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## Credit risk, owner liability and bank loan maturities during the global financial crisis

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### Abstract

We relate credit risk and owners' personal guarantees to bank loan maturities during the global financial crisis. The findings, which remain robust to reverse causality, show that firms rated as low risk, with a strong relationship with the bank, whose owners provided personal guarantees and with large loan sizes obtained longer maturities. Banks with larger nonperforming loans provided loans with shorter maturities. Firms with low and high risk ratings that provided owners' personal guarantees obtained longer maturities. These findings shed additional light on the relationship between risk and loan maturities and the role of personal guarantees in reducing information asymmetries.

**Keywords:** Small firm financing; Financial crisis; Government policy and regulation; Banks

**JEL classification:** *D82; G01; G18; G20*

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## **Credit risk, owner liability and bank loan maturities during the global financial crisis**

### **1. INTRODUCTION**

The financing of small firms became a matter of policy interest during the global financial crisis (financial crisis) as the failure of these firms could trigger a wave of bankruptcies and unemployment, further endangering the recovery of ailing economies. There was particular interest in Europe as many countries rely on small firms to drive the economy that, in turn, relies on banks rather than their underdeveloped capital markets for lending (Niskanen and Niskanen, 2006; Krivogorsky, 2011).

At the time of the crisis, monetary authorities designed quantitative easing programs aimed at smoothing economic recovery, and financial authorities designed policies aimed at facilitating access to bank loans by small firms and reducing their failures rates. While policymakers, scholars and practitioners continue to take great interest in the effectiveness of these programs and policies, there is still insufficient knowledge about how bank loan maturities that were not part of any specific policy were determined during the financial crisis (ECB, 2010).

A number of studies show that loan maturities matter to both firms and banks. For firms, shorter maturities restrict long-term capital expenditures (González, 2015) and increase tension due to regular renegotiating to roll over the loans and their terms (Bartoli et al., 2013). For banks, (shorter) loan maturities facilitate and increase the efficiency of monitoring (Berlin and Mester, 1992) and reduce the minimum capital required by regulators and supervisors (Kirschenmann and Norden, 2012).

The determination of bank loan maturities in theory is addressed within the context of credit rationing with imperfect information (Stiglitz and Weiss, 1981). Loan markets may be rationed as banks may consider not only the terms of the contract, such as maturities and riskiness of

firms, but also how the loan terms might subsequently affect adverse selection and moral hazard. Studies in this vein predict loan maturities as being either a monotonic upward sloping function of risk in which low credit risk firms will have shorter maturities and high credit risk firms will have longer maturities (Flannery, 1986), or a nonmonotonic function of risk in which both low and high-risk firms will have shorter maturities (Diamond, 1991). The empirical literature that tests the relation between credit risk and loan maturities shows mixed findings however. In the United States (U.S.), Scherr and Hulburt (2001)<sup>1</sup> and Berger et al. (2005)<sup>2</sup> find a positive relation between credit risk and loan maturities, but Ortiz-Molina and Penas (2008)<sup>3</sup> find they have a negative relation. These differing findings may be linked to the fact that the original theories that relate credit risk to loan maturities were developed for market debt and not bank loans; alternatively, the survey data used in Scherr and Hulburt (2001, Berger et al. (2005) and Ortiz-Molina and Penas (2008), for example, are average responses of firms. In Europe, Magri (2010) and Kirschenmann and Norden (2012) find a more consistent negative relation between credit risk and loan maturities in Italy (1993-2000) where the enforceability of contracts is poor; and Germany (2005) where firms have high bargaining power.<sup>4</sup> The distinct findings for the U.S. and Europe may be explained by their institutional contexts, more specifically, the market emphasis in the U.S. vs. bank emphasis in Europe.

None of the studies in the U.S. and Europe look at bank loan maturities during the global financial crisis, which is widely acknowledged as a unique laboratorial context to test finance theories (Abreu and Gulamhussen, 2013) and inform post-crisis reforms (Clare et al., 2016). We aim to fill this gap with this paper. Studying the crisis context is particularly interesting. For example, the original theories predict that low credit risk firms would prefer shorter

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<sup>1</sup> In the data provided by the 1987 and 1993 National of Survey of Small Business Finance (NSSBF).

<sup>2</sup> In the data provided by the Federal Reserve's 1997 survey of bank lending terms.

<sup>3</sup> In the data provided by the 1993 National of Survey of Small Business Finance (NSSBF).

<sup>4</sup> In one related line of inquiry, firm governance may also determine corporate debt maturity (Li and Zhang, 2019). In another related line of inquiry, short-term debt may lead to lower stock price crashes (Dang et al., 2018).

maturities as they would have no concerns about interest rate or liquidity changes in order to roll over their loans. But the crisis context involved significant uncertainties regarding interest rate policy and the supply of bank loans. How firms responded to these uncertainties has not yet been addressed in the literature.

