similar to the one employed in Ioannidou and Ongena (2010) and estimate the average effect of relationship age on the loan spread. We implement exact matching in terms of industry, year-month of loan granting, and several loan characteristics (i.e., refinancing, collateralization and time to maturity). Additionally, firms are matched using the nearest neighbor in terms of size, profitability, leverage, and loan size relative to total assets. The control group consists of loans granted to firms with no prior relationship with the bank. The spreads of those loans are compared to those corresponding to loans granted to firms with an existent relationship. This implies that we compare loans with identical characteristics granted to firms that are similar across several dimensions and only differ in the duration of their relationship with the bank. For an easier comparison with Ioannidou and Ongena (2010), we group the duration of relationship lending in 6-month periods up to 36 months and then from 36 to 60 months. A negative coefficient in Table 8 indicates that the spread of loans granted to firms with no previous interactions with the bank is, on average, higher than the one charged to later loans. For each analysis we report the average treatment effect together with the Z-statistic and the number of observations. We observe a decrease in the loan spread during the next 18 months following the granting of the first loan, consistent with Ioannidou and Ongena's (2010) findings. The loan spreads increase afterwards, consistent with the hold-up theory, approximately reaching the levels of the first loan. In fact, we do not observe significant differences in the spreads corresponding to the third year after the first interaction between the bank and the firm. Spreads diminish significantly after the third year of relationship, when they reach their lowest levels.

< Insert Table 8 here >

Figure 2 displays the average loan rates charged to firms depending on the duration of their relationship with the bank. The initial point is the average rate corresponding to

[17] There are several relevant differences across studies: First, we study the case of a bank in Spain, a much deeper financial market than Bolivia. Second, instead of defining the loan rate differentials as the difference between the switching loan rate and those of subsequent loans, we define the spread as the difference between the loan rate and the 3-month Euribor rate. Third, the average/median loan maturity is very different across the two studies. In our case, the median length is 36 months, around six times higher.

loans of firms with no previous interactions with the bank. This rate is 5.2% in our paper and 13.3% in Ioannidou and Ongena (2010). We then add the coefficients reported in Table 8 in our paper and the ones reported in Panels A and B of Table IV in Ioannidou and Ongena (2010) to the previous average initial rates. The resultant interest rates are depicted in Figure 2. We observe that interest rates charged to the first loans in our study are high relative to later loans. Thus, we observe a discount offered to the loans following the first loan, consistent with the one documented by Ioannidou and Ongena (2010). However, the later discounts observed in their results are much higher than the ones in ours. The rates exhibit a positive trend after a year of relationship in the three series in Figure 2, also consistent with the hold-up theory. After three years of relation, our results imply that long relationships help attenuate the hold-up problems by reducing information asymmetries from the bank perspective (both adverse selection and moral hazard). Thus, in our setting the hold-up problem arises during the early stages of the relation, but when the relationship becomes long enough and the adverse selection problem is fully eliminated, the slope turns to negative. We observe this pattern because we take into account the whole life of the bank-firm relationship.

< Insert Figure 2 here >

6.2 Disentangling the Role of the "Cross-Product" Dummy

In our analysis, the "Cross-Product" dummy includes the existence of other outstanding contracts different from loans, such as credit lines, credit cards, or leasing. This variable appeared with a non-significant effect across regressions, unlike the results obtained by Kysucky and Norden (2016). However this could be due to the fact that all other contracts are included in a dummy variable and it may be that not all types of contracts display synergies with loans.

To get more intuition about the potential cross-product synergies in our approach, we disaggregate the "Cross-Product" dummy based on the information in our dataset. Thus, we split this dummy into three separate dummy variables for each type of contract such that each of them equals one if the firm has outstanding credit lines, credit cards, or leasing contracts, respectively. This enables us to understand whether there exist one or some specific contracts which bring synergies. Given the aggregation of these variables in our original measure, the aggregate measure could potentially cloud the contract-specific effects.

