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Owner Guarantees, Observed and Unobserved Risks, and Bank Lending Spreads

Fábio Dias Duarte[1] · **Ana Paula Matias Gama**[2] · **Mohamed Azzim Gulamhussen**[3]

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Abstract
In this paper, we examine the influence of owner guarantees on loan rates. Other studies on the influence of business collateral have used survey and credit register data to establish this link. They support it with the pre-lending information theory and post-lending incentive theory and find that the latter predominates the former. Thus, we measure observed and unobserved risks on bank lending spreads negotiated over the counter to show the co-existence of both theories. The main findings and robustness tests show that owner guarantees reduce bank lending spreads for safe but not risky firms, supporting the pre-lending information theory rather than the post-lending incentive theory. These findings underscore the role of owner guarantees in allaying the information problems the bank confronts prior to lending.

Keywords Signaling and incentives · Banks · Firm financing · Business fluctuations

JEL Classification D82 · G21 · G32 · E32

✉ Fábio Dias Duarte
fduarte@fep.up.pt

Ana Paula Matias Gama
amatias@ubi.pt

Mohamed Azzim Gulamhussen
mohamed.azzim@iscte-iul.pt

[1] University of Porto, School of Economics and Management and cef.up, Rua Dr. Roberto Frias, 4200-464 Porto, Portugal

[2] Universidade da Beira Interior and NECE, Estrada do Sineiro – Polo IV, 6200-209 Covilhã, Portugal

[3] Instituto Universitário de Lisboa (ISCTE-IUL), Business Research Unit (BRU-IUL), Av. Forcas Armadas, 1640-026 Lisbon, Portugal

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1 Introduction

Studies have shown that small and medium-sized enterprises, hereafter firms, are critical to economic growth in many countries (e.g., Niskanen and Niskanen 2006; Krivogorsky 2011). However, these firms rely greatly on bank loans to finance their activities. Even when they do not, bank loans constitute a signal of value to outside investors, and a critical substitute for market and trade debt. We add to the literature by examining the effect of owner guarantees on the spreads in bank lending by building on other studies on the relationship between business collateral and loan spreads (Berger et al. 2011a, 2016). We examine the extent to which the pre-lending information theory or the post-lending incentive theory, or both, can explain the relation between owner guarantees and spreads.

As is well-known, bank lending to firms is hampered by serious information (adverse selection) and incentive (moral hazard) problems. These problems make not only selecting safe firms prior to lending difficult (Bester 1985, 1987) but also make reducing losses after lending difficult (Boot and Thakor 1994; Boot et al. 1991; Holmström and Tirole 1997). Mechanisms that reduce these information and incentive problems can translate into lower risks for banks and lower costs of borrowing for firms. It is also well-known that reducing information and incentive problems can facilitate the extension of business cycles through positive procyclical lending and smoothen the functioning of financial systems.

Banks and firms most often mitigate these information and incentive problems in loan contracting by using business collateral, hereafter collateral.[1] The studies based on small firms that focus on the influence of collateral show mixed effects on lending rates pointing to a co-existence of both the pre-lending information theory and the post-lending incentive theory (Berger et al. 2011a, 2016). While these studies find that the post-lending incentive theory predominates through the role of collateral in reducing losses, the relation between the collateral-risk (Ono and Uesugi 2009) and collateral-loan rates (Berger et al. 2016; Cerqueiro et al. 2016) depends on the nature of collateral.

The role of owner guarantees in mitigating information and incentive problems has received far less attention than collateral in the literature. Notable exceptions are the studies conducted by Brick and Palia (2007) in the US, Calcagnini et al. (2014) and Pozzolo (2004) in Italy, Hernández-Cánovas and Martínez-Solano (2006) in Spain, and Peltoniemi and Vieru (2013) in Finland. These studies make significant inroads in understanding the role of owner guarantees in the financing of small firms but generate mixed findings. These studies also do not test the information and incentive theories directly.

We extend these studies by examining the role of owner guarantees in determining lending spreads within the scopes of the pre-lending information and post-lending incentive theories. In this paper, we use loan contract data provided by a large European bank during the global financial crisis (hereafter, crisis) that cannot otherwise be accessed through publicly available sources. We also control for both observed credit scores and unobserved defaults.

Our focus on owner guarantees is of relevance in the context of our firms as these rely heavily on intangible assets that cannot be used as collateral to back their business loans which often leads to credit rationing (Jaffee and Russell 1976; Stiglitz and Weiss 1981) and

[1] Other lending technologies encompass credit scoring (Altman 1980; Berger et al. 2005; Berger and Frame 2007; Frame et al. 2001; Ivashina 2009; Nakamura and Roszbach 2018) and bank-firm relationships (Blackwell and Winters, 2014; Casu et al. 2022; Degryse and Ongena 2005; Degryse and Van Cayseele 2000; Lehmann and Neuberger 2001; Petersen and Rajan 1994).

lemons-type discouragement (Akerlof 1970) by banks. Small firms are often managed by owners (Bolton Bolton Committee 1971) and hence the creditworthiness of owner-managers has far greater influence on lending terms (Avery et al. 1998).

Owners often offer guarantees in the form of blanket liens that are a simpler way to contract than business collateral (Voordeckers and Steijvers 2006). They just require a written contract between banks and borrowing firms, but their implications can be far-reaching (Bhimani et al. 2014). With business collateral, firms assume liability up to the value of the assets they offer as security, thereby mitigating the risk for owners while retaining the potential for gains. With guarantees in place, owners bear liability that extends beyond their business assets, thereby retaining exposure to both downside risk and upside potential. This liability can translate into being summoned to plow in additional equity in case of distress (default or bankruptcy).

Within the scopes of the pre-lending information and post-lending incentive theories, the relation between owner guarantees and lending spreads is mediated by firm risk. The pre-lending information theory advocates that owners of safer firms are likely to voluntarily pledge guarantees to signal the creditworthiness of their firms in exchange for a reduction in their spreads (Bester 1985, 1987; Besanko and Thakor 1987a). In this case, the relation between owner guarantees and low risk (observed in the form of credit scores and unobserved in the form of defaults) will be negative both independently and interactively. The post-lending incentive theory advocates that owners of risky firms are more likely to be forced by banks to pledge guarantees and pay higher spreads to mitigate moral hazard incentives (Boot and Thakor 1994; Holmström and Tirole 1997). In this case, the relation between owner guarantees and high risk (observed in the form of credit scores and unobserved in the form of defaults) will be positive both independently and interactively. These theories are not necessarily mutually exclusive, thus either or both can exist with one or the other predominating (Berger et al. 2011a, 2016).

We relate *Owner Guarantees*, pre-lending *Credit scores*, post-lending *Default*[2] and their interactions, to *Bank Lending Spreads* while controlling for loan terms, bank-firm relationships, and bank features. We also control for time, location, and industry fixed effects. We test our model of lending spreads with sequential estimations using ordinary least squares (OLS) with a clustering correction by the industry in which firms operate. Overall, our findings are based on three different measures of owner guarantees (binary indicator, coverage, and bargaining power) and indicate the pre-lending information theory strongly predominates the post-lending incentive theory. Our findings on these theories mimic the previous findings on business collateral (Berger et al. 2011a, 2016) but the predominance of the pre-lending information theory is at odds with those findings. These findings point to the stronger role of owner guarantees in alleviating information problems and consequently adverse selection. Thus, they complement the previous findings on the stronger role of business collateral in alleviating incentive problems and consequent loan losses. Further, they shed light into the sparse and mixed evidence on the relation between owner guarantees and bank lending rates.

[2] Unlike credit scores, which are observed prior to lending, default or effective nonrepayment after lending can be predicted by the firm prior to lending but verified by the bank after lending. The data on post-lending defaults are unique in that they are observed post-lending and are considered the most appropriate measure of private information prior to lending (Jiménez et al. 2006). These singular data enable us to contribute to the literature by assessing the extent to which owner guarantees reduce the spreads charged by banks to (observed and unobserved) safe and risky firms.

Our paper is organized as follows: In Section 2, we establish the theoretical background and define the research hypotheses. In Section 3, we describe the data used for loans negotiated over the counter, and we outline the method. Section 4 presents our main findings and robustness checks. In Section 5, we discuss the results and outline the limitations of the study. In Section 6, we conclude by summarizing the results and outlining the managerial, policy, and academic implications.

2 Literature Review and Hypotheses

2.1 Theoretical Approaches

Bank loans constitute a critical source of financing for small firms. Still, many fail to access loans at acceptable rates due to information and incentive problems. Banks face information asymmetries that prevent them from gauging the creditworthiness of firms. In particular, they have trouble in developing their risk profiles (Bester 1985, 1987) and ascertaining the feasibility of their ventures before lending. These constraints limit their conduct after lending (Bhattacharya and Thakor 1993). Small firms find it difficult to prove the value of their ventures to banks, who in turn find it costly to screen and monitor them.

Banks incorporate implicit (collateral) and explicit (spreads) components in the determination of lending contracts for their clients to mitigate both adverse selection and moral hazard (Coco 2000). The extensive debate around the topic (Chan and Kanatas 1985) points to the value of collateral as an informative signal (pre-lending information theory) and as an incentive device (post-lending incentive theory) with the possibility of both prevailing as substitutes or as complements to the rates charged by banks.

In the pre-lending information theory, asymmetries may require firms to trade collateral for lower rates (Bester 1985, 1987) given their belief that the value of collateral is better assessed compared to venture feasibility (Chan and Kanatas 1985). The willingness to offer collateral can be interpreted as a positive and trustworthy signal of their quality and effort by banks that are imperfectly informed. The signaling effect attributed to collateral therefore implies that secured loans are less risky (Bester 1985, 1987; Besanko and Thakor 1987a, 1987b; Boot et al. 1991; Chan and Thakor 1987) which promotes self-selection in a manner that reduces adverse selection. For firms, signaling prevents the undervaluation of ventures and increases profitability. For banks, signaling reduces screening costs and increases the value of their portfolios. Accordingly, collateral should reduce lending spreads.

In the post-lending incentive theory, collateral and lending rates mitigate incentive problems (Boot and Thakor 1994; Boot et al. 1991). In this setting, banks are able to produce information on the creditworthiness of firms that intend to borrow from them (Berger and Udell 1990); so, an increase in lending spreads does not preclude adverse selections of firms, and collateral serves more as mitigating losses rather than as a screening device (Inderst and Mueller 2007). In the presence of moral hazard, banks may force firms to pledge collateral to impose high costs of distress if they fail to repay their loans (Boot and Thakor 1994).