During the financial crisis, many banks in Europe required owners of small firms to pledge personal guarantees to access loans and set terms (Bhimani et al., 2014; Duarte et al., 2018)<sup>5</sup>. Unlike business collateral where firms' owners are liable up to the amount of collateral that they post, personal guarantees amplify the owners' liability to an unlimited extent. Business collateral limits the owners' downside risk and incentivizes shirking and risk-shifting. Personal guarantees do not limit owners' downside risk. Personal guarantees provided by owners commit them to plowing additional equity into their firms in the case of distress. Such commitments reduce information asymmetries (Flannery, 1986; Diamond, 1991), signal creditworthiness (Hölmstrom and Tirole, 1997) and incentivize effort and prudence (Bester, 1985). These guarantees were widely used by banks in Europe, largely facilitated by the following: heavy dependence of small firms on intermediation for their financing requirements rather than mediation through capital markets that inhibits the substitution of bank debt by market debt or equity; judicial systems that involve significant transactions costs for firms to pledge business assets as guarantees to banks; legal limitations in the repossession of business assets; and markets that do not clear second-hand business assets easily (Krivogorsky, 2011). However, researchers have not given sufficient attention to this issue<sup>6</sup>.

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<sup>5</sup> Bhimani et al., (2014) and Duarte et al. (2018) study the role of owners' personal guarantees in predicting defaults in bank loans to small firms during stable and unstable economic situations.

<sup>6</sup> Notable exceptions include studies by Voordeckers and Steijvers (2006, Belgium) and Ortiz-Molina and Penas (2008, U.S.). Both distinguish the roles of business collateral and owners' personal guarantees in small firm financing. Voordeckers and Steijvers (2006, Belgium) focus on the factors that determine the use of business collateral and owners' personal guarantees. Ortiz-Molina and Penas (2008) focus in particular on the roles of collateral and guarantees in the determination of loan maturities of small firms in the U.S. The authors use survey data to first estimate a model with both business collateral and personal guarantees in which the latter is not significant, and then estimate models for business collateral and personal guarantees separately.

In this paper, we first develop and test hypotheses that link bank loan maturities to firm and bank characteristics, contract terms, and macroeconomic economic conditions. For hard information, we relate the credit ratings of firms to loan maturities with the aim of assessing whether banks use longer maturities for low risk firms and shorter maturities for high risk firms. For soft information, we relate the bank-firm relationship to maturities of loans with the aim of assessing whether banks use longer maturities for firms about which they are better informed. For contract terms, we relate owners' personal guarantee to loan maturities of loans with the aim of assessing whether this commitment increases loan maturity; and loan size to loan maturities with the aim of assessing whether larger loans have longer maturities. For the balance sheet quality of the lending bank, we relate nonperforming loans to maturities with the aim of assessing whether impaired loans on the balance sheet of banks condition the maturities of new loans. Lastly, but equally important, we relate the volatility of macroeconomic conditions to maturities with the aim of assessing the influence of the financial crisis on loan maturities.

We then develop and test hypotheses that relate bank loan maturities to the interaction of credit risk and their owners' personal guarantee with the aim of assessing whether these guarantees lead to longer/shorter maturities for low/high risk firms. Owners' personal guarantees may feature in bank loan contracts for distinct reasons: low risk firms may voluntarily pledge such guarantees to reduce information asymmetries (Flannery, 1986; Diamond, 1991) and to signal their creditworthiness (Holmstrom and Tirole, 1997); or banks may force high-risk firms to pledge these guarantees to reduce information asymmetries (Flannery, 1986; Diamond, 1991) and mitigate adverse selection and moral hazard (Bester, 1985).

We address the setting of our study in Section 2. In Section 3, we develop the hypotheses. In Section 4, we describe the data and discuss the method; and in Sections 5 and 6, we report

the findings and robustness tests. We summarize, conclude and draw policy implications in Section 7.

## **2. THE UNIQUENESS OF OUR CONTEXT**

The importance of financial systems and their institutional traditions have been identified as relevant in the design of debt maturity structures (Antoniou et al., 2006). The determination of bank loan maturities in Portugal acquired regulatory significance with the adoption of Basel Capital Accords and policy relevance with the adoption of unconventional monetary measures during the financial crisis.

### **2.1. Bank infrastructure**

Banks play an important role in the country, with the four largest banks dominating over ninety percent of the domestic market. Capital markets are less developed due to the lack of separation of ownership and control. These two features inhibit firms from easily substituting bank financing by issuing bonds or equity in capital markets. The networks of bank branches were established through a series of mergers and acquisitions in the 1980s and 1990s. The bank infrastructure was hit by the financial crisis, which ultimately resulted in the stringent design of contract terms including loan maturities for small firms in particular.

In the past, banks dealt with extreme information asymmetries by relying extensively on soft information; securing the personal guarantee of owners comprised of deposits, bonds, equities, funds and property; and /or granting loans with shorter maturities to prevent shirking, risk-shifting and deliberate distress through forced renegotiation of contract terms. With the adoption of the Basel Capital Accords and the institution of the central credit registry that is accessible to all financial intermediaries, banks started relying fundamentally on internal risk ratings to guide credit decisions which we are able to consider in our study. Despite the

increasing sophistication in credit risk technology, banks continue to rely on owners' personal guarantee which functions as a commitment to provide fresh equity in case of distress, and on shorter maturities as a covenant to maintain flexibility and efficiency in financial contracting via frequent renegotiation.