The corresponding econometric specification is the same as the baseline specification. We use the three previous dummies separately and then jointly. Columns 1 to 3 in Table 9 show results with each one of the other contracts separately (credit cards, credit lines, renting/leasing), whereas the results for the three dummies introduced jointly are in column 4. The results show that only the credit card synergy reduces the loan rate spread significantly in our setting, whereas the remaining contracts do not deliver this significant result. Thus, we also obtain a cross-product synergy, consistent with Kysucky and Norden (2016), with this synergy being specific to credit cards. It supports the theory that both banks and firms benefit from increased information production and shared costs of multiple services. In fact, the level of information with credit cards could be very valuable given that the frequency of the data for the bank is much higher, and it could contribute to reduce the asymmetric information faster than without data from credit cards.

< Insert Table 9 here >

7. Conclusions

Our analysis provides fresh results on the relationship-lending research work under the lens of more than 20,000 loans granted in the 2013-2014 period by a Spanish bank to SMEs. This allows us to understand the dynamic reaction of loan pricing as a function of relationship-lending variables. Indeed, we uncover a nonlinear concave relationship between loan spreads and relationship age. In particular, we identify that firms only start profiting from interest rate reductions more than two years after the first loan was granted.

During the bank-firm relationship, banks gather, process and analyze the information about the firms they work with. Our results are consistent with a scenario where the bank offers competitive spreads immediately after the first interaction. Then, consistently with the hold-up theory, it charges above-cost interest rates over future contracts as the relationship continues. In this way, the bank will progressively reduce the asymmetric information problem. Eventually, when the level of asymmetry is small or non-significant, and the problems of adverse selection and moral hazard are overcome, there will be a reduction of the spread charged. This reduction in the spread charged increases when the marginal information required from the firm decreases.

Indeed, we show that this result is triggered by opaque firms, whose "soft" information is especially valuable for banks.

Our paper provides additional evidence to the loan rate cycle and offers a possible explanation for the mixed findings in the existing empirical literature. From the firm's perspective, these results appear important because the benefits from the relationship may accrue after some time in terms of interest rate reductions. In this sense, short-run opportunistic behavior on the side of firms switching to other banks offering more competitive rates may not maximize profit over the long-run. This is thus a very relevant input for firms when making their cost-benefit analyses, since they should take into account that the benefits from lower interest rates may be accruing after some years.

Relationship lending is also key to refinancing contracts. These contracts imply a risky liquidity profile for the firm. Accordingly, banks tend to charge higher loan rates compared to non-refinanced loans. This is a pattern that we empirically corroborate. The novelty of our analysis is to show that both relationship duration and having additional contracts (other than loans) with the bank significantly lower this refinancing premium, both statistically and in economic terms.

Our study focuses on the importance of bank-firm relations at the time when the Spanish 2008 real estate crisis was ending. In a recent study, Bolton et al. (2016) theoretically and empirically show that relationship lending improves bank-firm continuation-loan rates in response to the crisis. In turn, Beck et al. (2014) find that relationship lending alleviates credit constraints in a pool of countries, in terms of credit availability, during downturns, but not during booms. While our study includes some months of the expansion start, the Spanish economic scene was still quite bleak in 2014, with an unemployment rate of around 23%. In this sense, relationship lending proved to be a partial insurance in loan contracting during the economic crisis and its aftermath.

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Table 1: Descriptive statistics

This table contains descriptive statistics of the variables employed in the regression analysis. Panel A reports the descriptive statistics for the four relationship lending (RL) measures: Age in months (Duration), the amount of loans amortized relative to total firm debt (Amortized), a dummy that indicates whether the firm has different contracts with the bank other than loans (Cross-Product), and a proxy for exclusivity measured as the firm amount outstanding of loans relative to its total debt (Exclusivity). For ease of readability of the coefficients obtained in the regression analyses, we do not define Amortized in percent. Panel B contains descriptive statistics on the loan: Loan rate over 3-month Euribor including fees (dependent variable), loan size relative to total assets (Loan Size), time-to-maturity at origination in months (Maturity), a dummy that indicates whether the loan is guaranteed or not (Guarantee) and a dummy equal to one if the loan has been refinanced. Finally, Panel C reports descriptive statistics at firm level: Number of loans (Number); Total Assets in thousands of euros (Size); Debt to Total Assets ratio; (Leverage): Ebitda to Total Assets ratio (Profitability).