While this enforcement mechanism aims to ensure firm compliance (Swary and Udell 1988), the value of the collateral may fluctuate over time and differ for lenders and borrowers (Barro 1976). Moreover, firms may have different post-lending risk preferences (Coco 1999) and still withhold information about their ventures (Holmström and Tirole 1997) as

they may engage in riskier projects after lending (Stiglitz and Weiss 1992). Therefore, collateral may alleviate but not replace the monitoring and repossession efforts by banks. That is, banks that offer loans secured with collateral may incur monitoring and repossession costs related to collateral after defaults. In competitive markets, banks offset the monitoring and repossession costs by increasing their rates (Barro 1976; Petersen and Rajan 1995). Consequently, under the post-lending theory, collateral should result in higher spreads.

2.2 Empirical Evidence

Most empirical studies are based on the concept of collateral as assets possessed by firms to secure loans, and they provide conflicting results on the relation between collateral and loan rates. While some of these studies show negative relations between collateral and loan rates (Booth and Booth 2006; Cerqueiro et al. 2016; Degryse and Van Cayseele 2000; Lehmann and Neuberger 2001; pre-lending theory), a larger body of research shows an overall positive relation between collateral and loan rates (Berger and Udell 1990; Berger et al. 2011a; Blackwell and Winters 1997; Godlewski and Weill 2011; Ivashina 2009; Machauer and Weber 1998; post-lending theory). These mixed findings are grounded on the varying natures of business collateral, in particular, their quality (Cerqueiro et al. 2016), liquidity (Berger et al. 2016), and asymmetric information (Godlewski and Weill 2011). The dual role of collateral (signaling and incentive) may thus not necessarily be mutually exclusive. The information and incentive theories may both coexist. Indeed, the evidence indicates the coexistence of both with the post-lending theory showing stronger statistical and economic significance for certain types of business collateral (Berger et al. 2011a, 2016).

Owner guarantees have received less attention in the literature on collateralization. Owner guarantees can provide distinctive information and incentives compared to business collateral (Ono and Uesugi 2009). Business collateral ties the liability of the firm to the amount of collateral pledged. Owner guarantees expose their underwriters to unlimited liability given that they tie repayment to the current health and future earnings of the owner (Ang et al. 1995). This unlimited liability feature of guarantees is unique and can increase the quality and liquidity of collateralization for banks. That is, while business collateral holds greater value for owners than for banks due to limited liability (Chen 2006), owner guarantees may hold stronger value for banks than for owners given their distinct implications for mitigating information and incentive problems. This distinction introduces a nuanced perspective on the signaling and incentive values of owner guarantees to collateralization due to their superior costs for owners and superior benefits for banks (Mann 1997).

Although some studies have delved into the factors influencing the use of owner guarantees to secure business loans for small firms (e.g., Hernández-Cánovas and Martínez-Solano, 2006) and how they differ from business collateral (Ono and Uesugi 2009; Ortiz-Molina and Penas 2008; Voordeckers and Steijvers 2006), the empirical research on the relationship between owner guarantees and loan rates is sparse and is mixed. On the one hand, Calcagnini et al. (2014) and Hernández-Cánovas and Martínez-Solano (2006) find no systematic effects on loan rates; Brick and Palia (2007) and Peltoniemi and Vieru (2013) find a positive relation between owner guarantees and loan rates. On the other hand, Pozzolo (2004) finds that an increase in owner guarantees leads to lower lending rates, and an increase in risk leads to higher rates. These findings reinforce the potential role of owner guarantees as a device of information and incentives.

We add to this literature by testing the pre- and post-lending theories in the context of the collateralization of the loans of small firms with guarantees provided by their owners. For this purpose, we draw on unique over-the-counter loan contracts to construct multiple measures of owner guarantees that encompass a binary indicator of whether owners provide guarantees or not, guarantees coverage and bargaining power of owners, and multiple measures of risk that encompass observed or pre-lending *Credit Scores* and unobserved or post-lending *Default*. We also construct measures of loan terms (size and maturity), bank-firm relationships (main bank, overdraft facility, and branch proximity), and bank features (capital and liquidity) to control the analyses of the influence of owner guarantees on lending spreads, and the combined influences of owner guarantees and (observed and unobserved) risks on lending spreads.

2.3 Research Hypotheses

The signaling theory indicates that owners of riskier firms cannot afford to imitate owners of safer firms due to the threat of losing their assets; hence, collateral acts as an informative signal. Compared to business collateral, an owner guarantee transmits a stronger signal from owners to banks about their confidence in the profitability of their ventures because their risk of loss is higher. Owner guarantees also signal that firms are willing to put extra effort and prudence into their ventures. This strong signaling of quality and commitment that the owner guarantees provide should mitigate adverse selection (Pozzolo 2004). Hence a negative relation between owner guarantees and bank lending spreads**.** Concurrently, owner guarantees also offer protection to banks against imprudence and laziness by limiting their downside risks which is achieved by forcing owners to plow additional equity into the firm in case of distress (Bhimani et al. 2014). The unlimited liability feature of owner guarantees can impose a disciplinary effect on the post-lending conduct of firms (Mann 1997; Brick and Palia 2007; Peltoniemi and Vieru 2013) and consequently reduce their misconduct. Hence, there is a positive relation between owner guarantees and bank lending. We test the following hypotheses:

H1a (pre-lending information theory): There is a negative effect of owner guarantees on bank lending spreads.

H1b (post-lending incentive theory): There is a positive effect of owner guarantees on bank lending spreads.

Disentangling the aggregated effect of owner guarantees and risk on lending spreads poses a complex challenge. Banks can collect information on firm risk even if the observed information is imperfect. The observed risk produced by banks includes information on the verifiable characteristics of firms, such as financial information from public credit bureaus (Nakamura and Roszbach 2018). Banks draw on financial information on firms to produce credit scores that reflect their likelihood of loan repayment that is verifiable ex ante (Aghion and Tirole 1997). This lending technology improves the information produced by banks (Berger et al. 2005; Berger et al. 2011b) and loan availability (Berger and Frame 2007). Based on their prior creditworthiness assessed through credit scores, banks can offer riskier (safer) firms high (low) lending spreads (Ivashina 2009). Under asymmetric information, however, the observed risk may be imperfectly assessed, so adverse selection and perverse incentives may persist. Credit scores in the case of small firms can be highly asymmetric. Compared to large firms, information on small firms and their owners and managers is often sparse and therefore very costly for banks to collect (Ang 1991).

Owner guarantees can mitigate these problems and moderate the relationship between firm risk and bank lending spreads.

Low-risk firms can use collateralization as a signal, and thus, they can trade owner guarantees for a reduction in lending spreads. This signaling mechanism certifies accumulated (imperfect) information possessed by banks and translates into their credit scores to mitigate adverse selection (Pozzolo 2004). Therefore, a negative effect of owner guarantees on lending spreads for riskier firms can be expected. High-risk firms are less likely to use voluntary collateralization. Banks are often motivated to demand collateralization from riskier firms to mitigate potential losses from future distress (Berger and Udell 1990; Jiménez and Saurina 2004; Leeth and Scott 1989; Orgler 1970). In these situations, the moral hazard model (Boot and Thakor 1994; Boot et al. 1991; Holmström and Tirole 1997) predicts that owner guarantees may be used to ameliorate perverse incentives, particularly from firms inclined to pursue riskier ventures (Berger et al. 2011b; Ivashina 2009).[3] Therefore, a positive effect of owner guarantees on lending spreads for riskier firms can be expected. Altogether, these arguments indicate that both the pre-lending information and post-lending incentive theories can explain the determination of bank lending spreads. We test the following hypotheses:

H2a (pre-lending information theory): There is a negative association between the aggregated effect of owner guarantees with observed low risk and bank lending spreads.

H2b (post-lending incentive theory): There is a positive association between the aggregated effect of owner guarantees with observed high risk and bank lending spreads.

We establish a distinction between observed risks (H2a, H2b) and unobserved risks (H3a, H3b). As mentioned, observed risk encompasses (imperfect) information before lending. The unobserved risk, namely expected default, is verified only after lending, which may reflect post-lending incentive problems (Jiménez et al. 2006). This setting is crucial for understanding the role of owner guarantees in the determination of lending spreads. Firms formulate expectations about the success of their ventures; then, based on these expectations, firms and banks negotiate loan terms. In this setting, on the one hand, firms that possess positive private information about their standing and prospects (firms that believe they are not likely to default during the loan) are more likely to voluntarily offer owner guarantees to secure their loans in exchange for a reduction in spreads. In this setting, banks can attribute a signaling role to owner guarantees regardless of whether the future positive prospects of the firms are, or not, confirmed.[4] At the other end of the spectrum, firms that possess negative private information about their standing and prospects are less likely to voluntarily offer owner guarantees. In these situations, banks are more likely to demand owner guarantees to mitigate their losses in case of default. If unobserved risky firms are forced to offer a guarantee to mitigate perverse incentives, we can expect a positive association with bank lending spreads. The interaction of owner guarantees with post-lending default, therefore, should indicate the role of owner guarantees in reducing information and/or incentive gaps. We test the following hypotheses:

H3a: (pre-lending information theory): There is a negative association between owner guarantees and bank lending spreads despite post-lending default.

H3b: (post-lending incentive theory): There is a positive association between the owner guarantees and bank lending spreads for firms that enter into default post-lending.

[3] We draw this point from the literature on business collateral.

[4] Firms with good expectations about their ventures can also fail in the future because of unexpected frictions (Berger et al., 2011a, b).

3 Data and Method

3.1 Data

We use proprietary data on the portfolio of loans granted to small firms between 1Q2007 and 4Q2010 provided by a large bank. This bank maintains a single loan policy in which branch managers approve loans below a certain threshold and then are approved at the headquarters. The multi-period setting of our data allows us to control survivor bias by including not only surviving but also defaulting firms. We focus on new bank loans granted during that period.[5,6] Mortgage-backed loans, equipment loans, and motor vehicle loans that are mainly transaction-driven are excluded from our sample as they typically have standardized contract terms. Our data are considered reliable as they have also been used to address other research questions (for example, Duarte et al. 2018, 2020).