## **2.2. Global Financial crisis**

The global financial crisis of 2008-10 is now considered to be the worst and most serious in the history of Portugal<sup>7</sup>. During the financial crisis, monetary authorities designed programs with the aim of facilitating economic recovery, and financial authorities designed policies with the aim of facilitating access to finance by small firms and reducing their failure rates. Despite the massive efforts, the crisis inevitably unsettled the bank lending to the economy, particularly to small firms, further debilitating economic growth and employment in the country. In recent years, several studies have started assessing the effectiveness of these programs and policies from the perspectives of changes in lending, pricing, and defaults (Duarte et al., 2018). Bank loan maturities that were not part of any specific program or policy have not yet received any attention. Loan maturities are particularly relevant for the small firms studied herein as they not only provide relevant information on the nature of projects implemented by these firms, but also indicate whether these firms were able to reduce the risk of refinancing during a period that was exposed to extreme macroeconomic volatility.

## **3. HYPOTHESES**

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<sup>7</sup> The subsequent sovereign debt crisis that hit the country in March 2011 culminated in its bailout through a multilateral assistance program underwritten by the International Monetary Fund (IMF), European Central Bank (ECB) and the European Commission (EC) in May 2011 (Thomsen and Martin, 2011). From 2012 onwards, within the envelope foreseen in this multilateral assistance program, several banks were not only bailed out but also able to obtain funding from the central bank by posting sovereign debt as collateral.



Banks' role in modern economies includes processing information on depositors and borrowers so as to facilitate intermediation between them. This is critically important in the case of small firms as details on their agreements with suppliers and clients is not publicly available, and opinion on their going concern from chartered auditors is not required (Krivogorsky, 2011). Banks deploy credit risk technologies driven by regulations to determine risk ratings based on hard information such as the financial statements these firms have to file for tax purposes to determine loan maturities (Siddiqi, 2006). In stable economic settings, low risk firms are likely to prefer shorter maturities as they would not foresee problems with loan renegotiation (Flannery 1986; Diamond, 1991); high risk firms are likely to prefer longer maturities as they would foresee problems with loan renegotiation (Flannery 1986). In unstable economic settings, both low and high -risk firms are likely to prefer longer maturities to avoid rollover uncertainties related to interest rate policy (Flannery 1986)<sup>8</sup> and supply of bank loans (Diamond, 1991). Banks are likely to set shorter loan maturities, particularly for high risk firms, to facilitate and increase the efficiency of their monitoring (Berlin and Mester, 1992) and to reduce the capital required by regulators and supervisors (Kirschenmann and Norden, 2012). In light of the multitude of predictions, we expect low risk firms to prefer longer maturities to reduce uncertainties related to rolling over their debts, and high -risk firms to obtain shorter maturities from their banks with the aim of facilitating their monitoring and providing flexibility in renegotiation. *H1: There is a positive (negative) relation between low (high) credit risk and bank loan maturities.*

The repeated interaction with firms provides banks with valuable information on deposits, withdrawals, provision of payment services, interest and exchange risk management, credit commitments, and repayment history on previous loans. Frequent interactions with small firms lead to the build-up of relationships that help banks reduce information asymmetries and

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<sup>8</sup> Diamond (1991) does not foresee longer maturities for high risk firms.

mitigate adverse selection and moral hazard (Bartoli et al., 2013; Gama and van Auken, 2015). Banks are therefore likely to offer longer maturities to firms with which they have strong relationships and shorter maturities to firms with which they have weak relationships, as the latter may require more intense monitoring than can be achieved through frequent renegotiation (Berlin and Mester, 1992). *H2: There is a positive (negative) relation between strong (weak) bank-firm relationships and bank loan maturities.*

Banks can attenuate information asymmetries by requiring that riskier firms renegotiate loan terms over regular short maturities. Alternatively, they can force some firms to pledge their owners' personal guarantees. Banks consider these guarantees desirable as they commit owners to plowing in additional equity in the case of distress (Bhimani et al., 2014; Duarte et al., 2018). *H3: There is a positive relation between owners' personal guarantees and bank loan maturities.*

Loan size reflects the additional complexity of projects implemented by borrowing firms (Derban et al., 2005). Many banks resort to computer algorithms to make decisions on small loans. Information on loans involving smaller amounts is likely to be limited and its quality also less reliable. Bank may thus not have the formal means to acquire information on these loans, much less impose direct covenants. Shorter maturities may function as indirect covenants. Decisions on large loans are made by branch or head office managers. Information on loans involving larger amounts is likely to be detailed and its quality also more reliable and cross-checkable through alternative sources. Banks may thus have formal means to impose covenants on these loans and extend the length of maturities of these loans. *H4: There is a positive relation between the loan size and bank loan maturities.*

The asset quality of the lending banks determines not only the availability of bank loans but also their contract terms. Banks that possess better quality assets on their balance sheets are more likely to lend to small firms and to have the flexibility to negotiate the contract terms

particularly during periods of financial crisis (Kapan and Minoiu, 2013). The quality of loan portfolios held by banks on their balance sheets, notably the prior (non)performance of loans in bank portfolios, is likely to determine their preference for shorter or longer maturities. Banks with larger portfolios of nonperforming loans are likely to prefer shorter maturities than longer maturities as it gives them flexibility to renegotiate the terms of the contract. *H5: There is a negative relation between nonperforming loans of banks and bank loan maturities.*