Panel A					
	Mean	SD	Median	Min	Max
RL Duration (months)	73.81	65.77	49.50	1	298
RL Amortized (amortized loans / firm debt)	2.53	6.35	0.15	0	49.17
RL Cross-Product (0/1)	0.13	0.31	0	0	1
RL Exclusivity (%)	9.39	13.54	4.82	0	93.46
Panel B					
	Mean	SD	Median	Min	Max
Loan rate (with fees) over 3-m Euribor (%)	5.06	1.61	4.93	2.02	11.38
Loan size / TA (%)	5.85	48.88	3.07	0.01	3,896.87
Maturity (months)	42.71	41.77	36.49	12.00	816.56
Guarantee (0/1)	0.77	0.42	1	0	1
Refinancing (0/1)	0.14	0.34	0	0	1
Panel C					
	Mean	SD	Median	Min	Max
Number	1.50	0.89	1	1	17
Size (thousands of euros)	5,755	9,902	2,427	5.62	113,496
Leverage (%)	70.67	20.86	72.90	12.28	140.95
Profitability (%)	5.91	7.06	5.65	-23.40	35.18

Table 2: Different dimensions of relationship lending and loans rates

This table contains the effect of four relationship-lending dimensions and other control variables on the loan spread over 3-month Euribor (including fees). The regression is conducted with sector, month, and municipality fixed effects and standard errors clustered on firm and date. The duration of relationship lending is the variable of interest in column 1. Column 2 analyzes the role of the ratio of total amount of loan amortized to total debt as a measure of relationship lending. A dummy indicating whether the firm has any other type of contract with the bank is the dimension of relationship lending employed in column 3. Column 4 includes a proxy of exclusivity defined as the ratio of total debt of a given firm with the bank relative to the firm total debt as a proxy for relationship lending. Column 5 includes the four proxies for relationship lending jointly. Column 6 contains the economic effect of each variable that is obtained as the product of the coefficient in column 5 and the standard deviation of each variable. Column 7 contains the effects of three relationship lending dimensions reported in Panel B of Table 2 in Kysucky and Norden (2016) joint with their statistical significance. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors are reported in brackets.

Varibales	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Duration	-0.030***				-0.015*	-0.017	0.007
	[0.007]				[0.009]		
Amortized		-0.006***			-0.003*	-0.018	-
		[0.002]			[0.002]		
Cross-Product			0.017		0.022	0.008	-0.024**
			[0.023]		[0.023]		
Exclusivity				-0.005***	-0.004***	-0.063	-0.031***
				[0.001]	[0.001]		
Guarantee	0.064*	0.061*	0.058	0.064*	0.068*	0.029	
	[0.034]	[0.035]	[0.035]	[0.035]	[0.034]		
Maturity	0.746***	0.744***	0.745***	0.744***	0.745***	0.548	
	[0.080]	[0.081]	[0.081]	[0.081]	[0.080]		
Loan Size	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.098	
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]		
Size	-0.154***	-0.160***	-0.160***	-0.166***	-0.165***	-0.183	
	[0.014]	[0.014]	[0.014]	[0.014]	[0.014]		
Refinancing	1.147***	1.145***	1.143***	1.168***	1.174***	0.405	
	[0.082]	[0.083]	[0.083]	[0.084]	[0.084]		
Profitability	-0.005**	-0.004**	-0.004**	-0.004**	-0.004**	-0.030	
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]		
Leverage	0.004***	0.003***	0.004***	0.003***	0.003***	0.060	
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]		
Sector FE	YES	YES	YES	YES	YES		
Month FE	YES	YES	YES	YES	YES		
Municipality FE	YES	YES	YES	YES	YES		
Observations	22,245	22,245	22,245	22,245	22,245		
Adj. R-squared	0.396	0.396	0.396	0.397	0.398		
Condition index	22.96	20.39	20.46	20.64	24.20		

Table 3: Nonlinear effect of relationship lending duration

This table contains the effect of the four relationship lending dimensions and other control variables, on the loan spread over the 3-month Euribor (including fees). The novelty with respect to Table 2 is the inclusion of the square of duration. The regression is conducted with sector, month, and municipality fixed effects and standard errors clustered on firm and date. Column 1 only includes duration variables in the relationship lending set, whereas Column 2, which is the baseline specification, contains the four relationship lending dimensions. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors are reported in brackets.