3.2 The Setting

Our data cover the crisis in Europe (2007–10). Our focus on this period is rooted in prior considerations of its severity for banks given the disruptions in the functioning of interbank markets across the globe to which European banks were not immune. The interbank market freeze seriously affected bank liquidity (Acharya and Mora 2015) that led banks to limit lending to small firms (Jiménez et al. 2012; Presbitero et al. 2014). At the time, the perceived costs of higher capital and liquidity ratios for banks within the Basel Capital Accords raised further concerns about lending to small firms (Naceur et al. 2018). The accords tightened the standards for granting loans (Artola and Genre 2011). These heightened constraints (Popov and Udell 2012) that led to either under or over-investment by small firms (Vermoesen et al. 2013) given their inability to substitute bank debt with trade debt (Iyer et al. 2014). The severity of the context increased the interest in the role of collateral and its potential to mitigate risks emerging from the loans granted to small firms by banks (Ferri et al. 2019). However, falling values of business collateral at the peak of the crisis curtailed their role in bank lending.[7] It is in this context that owner guarantees began to play a critical role in the loan contracting of banks. Whether such guarantees were used to mitigate pre-lending adverse selection or post-lending moral hazard can add to the literature on collateralization that has devoted significant attention to business assets rather than the personal assets of owners. The potential personal and social costs involved in using owner assets for business purposes generate significant policy issues that deserve focused attention.

[5] Renewal loans are not included in the sample as the bank did not provide this data.

[6] To avoid problems arising due to outliers, we dropped loan contracts with a loan amount higher than €1.000 thousand (5 observations).

[7] Asset market fluctuations influence the debt and capital expenditures of firms through the so-called collateral channel (Chaney et al. 2012) that amplifies the business cycle (Kiyotaki and Moore 1997). During this period, the falling value of pledged assets amplified the business cycle through procyclical changes in the cost and availability of loans (Gorton and Ordonez 2014).

Table 1 Definitions and measurements of variables used in the baseline and robustness regressions

Variables	Measure	Definition
Dependent		
Bank Lending Spread	%	difference between the contractual interest rate for the loan and the 12-month Euribor
Independent		
Owner		
Owner Guarantees	Binary	equals one if the owner pledged a guarantee to secure the loan for the firm, and zero otherwise
Pre-lending Credit Score (Risk)		
High Credit Score	Binary	equals one if the firm is classified by the bank as a low-risk firm, and zero otherwise
Intermediate Credit Score (base outcome)	Binary	equals one if the firm is classified by the bank as intermediate-risk firm, and zero otherwise
Low Credit Score	Binary	equals one if the firm is classified by the bank as a high-risk firm, and zero otherwise
Post-lending Default (Risk)		
Default	Binary	equals one if the firm defaulted after the loan was granted, and zero otherwise
Owner x Risk		
Owner Guarantees x High Credit Score	Interaction	interaction between *Owner Guarantees* and *High Credit Score*
Owner Guarantees x Low Credit Score	Interaction	interaction between *Owner Guarantees* and *Low Credit Score*
Owner Guarantees x Default	Interaction	interaction between *Owner Guarantees* and *Default*
Controls		
Loan characteristics		
Size	Th. Euros	loan amount in thousands of euros
Maturity	Months	number of months for which the loan is granted
Bank-Firm Relationship		
Main Bank	Binary	equals one if the bank is the main financial service provider to the firm, and zero otherwise
Overdraft Facility	Binary	equals one if the firm uses a permanent loan facility approved by the bank, and zero otherwise
Branch Proximity	Number	number of operations by branch/loan officer.
Bank characteristics		
Capital	%	ratio of core capital to total assets
Liquidity	%	ratio of the difference in interbank assets and liabilities to total net assets
Robustness		

Table 1 (continued)

Variables	Measure	Definition
Owner and *Owner* x Risk		
Owner Guarantees Coverage	Ratio	ratio of owner assets provided as guarantees to loan amount
Owner Guarantees Coverage x High Credit score	Interaction	interaction between *Owner Guarantees Coverage* and *High Credit score*
Owner Guarantees Coverage x Low Credit Score	Interaction	interaction between *Owner Guarantees Coverage* and *Low Credit score*
Owner Guarantees Coverage x Default	Interaction	interaction between *Owner Guarantees Coverage* and *Default*
Owner Bargaining Power	Binary	equals one if the owner possesses assets above the median of other firms within the same class of pre-lending credit score, and zero otherwise
Owner Bargaining Power x High Credit Score	Interaction	interaction between *Bargaining Power* and *High Credit Score*
Owner Bargaining Power x Low Credit Score	Interaction	interaction between *Bargaining Power* and *Low Credit Score*
Owner Bargaining Power x Default	Interaction	interaction between *Bargaining Power* and *Default*

3.3 Variables

Table 1 has the summaries of the main variables used in this study. The data include information on the *Bank Lending Spread* (our dependent variable) that is measured as the difference between the contractual interest rate of the loan (without fees) and the prime rate (12-month Euribor). The data also include an indication of whether the loan was granted with or without *Owner Guarantees* (and *Owner Guarantees Coverage* computed as the ratio of owner assets to loan amount, and *Owner Bargaining Power* that is computed from the coverage of owner guarantees by assigning one if the coverage is above the median of all firms in the same risk bucket).

We measure the observed firm risk through the internal credit scores ascribed by the bank prior to lending. This is a predetermined variable and hence is denoted as a *Pre-lending Credit Score*. These credit scores encompass financial, nonfinancial, and macroeconomic information related to the firm, and reflect the likelihood of repayment (Berger et al. 2011b; Berger and Frame 2007; Ivashina 2009).[8] In the context of this study, we aggregated these *Pre-lending Credit Scores* into three categories - *High Credit Score*, *Intermediate Credit Score*, and *Low Credit Score*. The binary variable *High Credit Score* equals one if the rating ranges in the interval from [AAA: BB], and zero otherwise. This credit score thus aggregates high, upper medium, and lower medium credit grades. The binary variable *Intermediate Credit Score* equals one if the rating ranges in the interval [BB: B-], and zero otherwise, therefore informing the speculative condition of the credit operation (our baseline outcome). The binary variable *Low Credit Score* equals one if the rating ranges in the interval [CCC: C], and zero otherwise, that identifies operations as posing a substantial risk and extremely speculative. While banks may conduct periodic reassessments of credit scores to adjust their risk-weighted assets and capital requirements, this study focuses on the pre-lending *Credit Scores* ascribed at the time of loan approval. Consequently, in this study, the pre-lending *Credit Scores* remain time-invariant. The ex post risk is captured by data from the bank on the *Post-lending Default* that indicates if a default occurred after the loan was granted.

Loan contract terms are controlled through *Size* (i.e., the loan amount in thousands of euros) and *Maturity* (in months). Bank-firm relationship characteristics (*Main Bank*, *Overdraft Facility* and *Branch Proximity*) control for soft information. *Main Bank* is a binary variable that equals one and indicates whether the bank is the main provider of financial services to the firm, and zero otherwise. The bank plays this role when the proportion of loans granted to a firm compared to its total loans from all banks exceeds 50% at the time the loan terms were agreed to. Banks that serve as the main loan providers of firms typically have stronger relationships with their clients (Kysucky and Norden 2016). Because lines of credit allow banks to collect information from multiple interactions (Norden and Weber 2010), we control whether the firm benefits from an *Overdraft Facility* at the time of agreeing to the loan terms. The distance between firms and banks is also crucial for information production (Hsueh and Zhang 2024). Due to data limitations, we cannot explicitly measure the geographic distance between the bank branches that process the loan and the firm. However, we do construct the variable *Branch Proximity* that measures the number

[8] Following the Basel Capital Accords, the bank deploys its internal ratings-based approach (IRBA) to compute minimum capital requirements. In this approach, the bank assigns a credit score to each firm, ranging from AAA (indicating the lowest risk) to C (highest risk). Subsequently, these internal credit scores are utilized to compute the risk-weight assets (RWA) and the capital requirements.

of loans processed by each branch. Hanedar et al. (2014) use a binary variable "City" as a measure of bank-firm proximity. In their study, they assume that large cities have a high concentration of firms and therefore have a higher density of bank branches. This density reduces the distance between banks and firms. In our study, *Branch Proximity* captures the effect of branch size to determine the bank-firm distance (see also Agarwal and Hauswald 2010). Larger branches tend to be more innovative and rely more on new technologies than smaller ones. These technologies reduce the distance between banks and firms and thus facilitate information sharing (Han 2008). Finally, the *Capital* and *Liquidity* positions of banks control for lender characteristics.

Table 2 gives a summary of the descriptive statistics of the variables. Banks, on average, charge a spread of 3.315%. Within the sample, 53.4% of the loans are issued with *Owner Guarantees*. Regarding *Pre-lending Credit Scores*, 45.1% of the firms have a *High Credit Score* (or low ex ante risk), 43.9% have an *Intermediate Credit Score*, and 11% have a *Low Credit Score* (or high ex ante risk). Concerning unobserved risk, 27% of the firms defaulted post-lending. The average *Size* in the sample is 106,711.00 euros with a *Maturity* of 31 months. Regarding bank-firm relationships, 23.1% of the firms identify a bank as their main financial services provider (the *Main Bank*), and 35.5% have an active *Overdraft Facility* with the bank. On average, each branch processed 130 loans similar to those in this study, with the number per branch ranging from 1 to a maximum of 736 loans that demonstrates the *Branch Proximity* between the bank and the firms. During the analysis period, the bank maintained an average *Capital* ratio of 7.78% and a net *Liquidity* position of 1.32% in the interbank market.

We regress the *Bank Lending Spreads* on the independent variables by clustering the errors at the industry level and by controlling for time, location, and industry fixed effects.[9] Table 3 presents the correlations between the independent variables.[10] It shows that none of the correlations is high enough to cause linear dependence in multivariate regression estimations.

3.4 Method

We model *Bank Lending Spreads* as a function of *Owner Guarantees*; *Pre-lending Credit Scores*; *Post-lending Default*; and the interactions among *Owner Guarantees*, *Credit Scores,* and *Default Rates*; while controlling for *Size* and *Maturity*, *Main Bank, Overdraft Facility*, *Branch Proximity*, and *Capital* and *Liquidity*. We estimate this model with the ordinary least squares (OLS), including each group of variables sequentially to overcome potential simultaneity in the determination of spreads and other variables (as in Berger et al. 2016). We also use clustering correction that accounts for unobserved correlations between the industries. All estimations (Table 4) include time, industry, and location fixed effects, except for the first (I.1) that only contains *Owner Guarantees* and the third (III.3) and the fourth (IV.1–3) that do not include time fixed effects as *Capital* and *Liquidity* are loan (time) invariant (variant) covariates.