Theories that explain the design of contract terms by banks were originally conceptualized in the context of stable economic environments; however, during crisis situations, banks need to factor in the volatility of the macroeconomic environment which can have both higher upside potential and higher downside risk (Casson, 2005). The higher upside potential arises from the prospect that the expansion of the economic environment will unlock economic growth. The higher downside risk arises from the risk that a contraction of the economy will impact smaller firms adversely and force them into distress. In volatile macroeconomic situations, banks are likely to prefer shorter maturities to facilitate their monitoring via frequent renegotiation. *H6: There is a negative relation between the volatility of macroeconomic conditions and bank loan maturities.*

The attenuation of information asymmetries discussed above through owners' personal guarantees may take different routes depending on the credit risk of firms. On one hand, in the "firm selection channel", low risk firms may willingly pledge such guarantees to reduce information asymmetries (Flannery, 1986; Diamond, 1991) and signal their commitment (Bester, 1985). On the other hand, in the "bank selection channel", high risk firms may be forced by banks to pledge such guarantees to reduce information asymmetries (Flannery, 1986; Diamond, 1991) and mitigate future losses from moral hazard (Holmstrom and Tirole, 1997). *H7: There is a positive relation between the interactive influence of low/high risk and owners' personal guarantees and bank loan maturities.*

## 4. DATA AND METHOD

### 4.1. Data

We use confidential loan data granted to small firms (as defined by the European Commission (EC), 2003), henceforth firms, between 1Q2008 and 4Q2010 by one of the largest retail banks operating in Portugal. The bank provided firms' data on credit risk computed from their internal rating model developed for compliance with the Basel Capital Accords, the relationship of the firms with the bank, owners' personal guarantees, loan size, the percentage of nonperforming loans to total assets of the bank and maturities of all bank loans granted to small firms. We compiled data on the gross domestic product (GDP) from 2008 to 2010 from the Eurostat<sup>9</sup> to compute the volatility of this indicator. Recent research uses similar data to address a different research question (Duarte et al., 2018).

\*\*\* INSERT TABLE 1 HERE \*\*\*

We summarize our data in Table 1. The average maturity of loans in our sample is 31 months. In terms of internal ratings, 48% of firms are low-risk, 23% are intermediate-risk and 29% are high-risk. The firm-bank relationship is measured as the ratio of the amount of the loan contracted with the bank to the total amount of the loans contracted with all banks in the country and equals 35%; the higher the ratio, the stronger the firm-bank relationship. Loans with a personal guarantee provided by owners represent 55%. The average size of loans is 106 thousand euros. The bank has 2.8% in nonperforming loans. The volatility of the GDP computed as the standard deviation of GDP over the period of analysis is 3.3%. We report the correlations of our variables in Table 2. As can be observed from the table, the correlations do not indicate linear dependence in our variables to the point of causing any bias in the multivariate estimations.

\*\*\* INSERT TABLE 2 HERE \*\*\*

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<sup>9</sup> Eurostat: macroeconomic data retrieved from <http://ec.europa.eu/eurostat/web/products-datasets/-tec00023/>.

## 4.2. Method

We relate bank loan maturities to firms' credit risk, bank-firm relationship, owners' personal guarantee, loan size, bank's nonperforming loans, and the volatility of the macroeconomic conditions. We control the estimation of these relations by including fixed effects for time, industry and geographic locations.

We measure our dependent variable as  $\ln(\text{maturity}+1)$  in the baseline estimations and as number of months in robustness tests. Given the continuous nature of the dependent variables, and the objectives to test the sign and statistical significance of the relations between independent and dependent variables, we estimate this relation with the ordinary least squares (OLS) regressions with robust standard errors. Bank loan maturities can be determined simultaneously with other loan contract terms. If this is the case, then the coefficients determined through OLS may prove to be biased via the correlation of owners' personal guarantees and the error terms. To correct the simultaneous determination of bank loan maturities and owners' personal guarantees, we first estimate separate OLS regressions for firm features, loan terms, bank features and macroeconomic conditions. Next, we estimate two-stage least squares regressions (2-SLS) where the owners' personal guarantees are considered endogenous and instrumented with prior default, a variable that equals 1 if the owner defaulted previously and 0 otherwise (Bliter et al., 2005). We estimate first-stage regressions including prior default as the instrument. We compute Wu-Hausman (Hausman, 1978; Wu, 1974) and Durbin-Wu-Hausman (Durbin, 1957; Hausman, 1978; Wu, 1974) tests of the null hypothesis that owners' personal guarantees are not simultaneously determined with bank loan maturities. In addition, we compute the Cragg-Donald F-statistic (Cragg and Donald, 1993) of the first-stage regression to test the explanatory power of the instrumental variable i.e., to test if the

endogenous variable is significantly correlated with the instrumental variable<sup>10</sup>. We discuss the findings in the next section.