Varibales	(1)	(2)
Duration	0.213***	0.209***
	[0.051]	[0.052]
$Duration^2$	-0.034***	-0.032***
	[0.007]	[0.007]
Amortized		-0.002
		[0.002]
Cross-Product		0.023
		[0.023]
Exclusivity		-0.005***
		[0.001]
Guarantee	0.063*	0.067*
	[0.034]	[0.034]
Maturity	0.744***	0.743***
	[0.081]	[0.081]
Loan Size	-0.002***	-0.002***
	[0.001]	[0.001]
Size	-0.151***	-0.161***
	[0.014]	[0.014]
Refinancing	1.142***	1.169***
	[0.082]	[0.084]
Profitability	-0.005**	-0.004**
	[0.002]	[0.002]
Leverage	0.003***	0.003***
	[0.001]	[0.001]
Sector FE	YES	YES
Municipality FE	YES	YES
Month FE	YES	YES
Observations	22,245	22,245
Adj. R-squared	0.397	0.398

Table 4: **Additional evidence on the nonlinear effect of relationship lending duration**

This table shows an analysis based on the specific matching estimators technique developed in Abadie and Imbens (2002). This technique implements a nearest neighbor matching estimation for average treatment effects. The table reports the average effect of each relationship-lending dimension on the interest rate spread by comparing outcomes between the treated and control observations, using the nearest neighbor matching across the firm characteristics. We require exact matching in terms of the sector, the date the loan is granted, and several loan characteristics (i.e., refinancing, collateralized, and time to maturity). To deal with the time to maturity, we create two buckets that contain loans with maturity of less and more than five years at origination. Additionally, firms are matched using the nearest neighbor in terms of the firm size, profitability, leverage, and loan size relative to total assets. The treated group varies across columns while the control group remains the same. Treated and control groups correspond to five intervals of relationship lending duration. Each interval corresponds to each quintile in the distribution of the relationship lending age over the sample period. The first quintile (1Qtl) includes loans granted to firms for which the duration of the relationship with the bank is 16 months or less. The second (2Qtl), third (3Qtl), and fourth (4Qtl) quintiles are obtained using loans granted to firms for which the duration of the relationship is between 17 and 36 months, 37 and 64 months, and 65 and 134 months, respectively. Finally, 5Qtl includes loans granted to firms with a relationship that lasts 135 months or more. The loans in 3Qtl are used as a control group in the four columns of Table 4, while loans in 1Qtl, 2Qtl, 4Qtl, and 5Qtl are the treated groups in columns 1, 2, 3, and 4, respectively. A negative coefficient indicates that the loan spread of the corresponding quintile is on average lower than the one for the control group (3Qtl) based on similar firms and loans across the characteristics specified above. For each analysis we report the average treatment effect. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors and Z-statistics are reported in brackets: () and [], respectively.

	1Qtl vs 3Qtl	2Qtl vs 3Qtl	4Qtl vs 3Qtl	5Qtl vs 3Qtl
Avg. Treatment Effect	-0.142***	0.010	-0.139***	-0.183***
	(0.053)	(0.042)	(0.048)	(0.054)
	[-2.650]	[0.230]	[-2.880]	[-3.400]
Observations	9,171	8,698	8,796	8,842

Table 5: The effect of relationship lending dimensions and opacity

This table contains a variation of Table 3 where we run the regressions depending on the degree of firm opacity. Opacity1 is the absolute value of the residual in equation (2) as a proxy for opacity. Opacity 2 is the ratio used by Leuz, Nanda and Wysocki (2003) (equation (3)). The least (most) opaque firms are those whose levels of discretionary accruals are in the first (fifth) quintile of the distribution of discretionary accruals. The regression is conducted with sector, month, and municipality fixed effects and standard errors clustered on firm and date. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors are reported in brackets.