[9] In the case of the paper in hand, the data are provided by a single bank and there are no multiple loans for the firms in the sample. Thus, the findings for the crisis are controlled for with loan characteristics, bank-firm-level relationships, bank-level capital, and liquidity positions, industry-level clustered errors, and time and location fixed effects.

[10] In the correlation matrix and OLS estimations, we use the variables loan *Size* and branch *Proximity* in the logarithm form to address the skewness of those variables.

Table 2 Descriptive statistics. The table presents the descriptive statistics for the 5096 loans granted to small firms between 1Q2007 and 4Q2010. Table 1 details the definitions and measurements for all variables used in the baseline and robustness regressions

Variables	Type	Obs.	Mean.	Std.Dev	Min.	Max.
Dependent						
Bank Lending Spread	%	5096	3.315	1.308	0.5	13.78
Independent						
Owner						
Owner Guarantees	Binary	5096	0.534	0.499	0	1
Pre-lending Credit Score (Risk)						
High Credit Score	Binary	5096	0.451	0.498	0	1
Intermediate Credit Score (base outcome)	Binary	5096	0.439	0.496	0	1
Low Credit Score	Binary	5096	0.110	0.314	0	1
Post-lending Default (Risk)						
Default	Binary	5096	0.265	0.441	0	1
Owner x Risk						
Owner Guarantees x High Credit Score	Interaction	5096	0.073	0.260	0	1
Owner Guarantees x Low Credit Score	Interaction	5096	0.238	0.426	0	1
Owner Guarantees x Default	Interaction	5096	0.127	0.333	0	1
Controls						
Loan characteristics						
Size	Th. Euros	5096	106.711	147.591	5	997.596
Maturity	Months	5096	31.264	27.205	1	120
Bank-Firm Relationships						
Main Bank	Binary	5096	0.231	0.421	0	1
Overdraft Facility	Binary	5096	0.355	0.479	0	1
Branch Proximity	Number	5096	129.790	197.404	1	736
Bank characteristics						
Capital	%	5096	7.783	1.070	6.2	8.9
Liquidity	%	5096	1.321	0.488	0.762	1.938
Robustness						
Owner and *Owner* x Risk						
Owner Guarantees Coverage	Ratio	5096	0.529	0.497	0	1
Owner Guarantees Coverage x High Credit Scorescore	Interaction	5096	0.073	0.259	0	1
Owner Guarantees Coverage x Low Credit score	Interaction	5096	0.236	0.423	0	1
Owner Guarantees Coverage x Default	Interaction	5096	0.126	0.331	0	1
Owner Bargaining Power	Binary	5096	0.521	0.500	0	1
Owner Bargaining Power x High Credit Score	Interaction	5096	0.232	0.422	0	1
Owner Bargaining Power x Low Credit Score	Interaction	5096	0.072	0.259	0	1
Owner Bargaining Power x Default	Interaction	5096	0.124	0.330	0	1

Table 3 Pearson correlation matrix for the dependent and the explanatory variables used in the baseline regressions. Table 1 details the definitions and measurements for all variables. In the correlation matrix, we use the variables loan *Size* and branch *Proximity* in the logarithm form to address the skewness of those variables shown in Table 2

Variables	Measure	VIF		1	2	3	4	5	6	7	8	9	10	11	12
Dependent															
Bank Lending Spread	%		**1**	1.0000											
Independent															
Owner															
Owner Guarantees	Binary	1.26	**2**	−0.1545*	1.0000										
Pre-lending Credit Score (Risk)															
High Credit Score	Binary	1.26	**3**	−0.1288*	−0.0110	1.0000									
Low Credit Score	Binary	1.17	**4**	0.1199*	0.0883*	−0.3191*	1.0000								
Post-lending Default (Risk)															
Default	Binary	1.29	**5**	0.0754*	−0.0672*	−0.3259*	0.0507*	1.0000							
Controls															
Loan characteristics															
ln(Size)	in *ln* form	1.15	**6**	−0.0764*	−0.0492*	0.0731*	−0.0988*	−0.0209	1.0000						
Maturity	Months	1.49	**7**	−0.0853*	0.4104*	0.0224	0.1118*	−0.0952*	0.0910*	1.0000					
Bank-Firm Relationship															
Main Bank	Binary	1.10	**8**	0.0309	0.1154*	−0.0659*	0.1266*	0.0069	0.0149	0.2275*	1.0000				
Overdraft Facility	Binary	1.15	**9**	0.0929*	−0.0332	0.0243	−0.0183	−0.0305	0.1834*	−0.2509*	−0.0860*	1.0000			

Table 3 (continued)

Variables	Measure	VIF		1	2	3	4	5	6	7	8	9	10	11	12
ln(Branch Proximity)	in *ln* form	1.34	**10**	−0.0610*	−0.1236*	−0.0664*	−0.0925*	0.3467*	0.1701*	−0.2535*	−0.1891*	0.0070	1.0000		
Bank characteristics															
Capital	%	1.13	**11**	0.2368*	0.1381*	−0.0672*	0.1121*	−0.0893*	−0.0420*	−0.0097	0.0086	−0.1389*	0.0362*	1.0000	
Liquidity	%	1.07	**12**	−0.0755*	−0.0126	0.0304	−0.0744*	−0.0090	−0.0297	0.0041	0.0105	0.0274	−0.0203	0.2126*	1.0000

* p value<0.01. All variables are defined in Table 1

Table 4 The effect of *Owner Guarantees* and Pre-lending *Credit Score* and Post-lending *Default* on the *Bank Lending Spread* - baseline ordinary least squares estimations. Column I presents the findings from the baseline specification that comprises only *Owner Guarantees* (Hypotheses *H1a, H1b*). We augment this specification by adding measures of pre-lending (*High Credit Score* and *Low Credit Score*) and post-lending (*Default*) risk to Column II. The base outcome of *Pre-lending Credit Scores* is the *Intermediate Credit Score*. Control variables (i.e., loan, relationship, and bank characteristics) are added in Column III. We use the variables loan *Size* and branch *Proximity* in the logarithm form to address the skewness of those variables shown in Table 2. The moderating effects of *Owner Guarantees* on the relationship between *Pre-lending Credit Scores*, *Post-lending Default*, and *Bank Lending Spread* are reported in Column IV. The estimates reported in Column IV display the association between the aggregated effect of owner guarantees with observed high risk and bank lending spreads (Hypotheses H2a, H2b) and the association between the owner guarantees and bank lending spreads for firms that enter into default post-lending (Hypotheses H3a, H3b). Table 1 details the definitions and measurements for all variables

	Column I		Column II		Column III			Column IV		
	Owner		Risk		Controls			Interactions		
	Owner	[+] Fixed Effects	[+] Pre-lending *Credit Score*	[+] Post-lending *Default*	[+] Loan charact.	[+] Bank-firm Relationships	[+] Bank charact.	*High Credit Score*	*Low Credit Score*	*Default*
	I.1	I.2	II.1	II.2	III.1	III.2	III.3	IV.1	IV.2	IV.3
Independent										
Owner										
Owner Guarantee	−0.405**	−0.524**	−0.535**	−0.527**	−0.533**	−0.556**	−0.561**	−0.470*	−0.634**	−0.683**
	(0.059)	(0.085)	(0.074)	(0.074)	(0.093)	(0.099)	(0.104)	(0.113)	(0.082)	(0.116)
Pre-lending Credit Score (Risk)										
High Credit Score			−0.230**	−0.174**	−0.167*	−0.167*	−0.162*	−0.161*		
			(0.042)	(0.040)	(0.039)	(0.045)	(0.047)	(0.050)		
Low Credit Score			0.313**	0.323**	0.304**	0.270*	0.236*		−0.077	
			(0.056)	(0.061)	(0.065)	(0.072)	(0.082)		(0.048)	
Post-lending Default (Risk)										
Default				0.182**	0.180**	0.240**	0.239**			0.105*

Table 4 (continued)

Column I	Column II		Column III			Column IV		
		(0.038)	(0.035)	(0.044)	(0.043)			(0.028)
Owner x Risk								
Owner Guarantees x High Credit Score						−0.207**		
						(0.031)		
Owner Guarantees x Low Credit Score							0.650***	
							(0.031)	
Owner Guarantees x Default								0.460***
								(0.020)
Controls								
Loan characteristics								
ln(Size)			−0.069**	−0.085**	−0.091**	−0.102**	−0.101**	−0.101**
			(0.013)	(0.011)	(0.010)	(0.015)	(0.011)	(0.014)
Maturity			0.000	0.001	0.001	0.001	0.001	0.001
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Bank-Firm Relationships								
Main Bank				0.111**	0.121**	0.147**	0.154**	0.133**
				(0.022)	(0.023)	(0.021)	(0.021)	(0.016)
Overdraft Facility				0.275***	0.278***	0.283***	0.278***	0.276***
				(0.022)	(0.022)	(0.021)	(0.011)	(0.016)

Table 4 (continued)

	Column I		Column II		Column III			Column IV		
ln(Proximity)						−0.045***	−0.041***	−0.022**	−0.011	−0.060***
						(0.001)	(0.001)	(0.003)	(0.004)	(0.001)
Bank characteristics										
Capital							0.338**	0.337**	0.337**	0.355***
							(0.038)	(0.038)	(0.039)	(0.029)
Liquidity							−0.348**	−0.359**	−0.349**	−0.370**
							(0.054)	(0.049)	(0.052)	(0.041)
[1]Intercept	3.531***	2.903***	3.072***	2.970***	3.268***	3.453***	1.808**	1.849**	1.749**	1.773***
	(0.011)	(0.057)	(0.078)	(0.053)	(0.086)	(0.078)	(0.217)	(0.235)	(0.206)	(0.160)
Observations	5096	5096	5096	5096	5096	5096	5096	5096	5096	5096
R-squared	0.024	0.101	0.118	0.122	0.125	0.138	0.147	0.141	0.141	0.145
Clustered Sandwich Estimator (Industry)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Location and Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p value<0.01, ** p value<0.05, and * p value<0.01. Standard errors are shown between parentheses. We use time- location-, and industry-clustering

4 Findings

4.1 Baseline: Owner Guarantees

We report the findings in Table 4. Column I presents the findings from the baseline specification with only *Owner Guarantees*. We augment this specification by adding measures of pre-lending and post-lending risk to Column II; loan, relationship, and bank characteristics to Column III; and the moderating effects of guarantees on risk to Column IV.