## 5. FINDINGS

We report the findings for the testing of hypotheses H1-6 in Table 3. In Column I of this Table, we report the findings for the OLS with the full set of variables. In Column II, we report the findings for the OLS grouping firm features (Column II.1) and loan terms that include personal guarantees (Column II.2) and loan terms that include size (Column II.3). In Column III, we report the findings for the first stage (Column III.1) and second stage (Column III.2) of the 2-SLS instrumented with prior default in Column III. In Column I, low risk, bank-firm relationship, personal guarantees and size are positively and significantly related to bank loan maturities at the 1% confidence level; and nonperforming loans are negatively and significantly related to bank loan maturities at the 5% confidence level. In Column II (1-3), the findings are identical to Column I. In Column III.1, the computed value of the Cragg-Donald F-statistic 21.07 is significant at the 1% confidence level and exceeds the critical value of 10 (Stock and Yogo, 2005). In Column III.2, the computed values of the Wu-Hausman and Durbin-Wu-Hausman statistics 375.61 and 343.36 are significant at the 1% confidence level leading us to rely on the second-stage regressions. Personal guarantees and size are positively and significantly related to bank loan maturities at the 1% confidence level. Nonperforming loans and volatility are negatively and significantly related to bank loan maturities at the 1% confidence level. Overall, our estimations based on the 2-SLS regressions do not reject H3, H4, H5 and H6.

\*\*\* INSERT TABLE 3 HERE \*\*\*

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<sup>10</sup> Stock and Yogo (2005) contend that the Cragg-Donald F-statistic should exceed 10 for inference based on the two-stage estimations being reliable. The Cragg-Donald F-statistic for all our first-stage regressions exceeds this critical value of 10.

We report the findings related to the testing of hypothesis H7, the interactive influence of internal risk ratings of banks and owners' personal guarantees, in Tables 4 (low risk) and 5 (high risk). In Table 4 Column I, we report the findings for the OLS. In Column II, we report the findings for 2-SLS instrumented with prior default. In Column II.1 and Column II.2, we report the first-stage regressions and the Cragg-Donald F-statistic. The computed value of this statistic in the range of 10.92-7.79 is significant at the 5% confidence level and exceeds the critical value of 10 (Stock and Yogo, 2005). In Column II.3, we report the findings for the second-stage regression and the Wu-Hausman and Durbin-Wu-Hausman statistics. The computed values of these statistics 184.99 and 338.85 are significant at the 1% confidence level leading us to rely on the estimates of the second-stage regression. Personal guarantees and size are again positively and significantly related to bank loan maturities at the 1% confidence level. Nonperforming loans and volatility are negatively and significantly related to bank loan maturities at the 5% confidence level. The interaction of low risk and personal guarantees is positively related to bank loan maturities at the 1% confidence level. Overall, our estimations based on the 2-SLS do not reject H7.

\*\*\* INSERT TABLE 4 HERE \*\*\*

In Table 5 Column I, we report the findings for the OLS. In Column II, we report the findings for the 2-SLS instrumented with prior default. In Column II.1 and Column II.2, we report the first-stage regressions and the Crag-Donald F-statistics. The computed values of these statistics in the range of 12.00-58.93 are significant at the 5% and 1% confidence levels and exceed the critical value of 10 (Stock and Yogo, 2005). In Column II.3, we report the Wu-Hausman and Durbin-Wu-Hausman statistics. The computed values of these statistics 185.60 and 339.86 are significant at the 1% confidence level, leading us to rely on the estimates of the second stage. Personal guarantees and size are positively and significantly related to bank loan maturities at the 1% confidence level. Nonperforming loans and volatility are negatively and significantly

related to bank loan maturities at the 1% confidence level. The interaction of high risk and personal guarantee is positively related to bank loan maturities at the 1% confidence level. Overall, our estimations based on the 2-SLS do not reject H7. The findings from Table 5 indicate that firms with a high credit risk obtained longer maturities when their owners provided personal guarantees.

\*\*\* INSERT TABLE 5 HERE \*\*\*

## **6. ROBUSTNESS OF FINDINGS**

In order to ensure the sensitivity of our findings to credit risk, we re-estimated the baseline model reported in Table 3 separately for low and high risk firms. We report the findings in Table 6, Columns I (low risk) and Column II (high risk). For low risk firms, we report the findings for the OLS with the full set of variables in Column I.1, and findings for the first-stage (Column I.2.1) and second-stage (Column I.2.2) of the 2-SLS instrumented with prior default in Column I.2. In Column I.2, the computed value of the Cragg-Donald F-statistic 2.63 is significant at the 10% confidence level. In Column I.2.1, the computed value of the Cragg-Donald F-statistic 2.63 is significant at the 10% confidence level. In Column I.2.2, the computed value of the Wu-Hausman and Durbin-Wu-Hausman statistics 67.20 and 65.35 are significant at the 1% confidence level, leading us to rely on the second-stage regressions. Personal guarantees and size are positively and significantly related to the maturities of bank loans at the 10% confidence level. Nonperforming loans and volatility are negatively related to bank loan maturities, although neither are statistically significant at a meaningful level. Overall, for low risk firms (H1), these estimations based on the 2-SLS regressions do not reject H3, H4, H5 and H6.