	Opacity1		Opacity2	
Varibales	First Quintile	Fifth Quintile	First Quintile	Fifth Quintile
Duration	0.079	0.345**	0.242	0.441***
	[0.108]	[0.146]	[0.154]	[0.127]
$Duration^2$	-0.010	-0.048**	-0.029	-0.069***
	[0.017]	[0.022]	[0.020]	[0.018]
Amortized	-0.000	-0.010*	-0.006	0.003
	[0.005]	[0.006]	[0.004]	[0.006]
Cross-Product	0.055	0.068	-0.035	-0.005
	[0.056]	[0.087]	[0.039]	[0.063]
Exclusivity	-0.002	-0.001	-0.001	-0.001
	[0.003]	[0.003]	[0.003]	[0.001]
Guarantee	-0.018	0.007	0.049	0.082
	[0.055]	[0.070]	[0.062]	[0.064]
Maturity	0.877***	0.732***	0.986***	0.893***
	[0.084]	[0.103]	[0.111]	[0.085]
Loan Size	-0.002***	-0.018**	-0.034***	-0.035***
	[0.000]	[0.008]	[0.007]	[0.006]
Size	-0.117***	-0.202***	-0.185***	-0.226***
	[0.027]	[0.048]	[0.030]	[0.042]
Refinancing	0.957***	1.091***	1.233***	0.916***
	[0.153]	[0.138]	[0.180]	[0.139]
Profitability	-0.004	-0.003	-0.006*	-0.004
	[0.004]	[0.004]	[0.003]	[0.004]
Leverage	0.007***	0.003*	0.004**	0.002
	[0.002]	[0.002]	[0.002]	[0.001]
Sector FE	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Observations	3,494	3,507	3,529	3,506
Adj. R-squared	0.426	0.386	0.468	0.442

Table 6: Relationship lending and refinancing

This table contains the effect of the four relationship lending dimensions, and other control variables, on the loan spread over 3-month Euribor (including fees) when the firms have to be refinanced. The regression is conducted with sector, month, and municipality fixed effects and standard errors clustered on firm and date. We add interaction terms and introduce the interaction of the dummy indicating whether the loan is a refinancing contract with the four dimensions of relationship lending. We report the coefficients obtained for the refinancing dummy, the four relationship lending variables, and the interaction of the dummy with each of the four later variables. Column 1 contains the results obtained when the four relationship lending variables, their interaction with the refinancing dummy, and the dummy itself are included in the regression. Column 2 adds the quadratic term of duration and its interaction with the refinancing dummy. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors are reported in brackets.

Varibales	(1)	(2)
Duration x Refinancing	-0.315***	0.045
	[0.040]	[0.350]
Duration^2 x Refinancing		-0.046
		[0.044]
Amortized x Refinancing	0.022	0.073
	[0.515]	[0.517]
Cross-Product x Refinancing	-0.602***	-0.594***
	[0.193]	[0.192]
Exclusivity x Refinancing	-0.001	-0.001
	[0.003]	[0.003]
Refinancing	2.468***	1.791**
	[0.170]	[0.674]
Duration	0.011	0.141**
	[0.008]	[0.051]
Duration^2		-0.019**
		[0.007]
Amortized	-0.003*	-0.002
	[0.002]	[0.002]
Cross-Product	0.049**	0.049**
	[0.020]	[0.020]
Exclusivity	-0.004***	-0.004***
	[0.001]	[0.001]
Loan and Characteristics	YES	YES
Sector FE	YES	YES
Municipality FE	YES	YES
Month FE	YES	YES
Observations	22,245	22,245
Adj. R-squared	0.402	0.402

Table 7: The effect of different relationship lending dimensions on loan interest rates in the presence of the first loan

Column 1 in this table contains the effect of the four relationship lending dimensions and other control variables, on the loan spread over the 3-month Euribor (including fees) when including the first loan in the bank-firm history. The regression is conducted with sector, month, and municipality fixed effects and standard errors clustered on firm and date. Column 2 in Table 7 contains the baseline results of Column 2 in Table 3 for ease of comparison. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors are reported in brackets.