In Columns I-III, the negative coefficients for *Owner Guarantees* show that the bank charged 40.5 to 56.1 bps lower spreads to firms whose owners provided their guarantees. This finding aligns with H1a but not H1b. Columns II and III show that *High Credit Score* (*Low Credit Score*) is negatively (positively) related to *Bank Lending Spreads*. The estimations show that the bank charged 16.2 to 23.0 bps (23.6 to 32.3 bps) less (more) in spreads to safer (riskier) firms than those firms with *Intermediate Credit Score* (our base outcome). In Column IV.1., *Owner Guarantees*, *High Credit Score,* and *Owner Guarantees* x *High Credit Score* are negatively related to bank lending spreads. Among firms with a *High Credit Score*, the bank reduced spreads by 16.1 bps to firms that did not provide owner guarantees, and by 83.8 bps to those firms providing owner guarantees ($\beta_{owner\ guarantee=-0.470}+\beta_{high\ credit\ score=-0.161}+\beta_{owner\ guarantees\ x\ high\ credit\ score=-0.207}$).[11] This evidence aligns with H2a. The results reported in Column IV.2 show a negative coefficient for *Owner Guarantees*, a statistically nonsignificant coefficient for *Low Credit Score,* and a positive coefficient for the interaction *Owner Guarantees x Low Credit Score*. While firms with a *Low Credit Score* that did not provide owner guarantees do not pay lending spreads different than those paid by average firms ($\beta_{low\ credit\ score}$, p value>0.1), the bank increased spreads by 1.6 bps for firms with *Low Credit Score* that secured loans with *Owner Guarantees* ($\beta_{owner\ guarantee=-0.634}+\beta_{low\ credit\ score=0.000}+\beta_{owner\ guarantees\ x\ low\ credit\ score=0.650}$). This evidence aligns with H2b. Hence, even though the overall association of guarantees on lending spreads is negative (Columns I-III), this association turns out to be positive in the case of riskier firms that expose the bank to higher incentive problems. Banks charge high lending spreads to observed riskier firms to mitigate incentive problems. These effects are also evident when we compare the negative coefficient of *Owner Guarantees* for firms with *High* or *Intermediate Credit Score* ($\beta_{owner\ guarantee=}$-0.634) and the positive combined coefficient of *Owner Guarantees* and *Low Credit Score* ($\beta_{owner\ guarantee=-0.634}+\beta_{low\ credit\ score=0.000}+\beta_{owner\ guarantees\ x\ low\ credit\ score=0.650=}+0.016$). Still, the economic impact of the moderating effect of observed *Credit Score* and *Owner Guarantees* on *Bank Lending Spreads* is higher in the case of low-risk firms (reduction of 83.8 bps compared with an increase of 1.6 bps).

Default is positively related to *Bank Lending Spreads* (Columns II.2-III.3); the bank charged 18 bps to 24 bps higher spreads to firms that entered nonrepayment after obtaining the loan. Of particular interest for hypothesis H3 is the moderating effect of *Owner Guarantees* on the relation between *Default* and *Bank Lending Spreads*. The results reported in Column IV.3 show a negative coefficient for *Owner Guarantees* and positive coefficients for *Default* and the interaction *Owner Guarantees* x *Low Credit Score.* The magnitude of the combined coefficients shows that the presence of owner guarantees leads the bank to reduce lending spreads by 68.3 basis points (bps) for firms that did not default

[11] We follow Brambor et al. (2006) in the interpretation of the interaction terms and their constitutive parts.

subsequently. In contrast, the bank reduced the spreads by 11.8 bps for firms that did default subsequently ($\beta_{owner\ guarantee=-0.683} + \beta_{default=0.105} + \beta_{owner\ guarantees\ x\ default=0.460}$). In absence of owner guarantees, the bank increased spreads by an additional 10.5 bps. These results point to a strong negative relation between owner guarantees and lending spreads. They indicate that owner guarantees reduce lending spreads even for firms that defaulted after lending, which is not observable at that time. These findings align with H3a.

Summing up, all else being equal, the results show that *Owner Guarantees* decrease bank lending spreads by 40.5 to 56.1 bps, as reported in Columns I to III. The interplay between *Owner Guarantees* and *Default* demonstrates that the influence of *Owner Guarantees* on diminishing *Bank Lending Spreads* supersedes the base positive relation with default events, changing the effect from an increase of 10.5 bps (charged for those without owner guarantees) to a decrease of 11.8 bps (obtained from the combined effects), as detailed in Column IV.3. The interaction effects shown in Column IV.1 also demonstrate that *Owner Guarantees* reduce spreads for firms with high *Pre-lending Credit Scores* from a baseline decrease of 16.1 bps ($\beta_{default}$) to a significant decrease of 83.8 bps ($\beta_{onwer\ guarantee} + \beta_{default} + \beta_{onwer\ guarantee\ x\ default}$). The dual effect of *Owner Guarantees* and risks (observed and unobserved) on *Bank Lending Spreads* reflect both negative and positive aspects and indicate that their relations are explained by both the information and incentive theories. However, the overriding negative influence of the combination of owner guarantees with high *Pre-lending Credit Scores* and *Default* on *Bank Lending Spreads* indicates the predominance of the information theory. That is, owners that pledge their guarantees are perceived as providing a substantive signal of their creditworthiness and confidence in their ventures.

With regard to loan contract terms, the results show that loan *Size* (ln(*Size*)) reduces *Bank Lending Spreads*, while loan *Maturity* does not have a significant effect on lending spreads. The availability of more information in the case of larger loans reduces asymmetries (Nakamura and Roszbach 2018) and facilitates screening and monitoring that consequently reduce bank lending spreads. Relationship-based lending can also confer advantages to both banks and firms by reducing asymmetries and facilitating contracting. Yet, the research offers inconclusive evidence regarding the benefits of strong bank-firm relationships (Kysucky and Norden 2016). Our findings also show mixed evidence. The *Main Bank* and the *Overdraft Facility* are positively and significantly related to *Bank Lending Spreads*. These findings can be justified by the traditional holdup problem (Sharpe 1990) that is repeatedly observed in the literature (Gabbi et al. 2020), whereby banks exploit the monopoly of producing information on firms with whom they have privileged relationships to charge higher spreads. *Branch Proximity,* however, shows a negative effect on the spreads, which is in line with the large body of literature that examines the effect of distance on contract terms (Kysucky and Norden 2016).[12] When controlling for bank characteristics, our estimations show that *Capital* affects lending spreads positively; the need to maintain high capital ratios as prescribed by Basel Capital Accords might explain why banks increase lending spreads. Nevertheless, *Liquidity* is negatively associated with lending spreads. This evidence indicates that the bank might have practiced liquidity-induced predatory pricing in its lending.

[12] This evidence, however, is not unanimous and may vary depending on the measure of distance adopted. For instance, Degryse and Ongena (2005) identify a negative spatial price discrimination by banks; they observed that the loan rates decrease as the distance between the firm and the lending bank narrows, yet they increase with the distance from the firm to competing banks.

Table 5 Predicted Bank Lending Spreads based on Owner Guarantees and Pre-lending Credit Score and Post-lending Default. Columns I to IV present the average differences (T-test) in *Predicted Bank Lending Spreads* on *Owner Guarantees*, *Pre-lending High Credit Scores*, *Pre-lending Low Credit Scores,* and *Post-lending Default*, respectively. Column V displays the average differences in *Predicted Bank Lending Spreads* on firms having high credit scores for guaranteed and unguaranteed loans by the owner. Column VI displays the average differences in *Predicted Bank Lending Spreads* on firms having low credit scores for guaranteed and unguaranteed loans by the owner. Column VII displays the average differences in *Predicted Bank Lending Spreads* on firms that entered into post-lending default on guaranteed and unguaranteed loans by the owner. *Predicted Bank Lending Spreads* are those obtained from the baseline ordinary least squares estimations reported in Table 4; Table 5, Columns I to IV are those predicted from estimations displayed in Table 4, Column III; Table 5, Columns V, VI, and VII are those predicted from estimations displayed in Table 4, Columns IV.1, IV.2, and IV.3., respectively. The average of the predicted bank lending spread in the baseline estimations is 3.315 with a standard deviation of 0.502. Table 1 details the definitions and measurements for all variables

	Column I			Column II		
	Owner Guarantees = 1	*Owner Guarantees* = 0	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
	I.1	I.2	I.3	II.1	II.2	II.3
Observations	2721	2375		2296	2800	
Average Bank Lending Spread	3.126	3.531	−0.405***	3.129	3.467	−0.338***
Standard Deviation	0.467	0.451		0.449	0.492	
	Column III			Column IV		
	Low Credit Score = 1	*Low Credit Score* = 0	Difference III.1-III.2 (t-test)	*Default* = 1	*Default* = 0	Difference IV.1-IV.2 (t-test)
	III.1	III.2	III.3	IV.1	IV.2	IV.3
Observations	563	4533		1573	3745	
Average Bank Lending Spread	3.760	3.260	+0.500***	3.479	3.256	+0.223***
Standard Deviation	0.476	0.477		0.491	0.492	
	Column V			Column VI		
	Owner Guarantees = 1 |*High Credit Score* = 1	*Owner Guarantees* = 0 |*High Credit Score* = 1	Difference V.1-V.2 (t-test)	*Owner Guarantees* = 1 |*Low Credit Score* = 1	*Owner Guarantees* = 0 |*Low Credit Score* = 1	Difference VI.1-VI.2 (t-test)
	V.1	V.2	V.3	VI.1	VI.2	VI.3
Observations	1212	1084		371	192	

Table 5 (continued)

	Column I			Column II		
	Owner Guarantees = 1	*Owner Guarantees* = 0	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
Average Bank Lending Spread	2.888	3.398	−0.510***	3.800	3.682	+0.118***
Standard Deviation	0.412	0.391		0.424	0.420	
	Column VII					
	Owner Guarantees = 1 |*Default* = 1	*Owner Guarantees* = 0 |*Default* = 1	Difference VI.I1-VII.3 (t-test)			
	VII.1	VII.2	VII.3			
Observations	646	705				
Average Bank Lending Spread	3.400	3.551	−0.151***			
Standard Deviation	0.455	0.410				

*** p value<0.01, ** p value<0.05, and * p value<0.01

4.2 Baseline: Predicted Spreads

Table 5 presents the findings on the *Predicted Bank Lending Spreads* for our main variables of interest, *Owner Guarantees*, *Pre-lending Credit Scores*, *Default,* and their interactions. Column I shows that the bank charges an average spread of 312.6 bps (below the average of the sample: 331.5 bps) to firms whose owners provided guarantees and 353.1 bps to firms whose owners did not. The difference of −40.5 bps is statistically significant at the 1% level. This evidence is in line with empirical findings reported in Columns I-III of Table 4 and aligns with H1a, that is, the pre-lending information theory.