For high risk, we report the findings for the OLS with the full set of variables in Column II.1, and findings for the first stage (Column II.2.1) and second stage (Column II.2.2) of the 2-SLS instrumented with prior default in Column II.2. In Column II.2.1, the computed value of



the Cragg-Donald F-statistic 15.80 is significant at the 1% confidence level and exceeds the critical value of 10 (Stock and Yogo, 2005). In Column II.2.2, the computed value of the Wu-Hausman and Durbin-Wu-Hausman statistics 133.80 and 120.99 are significant at the 1% confidence level, leading us to rely on the estimates of the second stage. Personal guarantees and size are positively and significantly related to bank loan maturities at the 1% confidence level. Nonperforming loans and volatility are negatively related to bank loan maturities, although only the former is statistically significant at 10% confidence level. Overall, for high risk firms as well (H1), these estimations based on the 2-SLS regressions do not reject H3, H4, H5 and H6.

\*\*\* INSERT TABLE 6 HERE \*\*\*

To examine the sensitivity of our findings to the year in which the loans were granted, we re-estimated the baseline model reported in Table 3 by splitting the sample by years. In these estimations, nonperforming loans and volatility are dropped as these are year-invariant. We report the findings in Table 7, Column I for the OLS (I.1- 2008; I.2-2009, I.3-2010), and Column II for the 2-SLS instrumented with prior default. In Columns II.1.1, II.2.1 and II.3.1, the computed values of the Cragg-Donald F-statistic 6.27, 7.80, 5.71 are significant at the 5% and 1% confidence levels. In Columns II.1.2, II.2.2 and II.3.2, the computed values of the Wu-Hausman statistics 130.37, 103.16 and 143.57, and the Durbin-Wu-Hausman statistics 119.33, 96.85 and 130.12, are all significant at the 1% confidence level, leading us to rely on the estimates of the second stage. In all second-stage regressions, personal guarantees and size are positively and significantly related to bank loan maturities at least at the 1% and 5% (Column II.3.2) confidence levels. These estimations based on the 2-SLS regressions do not reject H3 and H4 (H5 and H6 are not tested due to their invariance over the year).

\*\*\* INSERT TABLE 7 HERE \*\*\*

To test the sensitivity of our findings to the regulatory pressure exerted on banks, we re-estimated the baseline model reported in Table 3 with the Core Tier I (common stock to risk-weighted assets) and Tier I (core capital to total assets) ratios<sup>11</sup>. We report the findings in Table 8, Column I (Core Tier I) and Column II (Tier I). For Core Tier I, we report the findings for the OLS with the full set of variables in Column I.1, and findings for the first stage (Column I.2.1) and second stage (Column I.2.2) of the 2-SLS instrumented with prior default in Column I.2. In Column I.2.1, the computed value of the Cragg-Donald F-statistic 21.07 is significant at the 1% confidence level and exceeds the critical value of 10 (Stock and Yogo, 2005). In Column I.2.2, the computed value of the Wu-Hausman and Durbin-Wu-Hausman statistics 375.61 and 343.36 are significant at the 1% confidence level, leading us to rely on the second-stage regressions. In the second-stage regressions, personal guarantees and size are positively and significantly related to bank loan maturities at the 1% confidence level. Core Tier I and volatility are negatively and significantly related to bank loan maturities at the 1% confidence level. Overall, these estimations based on the 2-SLS regressions do not reject H3, H4, and H6. For Tier I, we report the findings for the OLS with the full set of variables in Column II.1, and findings for the first stage (Column II.2.1) and second stage (Column II.2.2) of the 2-SLS instrumented with prior default in Column II. The findings are identical to those obtained for the variable Core Tier I, and overall, the estimations based on the 2-SLS regressions do not reject H3, H4, and H6.

\*\*\* INSERT TABLE 8 HERE \*\*\*

To test the sensitivity of our findings to the quantitative easing programs, we re-estimated the baseline model reported in Table 3 with the Euribor (6-month)<sup>12</sup> and the Eonia (1-day,

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<sup>11</sup> See also Abreu and Gulamhussen (2015), recently considered by Linnenluecke et al. (2017) to be an influential contribution.

<sup>12</sup> European Central Bank: Euribor retrieved from [https://www.ecb.europa.eu/stats/policy\\_and\\_exchange\\_rates/key\\_ecb\\_interest\\_rates/html/index.en.html](https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html).

overnight) indices<sup>13</sup>. We report the findings in Table 9, Column I (Euribor) and Column II (Eonia). For Euribor, we report the findings for the OLS with the full set of variables in Column I.1, and findings for the first stage (Column I.2.1) and second stage (Column I.2.2) of the 2-SLS instrumented with prior default in Column I.2. In Column I.2.1, the computed value of the Cragg-Donald F-statistic 21.38 is significant at the 1% confidence level and exceeds the critical value of 10 (Stock and Yogo, 2005). In Column I.2.2, the computed value of the Wu-Hausman and Durbin-Wu-Hausman statistics 376.56 and 344.16 are significant at the 1% confidence level, leading us to rely on the second-stage regressions. In the second-stage regressions, personal guarantees and size are positively and significantly related to the maturities of bank loans at the 1% confidence level. Bank-firm relationship and nonperforming loans are negatively and significantly related to bank loan maturities at the 5% and 10% confidence levels. Overall, these estimations based on the 2-SLS do not reject H2, H3 and H4. For Eonia, we report the findings for the OLS with the full set of variables in Column II.1, and findings for the first stage (Column II.2.1) and second stage (Column II.2.2) of the 2-SLS instrumented with prior default in Column II. These findings are identical to those obtained for the Euribor, and overall, the estimations do not reject H2, H3 and H4.