Varibales	(1)	(2)
Duration	0.144***	0.209***
	[0.016]	[0.052]
$Duration^2$	-0.024***	-0.032***
	[0.003]	[0.007]
Amortized	-0.002	-0.002
	[0.002]	[0.002]
Cross-Product	0.036	0.023
	[0.025]	[0.023]
Exclusivity	-0.005***	-0.005***
	[0.001]	[0.001]
Guarantee	0.097**	0.067*
	[0.038]	[0.034]
Maturity	0.781***	0.743***
	[0.082]	[0.081]
Loan Size	-0.002**	-0.002***
	[0.001]	[0.001]
Size	-0.148***	-0.161***
	[0.014]	[0.014]
Refinancing	1.226***	1.169***
	[0.084]	[0.084]
Profitability	-0.006***	-0.004**
	[0.001]	[0.002]
Leverage	0.003***	0.003***
	[0.001]	[0.001]
Sector FE	YES	YES
Municipality FE	YES	YES
Month FE	YES	YES
Observations	30,616	22,245
Adj. R-squared	0.401	0.398

Table 8. Comparing Spreads Originated Over the Life of the Relationship with Spreads Granted to Firms with No-Previous Relation

This table shows an analysis based on the specific matching estimators technique developed in Abadie and Imbens (2002). This technique implements a nearest neighbor matching estimation for average treatment effects. It estimates the average differential effect of relationship age on the loan spread. We implement exact matching in terms of industry, year-month of loan granting, and several loan characteristics (i.e., refinancing, collateralization, and time to maturity). Additionally, firms are matched using the nearest neighbor in terms of size, profitability, leverage, and loan size relative to total assets. The control group consists of loans granted to firms with no prior relationship with the bank. The spreads of those loans are compared to those corresponding to loans granted to firms with an existent relationship. A negative coefficient in Table 8 indicates that the loan spread granted to firms with no previous interactions with the bank is, on average, higher than the one charged to later loans. We group the relationship duration in in 6-month periods up to 36 months and then from 36 to 60 months. For each analysis, we report the average treatment effect together with the Z-statistic and the number of observations. ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors and Z-statistics are reported in brackets: () and [], respectively.

	1 - 6	7 - 12	13 - 18	19 - 24	25 - 30	30 - 36	> 36
Treatment Effect	-0.083*	-0.105***	-0.118***	-0.081*	-0.038	-0.061	-0.142***
	(0.043)	(0.036)	(0.040)	(0.044)	(0.051)	(0.053)	(0.049)
	[-1.940]	[-2.890]	[-2.920]	[-1.830]	[-0.740]	[-1.150]	[-2.910]
Observations	9,842	10,432	10,611	9,793	9,916	9,703	12,388

Table 9: Disentangling the effect of "Cross-Product" Dummy

This table contains the effect of the three relationship lending dimensions and different "Cross-Product" dummies (Credit Cards, Credit Lines and Renting/Leasing) on the loan spread over the 3-month Euribor (including fees). The regression is conducted with sector, month, and municipality fixed effects and standard errors clustered on firm and date. Columns 1, 2, and 3 report the results obtained for the baseline specification that contains the three relationship lending dimensions plus Credit Cards, Credit Lines and Renting/Leasing separately. Column 4 reports the results including the three dummies of Cross-Product (Credit Cards, Credit Lines and Renting/Leasing). ***, **, and * denotes statistical significance at 1%, 5%, and 10% level, respectively. Standard errors are reported in brackets.