In Column II, the bank charged an average spread of 312.9 bps to *High Credit Score* firms and 346.7 bps to *Intermediate* and *Low Credit Score* firms. The difference of −33.8 bps is also statistically significant at the 1% level. In Column III, the bank charged an average spread of 376 bps to *Low Credit Score* firms and 326 bps to *Intermediate* and *High Credit Score* firms. The difference of +50 bps is statistically significant at the 1% level. In Column IV, the bank charges an average spread of 347.9 bps to firms that enter *Default* and 325.6 bps to firms that did not do so. The difference of +22.3 bps is statistically significant at the 1% level. The evidence on the predicted spreads by observed and unobserved risk profiles are consistent with the estimations reported in Column II of Table 4.

The predicted values reported in Columns V-VII are of main relevance. In Column V, the bank charged an average spread of 288.8 bps to *High Credit Score* firms whose owners provided guarantees and 339.8 bps to *High Credit Score* firms whose owners did not provide guarantees. The difference of −51.0 bps is statistically significant at the 1% level and aligns with hypothesis H2a (pre-lending information theory). In Column VI, the bank charges an average spread of 380.0 bps to *Low Credit Score* firms whose owners provided guarantees and 369.2 bps to firms whose owners did not provide guarantees. The difference of +11.8 bps is also statistically significant at the 1% level and aligns with H2b (post-lending incentive theory). In Column VII, the bank charges an average spread of 340.0 bps to firms that *Default* and whose owners provided guarantees and 355.1 bps to firms whose owners did not provide guarantees. The difference of −15.1 bps is statistically significant at the 1% level and aligns with hypothesis H3a (pre-lending information theory).

These predicted spreads are clearly in line with the empirical findings reported earlier that pointed to the co-existence of both information and incentive theories with the pre-lending information theory overall predominating.

4.3 Robustness Tests: Owner Guarantees Coverage and Owner Bargaining Power

The findings reported in Table 4 and subsequent analyses of predicted spreads reported in Table 5 relate to whether owners provide guarantees. It may thus be relevant to assess whether the findings remain robust to the percentage of the loan amount that the owner guarantees cover (Bester 1987), and prudent management decisions may depend on the amount and value of guarantees (Niinimäki 2018). Table 6 presents additional empirical findings in which the owner guarantees are replaced by *Owner Guarantees Coverage*. In addition, it may also be relevant to assess whether the findings remain robust to the bargaining power of owners (Grunert and Norden 2012). Table 7 presents additional empirical findings in which owner guarantees are replaced by O*wner Bargaining Power*. The structures of Tables 6 and 7 are identical to that of Table 4. Reestimating the regressions with *Owner Guarantees Coverage* and *Owner Bargaining Power* yield findings that are in line

Table 6 The effect of Owner Guarantees Coverage and Pre-lending Credit Score and Post-lending Default on Bank Lending Spread – robustness Ordinary Least Squares estimations. Column I displays the findings from the baseline specification of the robustness test that comprises only *Owner Guarantee Coverage* (robustness check: Hypotheses *H1a, H1b*). We augment this specification by adding measures of pre-lending (*High Credit Score*, and *Low Credit Score*) and post-lending (*Default*) risk to Column II. The base outcome of *Pre-lending Credit Scores* is the *Intermediate Credit Score*. Control variables (i.e., loan, relationship, and bank characteristics) are added to Column III. We use the variables loan *Size* and *Branch Proximity* in the logarithm form to address the skewness of those variables shown in Table 2. The moderating effects of *Owner Guarantees Coverage* on the relationship between *Pre-lending Credit Scores*, *Post-lending Default*, and *Bank Lending Spread* are reported in Column IV. The estimates reported in Column IV display the association between the aggregated effect of owner guarantees coverage with observed high risk and bank lending spreads (robustness check: Hypotheses H2a, H2b) and the association between the coverage of owner guarantees and bank lending spreads for firms that enter into default post-lending (robustness check: Hypotheses H3a, H3b). Table 1 details the definitions and measurements for all variables

	Column I		Column II		Column III			Column IV		
	Owner		Risk		Controls			Interactions		
	Owner	[+] Fixed Effects	[+] *Pre-lending Credit Score*	[+] *Post-lending Default*	[+] Loan charact.	[+] Bank-firm Relationships	[+] Bank charact.	*High Credit Score*	*Low Credit Score*	*Default*
	I.1	I.2	II.1	II.2	III.1	III.2	III.3	IV.1	IV.2	IV.3
Independent										
Owner										
Owner Guarantees Coverage	−0.393**	−0.511**	−0.523**	−0.515**	−0.520**	−0.543**	−0.548**	−0.456*	−0.622**	−0.669**
	(0.057)	(0.084)	(0.072)	(0.072)	(0.089)	(0.096)	(0.101)	(0.108)	(0.078)	(0.114)
Pre-lending Credit Score (Risk)										
High Credit Score			−0.230**	−0.174*	−0.167*	−0.167*	−0.162*	−0.161*		
			(0.043)	(0.041)	(0.041)	(0.046)	(0.048)	(0.053)		
Low Credit Score			0.313**	0.323**	0.305**	0.272*	0.238*		−0.075	
			(0.056)	(0.060)	(0.064)	(0.072)	(0.081)		(0.048)	
Post-lending Default (Risk)										

Table 6 (continued)

Column I	Column II		Column III			Column IV		
Default		0.182**	0.180**	0.241**	0.240**			0.109*
		(0.037)	(0.034)	(0.044)	(0.042)			(0.029)
Owner x Risk								
Owner Guarantees Coverage x High Credit score						−0.210**		
						(0.030)		
Owner Guarantees Coverage x Low Credit Score							0.651***	
							(0.033)	
Owner Guarantees Coverage x Default								0.455***
								(0.019)
Control								
Loan characteristics								
ln(Size)			−0.071**	−0.086**	−0.093**	−0.104**	−0.103**	−0.103**
			(0.013)	(0.011)	(0.010)	(0.015)	(0.011)	(0.013)
Maturity			−0.000	0.001	0.001	0.001	0.001	0.001
			(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

Table 6 (continued)

	Column I		Column II		Column III	Column IV				
Bank-Firm Relationships										
Main Bank						0.110**	0.121**	0.147**	0.153**	0.133**
						(0.023)	(0.023)	(0.022)	(0.022)	(0.017)
Overdraft Facility						0.274***	0.277***	0.281***	0.277***	0.275***
						(0.022)	(0.022)	(0.020)	(0.010)	(0.016)
ln(Branch Proximity)						−0.046***	−0.042***	−0.023**	−0.012*	−0.061***
						(0.001)	(0.001)	(0.003)	(0.004)	(0.001)
Bank characteristics										
Capital							0.336**	0.336**	0.336**	0.353***
							(0.037)	(0.037)	(0.039)	(0.029)
Liquidity							−0.347**	−0.358**	−0.349**	−0.369**
							(0.053)	(0.048)	(0.051)	(0.041)
Intercept	3.523***	2.899***	3.068***	2.966***	3.273***	3.462***	1.824**	1.866**	1.767**	1.787***
	(0.011)	(0.059)	(0.080)	(0.055)	(0.086)	(0.078)	(0.217)	(0.235)	(0.206)	(0.158)
Observations	5096	5096	5096	5096	5096	5096	5096	5096	5096	5096
R-squared	0.022	0.099	0.116	0.120	0.124	0.136	0.145	0.139	0.139	0.143
Clustered Sandwich Estimator (Industry)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No

Table 6 (continued)

	Column I		Column II		Column III		Column IV			
Location and Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p value<0.01, ** p value<0.05, and * p value<0.01. Standard errors are in parentheses. We use time- location-, and industry-clustering

Table 7 The effect of Owner Bargaining Power, Pre-lending Credit Score, and Post-lending Default on Bank Lending Spread – robustness Ordinary Least Squares estimations. Column I displays the findings from the baseline specification of the robustness test that comprises only *Owner Bargaining Power* (robustness check: Hypotheses H1a, H1b). We augment this specification by adding measures of pre-lending (High Credit Score, and Low Credit Score) and post-lending (Default) risk to Column II. The base outcome of *Pre-lending Credit Scores* is the *Intermediate* Cr*edit Score*. Control variables (i.e., loan, relationship, and bank characteristics) are added to Column III. We use the variables loan *Size* and *Branch Proximity* in the logarithm form to address the skewness of those variables shown in Table 2. The moderating effects of *Owner Bargaining Power* on the relationship between *Pre-lending Credit Scores*, *Post-lending Default*, and *Bank Lending Spread* are reported in Column IV. The estimates reported in Column IV display the association between the aggregated effect of owner bargaining power with observed high-risk and bank lending spreads (robustness check: Hypotheses H2a, H2b) and the association between the owner bargaining power and bank lending spreads for firms that enter into default post-lending (robustness check: Hypotheses H3a, H3b). Table 1 details the definitions and measurements for all variables

	Column I		Column II		Column III			Column IV		
	Owner		Risk		Controls			Interactions		
	Owner	[+] Fixed Effects	[+] *Pre-lending Credit Score*	[+] *Post-lending Default*	[+] Loan charact.	[+] Bank-firm Relationships	[+] Bank charact.	*High Credit Score*	*Low Credit Score*	*Default*
	I.1	I.2	II.1	II.2	III.1	III.2	III.3	IV.1	IV.2	IV.3
Independent										
Owner										
Owner Bargaining Power	−0.354**	−0.469**	−0.481**	−0.473**	−0.471**	−0.494**	−0.500**	−0.408**	−0.570**	−0.613**
	(0.052)	(0.079)	(0.066)	(0.066)	(0.081)	(0.088)	(0.093)	(0.094)	(0.073)	(0.107)
Pre-lending Credit Score (Risk)										
High Credit Score			−0.231**	−0.173*	−0.165*	−0.165*	−0.161*	−0.164		
			(0.043)	(0.041)	(0.042)	(0.047)	(0.049)	(0.061)		
Low Credit Score			0.312**	0.322**	0.308**	0.274*	0.241*		−0.049	
			(0.056)	0.186**	0.182**	0.245**	0.244**			0.128*
Default				(0.036)	(0.033)	(0.043)	(0.041)			(0.033)
Owner x Risk										