\*\*\* INSERT TABLE 9 HERE \*\*\*

In order to ensure the sensitivity of our findings to the sovereign debt crisis, we re-estimated the baseline model reported in Table 3 with sovereign spreads (difference in the yield-to-maturity of 10-year domestic government bonds and their identical bunds)<sup>14</sup>. We report the findings in Table 10, OLS with the full set of variables in Column I, and the findings for the first stage (Column II.1) and second stage (Column II.2) of the 2-SLS instrumented with prior

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<sup>13</sup> European Central Bank: Eonia retrieved from [http://sdw.ecb.europa.eu/quickview.do?series\\_key=198.eon.d.eonia\\_to.rate](http://sdw.ecb.europa.eu/quickview.do?series_key=198.eon.d.eonia_to.rate).

<sup>14</sup> European Central Bank: Yields retrieved from [http://sdw.ecb.europa.eu/quickview.do?series\\_key=198.eon.d.eonia\\_to.rate](http://sdw.ecb.europa.eu/quickview.do?series_key=198.eon.d.eonia_to.rate).

default in Column II. Focusing on Table 10, in Column II.1, the computed value of the Cragg-Donald F-statistic 21.07 is significant at the 1% confidence level and exceeds the critical value of 10 (Stock and Yogo, 2005). In Column II.2, the computed value of the Wu-Hausman and Durbin-Wu-Hausman statistics 376.61 and 343.63 are significant at the 1% confidence level, leading us to rely on the second-stage regressions. Personal guarantees and size are positively and significantly related to bank loan maturities at the 1% confidence level. Bank-firm relationship and sovereign spread (used as an alternative to the volatility of GDP) are negatively and significantly related to bank loan maturities at the 5% and 1% confidence levels. Overall, these estimations based on the 2-SLS regressions do not reject H3 and H4.

\*\*\* INSERT TABLE 10 HERE \*\*\*

In order to ensure the sensitivity of the findings to the dependent variable that is measured as a logarithm of the number of months, we re-estimated all previously reported regressions with an alternative dependent variable that measures bank loan maturities in months. We report these findings in Tables 11-18. These Tables are organized in the same manner as Tables 3-10. The only difference is that the dependent variable, bank loan maturity, is now measured in months and not as  $\ln(\text{maturity}+1)$  as in Tables 3-10. Detailed analyses of Tables 11-18 show that the main findings remain unaltered vis-à-vis Tables 3-10.

\*\*\* INSERT TABLES 11-18 HERE \*\*\*

The possibility of analyzing predicted loan maturities for models estimated in Tables 11-18 is of particular interest. We do so in Table 19, Panel A in which Column I includes predicted maturities for firms whose owners provided personal guarantees (=1) and did not provide personal guarantees (=0) from Table 11 ; Column II includes predicted maturities for low risk firms (=1) that provided personal guarantees and firms that are not low risk (=0) but provided personal guarantees from Table 12; Column III includes predicted maturities for high risk firms (=1) that provided personal guarantees and firms that are not high risk (=0) but provided

personal guarantees (=0) from Table 13. As can be observed from Panel A, the predicted maturities for firms that provided personal guarantees are longer than for firms that did not provide personal guarantees. Panels B and C include a further granular view of predicted maturities for low and high risk firms whose owners did provide and did not provide personal guarantees. As can be observed from the Panels, the predicted maturities for firms that provided personal guarantees are longer than for firms that did not provide personal guarantees. This finding underlines the role of personal guarantees in augmenting bank loan maturities by reducing information asymmetries for all credit risk ratings and the subsequent adverse selection and moral hazard.

\*\*\* INSERT TABLE 19 HERE \*\*\*

In order to further assess the relation between credit risk, owner liability and bank loan maturities, we plot a graph displayed in Figure 1. This graph plots risk on the horizontal axis and the predicted loan maturities on the vertical axis. It shows loan maturities in which owners did provide their personal guarantees (straight line) and did not provide personal guarantees (dashed line). As can be observed, predicted loan maturities in which owners did provide personal guarantees are on average 40.84 months whereas predicted loan maturities in which owners did not provide personal guarantees are on average 19.32 months. Loan maturity increases are observed across all risk classes. This finding underlines the role of personal guarantees in augmenting bank loan maturities by reducing information asymmetries for all credit risk levels and subsequent adverse selection and moral hazard.