Varibales	(1)	(2)	(3)	(4)
Duration	0.208***	0.209***	0.209***	0.208***
	[0.052]	[0.052]	[0.052]	[0.052]
$Duration^2$	-0.032***	-0.032***	-0.032***	-0.032***
	[0.007]	[0.007]	[0.007]	[0.007]
Amortized	-0.002	-0.002	-0.002	-0.002
	[0.002]	[0.002]	[0.002]	[0.002]
Cross-Product: Credit Cards	-0.114***			-0.116***
	[0.029]			[0.029]
Cross-Product: Credit Lines		-0.0002		0.005
		[0.019]		[0.020]
Cross-Product: Renting/Leasing			0.004	0.014
			[0.050]	[0.049]
Exclusivity	-0.004***	-0.005***	-0.005***	-0.004***
	[0.001]	[0.001]	[0.001]	[0.001]
Guarantee	0.069*	0.068*	0.068*	0.069*
	[0.034]	[0.034]	[0.034]	[0.034]
Maturity	0.742***	0.743***	0.743***	0.742***
	[0.080]	[0.081]	[0.081]	[0.080]
Loan Size	-0.002***	-0.002***	-0.002***	-0.002***
	[0.001]	[0.001]	[0.001]	[0.001]
Size	-0.160***	-0.160***	-0.160***	-0.160***
	[0.014]	[0.014]	[0.014]	[0.014]
Refinancing	1.158***	1.166***	1.167***	1.159***
	[0.085]	[0.082]	[0.084]	[0.084]
Profitability	-0.004**	-0.004**	-0.004**	-0.004**
	[0.002]	[0.002]	[0.002]	[0.002]
Leverage	0.003***	0.003***	0.003***	0.003***
	[0.001]	[0.001]	[0.001]	[0.001]
Sector FE	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES
Month FE	YES	YES	YES	YES
Observations	22,245	22,245	22,245	22,245
Adj. R-squared	0.399	0.398	0.398	0.398

Figure 1: Average loan spread over the 3-month Euribor (including fees) depending on the duration of relationship lending

This figure reports the average loan spread for five intervals of relationship lending duration. Each interval corresponds to each quintile of the distribution of the relationship lending age over the sample period. The first quintile (1Qtl) includes loans granted to firms for which the duration of the relationship with the bank is 16 months or less. The bars associated with the second (2Qtl), third (3Qtl), and forth (4Qtl) quintiles are obtained with loans granted to firms for which the bank-firm relationship duration is between 17 and 36 months, 37 and 64 months, and 65 and 134 months, respectively. Finally, 5Qtl includes loans granted to firm with a relationship that lasts 135 months or more.

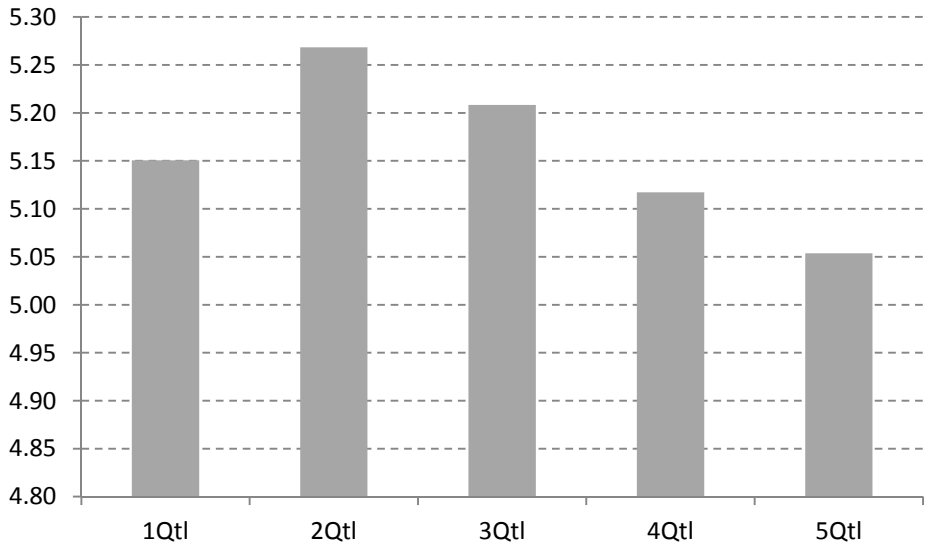

Figure 2. Average Loan Rates as a Function of Relationship Length

This figure displays the average loan rates charged to firms depending on the duration of their relationship with the bank (in months). We compare the average loan rate obtained in our study with the one in Ioannidou and Ongena (2010). The initial point is the average loan rate of firms with no previous interactions with the bank. This rate is 5.2% in our paper (left axis) and13.3% in Ioannidou and Ongena (2010) (right axis). We then add the coefficients reported in Table 8 in our paper to the average rate in our sample (Estimate Table 8) and the ones reported in Panels A and B of Table IV in Ioannidou and Ongena (2010) to their average rate (IO (Table_IV Panel A) and IO (Table_IV Panel_B), respectively).