Table 7 (continued)

Column I	Column II	Column III			Column IV		
					(0.024)		
Owner Bargaining Power x High Credit Score					−0.207**		
Owner Bargaining Power x Low Credit Score						0.618***	
						(0.026)	
Owner Bargaining Power x Default							0.429***
							(0.011)
Control							
Loan characteristics							
ln(Size)		−0.071**	−0.086**	−0.093***	−0.104**	−0.103***	−0.103**
		(0.011)	(0.009)	(0.008)	(0.013)	(0.009)	(0.012)
Maturity		−0.001	0.000	0.000	0.000	0.000	0.000
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Bank-Firm Relationships							
Main Bank			0.108**	0.118**	0.145**	0.151**	0.132**
			(0.023)	(0.024)	(0.022)	(0.023)	(0.018)
Overdraft Facility			0.269***	0.272***	0.277***	0.273***	0.272***

Table 7 (continued)

	Column I		Column II		Column III			Column IV		
						(0.022)	(0.022)	(0.020)	(0.010)	(0.016)
ln(Branch concentration)						−0.048***	−0.045***	−0.025**	−0.014*	−0.062***
						(0.001)	(0.001)	(0.003)	(0.004)	(0.000)
Bank characteristics										
Capital							0.332**	0.332**	0.331**	0.349***
							(0.037)	(0.037)	(0.039)	(0.029)
Liquidity							−0.345**	−0.357**	−0.347**	−0.367**
							(0.052)	(0.047)	(0.049)	(0.040)
Intercept	3.500***	2.890***	3.060***	2.956***	3.270***	3.468***	1.854**	1.898**	1.797**	1.811***
	(0.012)	(0.063)	(0.084)	(0.058)	(0.083)	(0.075)	(0.217)	(0.237)	(0.207)	(0.157)
Observations	5096	5096	5096	5096	5096	5096	5096	5096	5096	5096
R-squared	0.018	0.094	0.111	0.114	0.119	0.131	0.140	0.134	0.134	0.137
Clustered sandwich estimator (Industry)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Location and Industry fixed effects	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p value<0.01, ** p value<0.05, and * p value<0.01. Standard errors are in parentheses. We use time- location-, and industry-clustering

Table 8 Predicted Bank Lending Spreads based on robustness metrics of Owner Guarantees and Pre-lending Credit Score and Post-lending Default. Panel A. Based on *Owner Guarantees Coverage*. Columns I to IV display the average differences (T-test) in *Predicted Bank Lending Spreads* on (the median of) *Owner Guarantees Coverage*, the *Pre-lending High Credit Scores*, *Pre-lending Low Credit Scores,* and *Post-lending Default*, respectively. Column V displays the average differences in *Predicted Bank Lending Spreads* on firms rated as high credit scores based on the median coverage ratio of owner guarantees (equal or above the coverage ratio median versus below the median). Column VI displays the average differences in firms rated as having low credit scores based on the median coverage ratio of owner guarantees. Column VII displays the average differences in firms that entered default based on the median coverage ratio of owner guarantees. *Predicted Bank Lending Spreads* are obtained from the estimations reported in Table 6. Columns I to IV in this panel are those predicted from estimations displayed in Table 6, Column III; those in Columns V, VI, and VII are the predicted lending spread from estimations displayed in Table 6, Columns IV.1, IV.2, and IV.3., respectively. The average of the predicted bank lending spread in the baseline estimations is 3.315 with a standard deviation of 0.499. Table 1 details the definitions and measurements for all variables. Panel B Based on *Owner Bargaining Power*. Columns I to IV display the average differences (T-test) in *Predicted Bank Lending Spreads* on *Owner Guarantees Power*, the *Pre-lending High Credit Scores*, *Pre-lending Low Credit Scores,* and *Post-lending Default*, respectively. Column V (Column VI) displays the average differences in *Predicted Bank Lending Spreads* on firms rated as high (low) credit scores based on owner bargaining power. Column VII displays the average differences in firms that entered default based on owner bargaining power. *Predicted Bank Lending Spreads* are obtained from the estimations reported in Table 7. Columns I to IV in this panel are those predicted from estimations displayed in Table 7, Column III; those in Columns V, VI, and VII are the predicted lending spread from estimations displayed in Table 7, Columns IV.1, IV.2, and IV.3., respectively. The average of the predicted bank lending spread in the baseline estimations is 3.315 with a standard deviation of 0.490. Table 1 details the definitions and measurements for all variables

	Column I			Column II		
	Owner Guarantees Coverage ≥ Median	*Owner Guarantees Coverage* < Median	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
	I.1	I.2	I.3	II.1	II.2	II.3
Observations	2657	2439		2296	2800	
Average Bank Lending Spread	3.132	3.515	−0.383***	3.129	3.467	−0.339***
Standard Deviation	0.466	0.455		0.445	0.489	
	Column III			Column IV		
	Low Credit Score = 1	*Low Credit Score* = 0	Difference III.1-III.2 (t-test)	*Default* = 1	*Default* = 0	Difference IV.1-IV.2 (t-test)
	III.1	III.2	III.3	IV.1	IV.2	IV.3
Observations	563	4533		1351	3745	
Average Bank Lending Spread	3.760	3.260	+0.500***	3.479	3.256	+0.223***
Standard Deviation	0.474	0.473		0.488	0.489	

Table 8 (continued)

	Column I			Column II		
	Owner Guarantees Coverage ≥ Median	*Owner Guarantees Coverage* < Median	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
	Column V			Column VI		
	Owner Guarantees Coverage ≥ Median | *High Credit Score* = 1	*Owner Guarantees Coverage* < Median | *High Credit Score* = 1	Difference V.1-V.2 (t-test)	*Owner Guarantees Coverage* ≥ Median | *Low Credit Score* = 1	*Owner Guarantees Coverage* > Median | *Low Credit Score* = 1	Difference VI.1-VI.2 (t-test)
	V.1	V.2	V.4	VI.1	VI.2	VI.4
Observations	1181	1115		368	195	
Average Bank Lending Spread	2.893	3.378	−0.485***	3.802	3.679	+0.123***
Standard Deviation	0.411	0.397		0.426	0.417	
	Column VII					
	Owner Guarantees Coverage ≥ Median | *Default* = 1	*Owner Guarantees Coverage* < Median | *Default* = 1	Difference VII.1-VII.2 (t-test)			
	VII.1	VII.2	VII.4			
Observations	630	721				
Average Bank Lending Spread	3.402	3.546	−0.144***			
Standard Deviation	0.455	0.410				
	Column I			*Column II*		
	Owner Bargaining Power = 1	*Owner Bargaining Power* = 0	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
	I.1	I.2	I.3	II.1	II.2	II.3
Observations	2656	2440		2296	2800	

Table 8 (continued)

	Column I			Column II		
	Owner Guarantees Coverage ≥ Median	*Owner Guarantees Coverage* < Median	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
Average Bank Lending Spread	3.145	3.499	−0.354***	3.129	3.467	−0.338***
Standard Deviation	0.465	0.448		0.436	0.480	
	Column III			Column IV		
	Low Credit Score = 1	*Low Credit Score* = 0	Difference III.1-III.2 (t-test)	*Default* = 1	*Default* = 0	Difference IV.1-IV.2 (t-test)
	III.1	III.2	III.3	IV.1	IV.2	IV.3
Observations	563	4533		1351	3745	
Average Bank Lending Spread	3.760	3.260	+0.500***	3.479	3.256	+0.223***
Standard Deviation	0.462	0.471		0.477	0.489	
	Column V			Column VI		
	Owner Bargaining Power = 1 | *High Credit Score* = 1	*Owner Bargaining Power* = 0 | *High Credit Score* = 1	Difference V.1-V.2 (t-test)	*Owner Bargaining Power* = 1 | *Low Credit Score* = 1	*Owner Bargaining Power* = 0 | *Low Credit Score* = 1	Difference VI.1-VI.2 (t-test)
	V.1	V.2	V.3	VI.1	VI.2	VI.3
Observations	1181	1115		368	195	
Average Bank Lending Spread	2.907	3.363	−0.456***	3.805	3.674	+0.131***
Standard Deviation	0.410	0.388		0.426	0.411	
	Column VII					
	Owner Bargaining Power = 1 | Default = 1	*Owner Bargaining Power* = 0 | Default = 1	Difference VII.1-VII.2 (t-test)			

Table 8 (continued)

	Column I			Column II		
	Owner Guarantees Coverage ≥ Median	*Owner Guarantees Coverage* < Median	Difference I.1-I.2 (t-test)	*High Credit Score* = 1	*High Credit Score* = 0	Difference II.1-II.2 (t-test)
	VII.1	VII.2	VII.3			
Observations	632	719				
Average Bank Lending Spread	3.413	3.537	−0.124***			
Standard Deviation	0.455	0.405				

*** p value<0.01, ** p value<0.05, and * p value<0.01

with those reported in Table 4. *Owner Guarantees Coverage* as well as *Owner Bargaining Power* and *High Credit Score* firms and their interactions show negative coefficients that indicate a reduction in *Bank Lending Spreads* in line with the pre-lending information theory and thus align with H1a and H2a. There is a positive association between *Bank Lending Spreads* and *Owner Guarantees Coverage* (as well as *Owner Bargaining Power*) for firms with a *Low Credit Score*, and thus align with H2b. Lastly, owner guarantees reduce lending spreads for firms that defaulted after the loan approval and thus align with H3a. For the remaining variables, the results remain unaltered. The predicted spreads from the estimations reported in Tables 6 and 7 are reported in Table 8 and are in line with those reported in Table 5. These robustness tests add strength to our baseline examination of the influence of owner guarantees, *Pre-lending Credit Scores*, and *Post-lending Default*, and their interactions on *Bank Lending Spreads*. The findings from these robustness tests are also fully in line with the baseline findings.

5 Discussion

We have examined the association between owner guarantees (including their coverage and the owners' bargaining power) and lending spreads for small firms by considering the complex effect of firm risk in the forms of observed credit scores and unobserved default rates on this relationship. Using loan contract data from a major European bank, which is not accessible through public sources, our analysis considers new loan contracts granted to small firms during the crisis (1Q2007 to 4Q2010). The findings reported in the previous section indicate the concurrent relevance of the pre-lending information theory and post-lending incentive theory. However, the pre-lending information theory predominates in explaining the influence of owner guarantees and their combination with observed and unobserved risks on bank lending spreads.

Building on sequential estimations, our baseline findings show a consistent overall negative relationship between owner guarantees and bank lending spreads. Our findings indicate that the bank reduces the lending spreads to owners willing to pledge their guarantees. This evidence aligns with the pre-lending information theory (Bester 1985, 1987) and with the scarce prior evidence on the role of business collateral (Booth and Booth 2006; Cerqueiro et al. 2016; Degryse and Van Cayseele 2000; Lehmann and Neuberger 2001) and owner guarantees (Pozzolo 2004) in mitigating pre-lending information problems. Through the analyses of the interactions and their constitutive terms, we have shown that owner guarantees have a persistent effect in reducing bank lending spreads for safer firms. This finding also in line with the pre-lending information theory (Bester 1985, 1987) and offers a novel perspective on the signaling role of owner guarantees. Safer firms, with high credit scores, use owner guarantees as a signal and, thus, trade them for a reduction in lending spreads. This signaling mechanism certifies the accumulated (imperfect) information possessed by banks to mitigate adverse selection.

Noteworthy in our findings is the empirical evidence on the interplay of owner guarantees in the context of unobserved firm risk, as measured by the post-lending default, and lending spreads. We find evidence that guarantees reduce lending spreads for firms that defaulted after the loan approval, which is contrary to the post-lending incentive theory while aligning with the signaling value of owner guarantees advocated by the pre-lending information theory. Our results reinforce the signaling role of guarantees under the premise that rational firms will only pledge owner guarantees, given their huge personal and social

costs, if they believe in the ability to repay the loan regardless of the future positive prospects of the firms. Within the scope of business collateral, Jiménez et al. (2006) has also lent credence to the concept of collateralization as a mechanism to reduce information.[13] Our findings on owner guarantees align with their understanding of the use of collateral to alleviate information problems, while also elucidating on the previously unaddressed joint effect of owner guarantees and observed and unobserved risk on loan spreads.

In addition, we also find evidence that for firms with low credit scores, banks demand owner guarantees and higher lending spreads as complementary tools to mitigate incentive problems. This approach is advocated by the post-lending incentive theory (Boot and Thakor 1994; Boot et al. 1991) and aligns with the evidence on the positive relation between observed risk and both business collateral (Berger et al. 2011b; Ivashina 2009; Jiménez et al. 2006) and loan rates (Ivashina 2009). Thus, despite the overall association of guarantees on lending spreads appearing negative, a contrasting positive effect emerges in scenarios involving high risk firms which increases the vulnerability of banks to higher incentive-related losses. Paradoxically, loans that are secured by owner guarantees that default after inception benefit from reduced lending spreads. This evidence challenges the conventional wisdom regarding the informational opacity of small firms and shows that banks struggle to distinguish effectively between low- and high-risk firms. The potential consequences of such misjudgments in risk management underscore the need for heightened attention from both practitioners and regulators.

Our findings on the co-existence of the pre-lending information theory and the post-lending incentive theory in explaining the use of owner guarantees are in line with the evidence on the relationship between business collateral and bank lending spreads (Berger et al. 2011a, 2016). The predominance of the pre-lending theory is however at odds with the previous findings on business collateral where the post-lending theory predominated. Our findings advance our knowledge by pointing to the relevant role of owner guarantees in reducing information problems and business collateral in reducing incentive problems.

The evidence we provide is based on empirical observations of new loan contract terms from a single bank. Our study focuses on a large European bank and provides insights into the factors influencing lending spreads across the continent. Our bank mimics wider industry practices regarding the small firm segment. Banks in Europe have adopted the Basel Capital Accords concerning lending to small firms based on the internal ratings approach. If large, as is the case with our bank, it also falls within the single supervisory mechanism concerning its procedures including early warning signals stemming from the loan portfolios of small firms. While the regulatory and supervisory oversights ensure the similarity of practices for the small firm segment across large European banks, there may still be some nuances stemming from different operational models of banks to which future research endeavors can dedicate their attention.

In addition, unlike the US, Europe possesses a notably bank-centric financial system. Firms depend heavily on bank loans owing to the underdevelopment of the capital markets as notably only 2% of small firms in Europe pointed to debt securities as a relevant source of finance (ECB 2021). Additionally, in comparison to the US, there is minimal separation between ownership and management in European firms (Krivogorsky 2011), making owner guarantees particularly important for European small firms and banks. Together,

[13] They find a negative relationship between post-lending default and the probability of pledging business collateral; but once secured, borrowers defaulting post-lending secure a larger portion of loans with collateral.

these characteristics suggest that albeit not universal, our setting and findings reflect a wider phenomenon associated with bank lending to small firms in Europe. Nonetheless, future research endeavors over a wider spectrum of banks and financial would be most welcome.

The literature points to the critical role of owner guarantees for smaller firms. This role contrasts sharply with larger firms that possess tangible assets, and ownership is clearly separated from management (Ono and Uesugi 2009). Nevertheless, future research endeavors in the examination of owner guarantees on bank lending spreads could also consider the effect of size across a wider array of banks and financial systems. Depending on data availability, future studies could also consider owner characteristics alongside firm characteristics to detect idiosyncrasies in the use of owner guarantees.

6 Conclusions

Bank loans are an indispensable source of financing for small firms in many countries. Despite their importance, not much is known about the structure of bank loan contracts. Bank loans are mostly contracted over the counter; this makes data on these contracts largely inaccessible.

Bank loans granted to small opaque firms suffer from relevant adverse selection (Bester 1985, 1987) and incentive problems (Boot and Thakor 1994; Holmström and Tirole 1997) that may lead to credit rationing (Jaffee and Russell 1976; Stiglitz and Weiss 1981) and lemons-type of discouragement (Akerlof 1970). Mechanisms that reduce these problems can smooth lending by banks and reduce the cost of funding for firms that ultimately promote innovation and investment (Lee et al. 2015). Banks frequently respond to information and incentive problems by using hard credit scores (Altman 1980; Berger et al. 2005; Berger and Frame 2007; Frame et al. 2001; Ivashina 2009; Nakamura and Roszbach 2018), soft bank-firm relationships (Blackwell and Winters 1997; Casu et al. 2022; Degryse and Ongena 2005; Degryse and Van Cayseele 2000; Lehmann and Neuberger 2001; Petersen and Rajan 1994), or business collateral (Berger et al. 2011a, 2016) to guide their lending decisions. However, many young and innovative firms neither possess long enough credit histories or bank-firm relationships on which banks can rely on to guide lending decisions nor the collateral to provide secure lending.

Many small firms resort to providing guarantees with simple blanket liens that have far-reaching implications for owners and society. We build our research by using unique data on over-the-counter bank loans contracted by small firms to ascertain the extent to which the relation between owner guarantees is explained by the pre-lending information theory or by the post-lending incentive theory, or by both. To answer the above research question, we relate owner guarantees (their coverage and owners' bargaining power), observed (pre-lending credit scores), and unobserved (default) risks and their interactions with bank lending spreads while controlling for loan terms; bank-firm relationships; bank features; and time, location, and industry fixed effects. We test our model on bank lending spreads with sequential estimations using an OLS with a clustering correction for the industry in which the firm operates. We also estimate the predicted loan spreads to complement our regression analysis. Our baseline findings show a negative relation that is consistent and statistically significant among owner guarantees, high credit scores (safe firms), and bank lending spreads. Through the analyses of the interactions and their constitutive terms, we show that owner guarantees exert a significant influence in lowering bank lending spreads for safe

firms. This effect (aligned with the signaling value of collateralization theorized by Bester 1985) is particularly noticeable for firms with high credit scores and for those that do not default (safe firms), but also for firms that default after the loan's inception (unobserved risky firms). However, our analyses of the interactions between owner guarantees and low credit score firms (risky firms) also show evidence of a positive relation between owner guarantees and bank lending spreads. These findings indicate that both the information and incentive theories explain the influence of owner guarantees on bank lending spreads but with the information theory predominating empirically. The findings on the co-existence of the theories in explaining the relation between owner guarantees and bank lending spreads are in line with previous findings on the effectiveness of both theories in explaining the influence of business collateral on bank lending spreads (Berger et al. 2011a, 2016). The evidence of the predominance of the information theory is however at odds with previous findings on business collateral where the incentive theory predominates. Our findings point to the relevant role of owner guarantees in reducing information problems that therefore ameliorate bank lending spreads in the context of relational banking.

These findings complement the very limited ones on the relevant role of owner guarantees in reducing spreads (Pozzolo 2004), in limiting non-repayment (Bhimani et al. 2014), and extending maturities (Duarte et al. 2020) in bank lending to small firms. The inroads charted by this research can be extended further to uncover the effect of owner guarantees on credit rationing and the well-known under- and over-investment problems to name a few. These extensions are likely to be more relevant and critical in contexts predominated by the owner or family-managed firms (Voordeckers and Steijvers 2006) that must rely extensively on bank lending (Krivogorsky 2011) and less relevant in contexts predominated by large firms with clear separation of ownership and management that can tap into capital markets for their financing (Ono and Uesugi 2009).

Our fresh findings highlight the critical role played by owner guarantees in allaying information problems between banks and firms in loan contracting. Reductions in information asymmetries in bank lending have the potential to improve loan terms, in particular lending rates to small firms. But there is a caveat. On the one hand, owner guarantees have the potential to facilitate access to bank lending and improve loan terms, in particular lending rates, repayment terms, and maturities. On the other hand, such guarantees keep the downside risk of banks that requires owners to provide additional equity in case of distress (default or bankruptcy). To the best of our knowledge, these equity commitments remain largely unaccounted for by policymakers despite their far-reaching implications for owners who may have to declare personal bankruptcy if unable to provide additional equity to save their firms and generate significant social costs. The potential consequences of these equity commitments deserve further attention from academics, practitioners, and importantly, policymakers as also highlighted in the literature (Bhimani et al. 2014).

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Declarations

Authors and institutions are listed in alphabetical order. The authors have contributed equally to this research. The views expressed in this paper are those of the authors and do not necessarily represent the views of the institutions with which they are affiliated.

Conflict of Interest None.

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