\*\*\* INSERT FIGURE 1 HERE \*\*\*

## **7. SUMMARY AND CONCLUSIONS**

Bank loans are an important and probably the only source of financing for small firms in countries that have intermediated financial infrastructures. While access to bank loans, their

pricing and defaults have received significant attention, much less has been given to the way in which these loans are actually structured to attenuate information asymmetries and subsequent adverse selection and moral hazard. This issue acquired particular topicality at the time of the financial crisis when managers were required to structure their loans in a manner that would enable them to weather the crisis; monetary authorities to implement macroeconomic programs to unlock growth in ailing economies; financial authorities to alleviate pressure on the supply of bank credit, particularly to small firms; and academics to deliver rigorous answers to pressing questions on the financing of small firms.

We develop hypotheses that relate loan maturities to hard and soft information, loan contract terms, bank characteristics, and macroeconomic conditions during the financial crises and test these with confidential data provided by a large European bank. Unlike previous studies that focus on public firms or small firms in a market-dominated setting, we focus on small firms in a context that is bank-dominated and with less developed capital markets, thus inhibiting the issuance of debt or equity as alternatives to bank financing. Our study also focuses distinctively on the global financial crisis and the role of owners' personal guarantees that have not been addressed in previous studies.

Our data are unique as they enable us to relate loan maturities to hard information based on the credit ratings ascribed to firms in accordance with internal risk models used for regulatory and supervisory purposes, to soft information based on the bank-borrower relationship, to owners' personal guarantees, to loan size, to nonperforming loans of the bank and to the volatility of macroeconomic conditions. Our robust findings show that firms rated as low risk, with a strong relationship with banks, whose owners provided personal guarantees and with large loan sizes obtained longer maturities. Banks with larger nonperforming loans provided loans with shorter maturities. Firms with low and high ratings whose owners provided personal guarantees obtained longer maturities. The positive relation between low risk and bank loan

maturities indicates that firms with better credit ratings may have opted for longer maturities as they might have foreseen difficulties with renegotiating loans during the crisis situation that was characterized by extreme uncertainties related to macroeconomic conditions and policy responses. The positive relation for low and high risk interacted with owners' personal guarantees indicates that the latter play a key role in reducing information asymmetries, and subsequent adverse selection and moral hazard. Importantly, our study underlines the role of personal guarantees as a lending technology which was widely used by banks in many countries during the crisis but has not received significant attention.

It is now widely accepted that the impairment in the functioning of interbank markets during the global financial crisis led to a retraction in bank lending. Although tardily, monetary authorities responded with unconventional quantitative easing programs to smooth economic recovery, and financial authorities responded with policies to stabilize financial systems. The effectiveness of these policies is still being questioned. Our focus of bank loan maturities that were not part of any specific program or policy, indicates that contract terms of bank loans accessed by small firms were alleviated with extended maturities through the provision of owners' personal guarantees that ultimately involved their commitment to plowing in additional equity in the case of distress. On the one hand, such guarantees alleviated the contract terms of bank loans accessed by small firms with extended maturities but, on the other, augmented the firm owners' liability to an unlimited extent. This highly unappealing risk for owners of small firms deserves further attention from finance academics and policymakers.

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**TABLE 1.** Descriptive statistics

This table reports the descriptive statistics of variables used in the study for the full sample period: 1<sup>st</sup> quarter of 2008 - 4<sup>th</sup> quarter of 2010 (number of observations, mean, standard deviation, minimum and maximum values). The main of data used in this study were provided by one of the largest retail banks operating in Portugal. Macroeconomic data were collected from Eurostat and European Central Bank databases. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0; *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledged a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP); *Core Tier I* is the ratio of common stock to risk-weighted assets; *Tier I* is the ratio of core capital to total assets; *Euribor* is the 6-month rate at which a selection of European banks lend to one another; *Eonia* is the 1-day overnight rate at which a selection of European banks lend to one another; *Sovereign Spread* is the difference in the yield-to-maturity of 10-year domestic government bonds and their identical bunds.

<b>Variables</b>	<b>Source</b>	<b>Type</b>	<b>#</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<i>Dependent</i>							
Natural logarithm of maturity	Bank	Ln(1+Maturity)	3,808	2.961	1.126	0.693	5.165
Maturity in months	Bank	Months	3,808	31.173	27.078	1	174
<i>Independent</i>							
<i>Firm</i>							
Low risk	Bank	Yes=1; No=0	3,808	0.475	0.499	0	1
Intermediate risk (control)	Bank	Yes=1; No=0	3,808	0.232	0.422	0	1
High risk	Bank	Yes=1; No=0	3,808	0.292	0.455	0	1
Relationship	Bank	%	3,808	34 500	27 500	2 400	100
<i>Contract</i>							
Personal guarantee	Bank	Yes=1; No=0	3,808	0.551	0.497	0	1
Size	Bank	000 Euro	3,808	105 844	147 514	5	997.596
<i>Bank</i>							
Nonperforming loans	Bank	%	3,808	2 825	0.347	2 330	3 130
<i>Macroeconomic</i>							
Volatility of GDP	Eurostat	%	3,808	3 281	2 105	0.510	5 433
<i>Robustness</i>							
Core Tier 1	Bank	%	3,808	8.010	.855	6.8	8.8
Tier 1	Bank	%	3,808	8.143	.809	7	8.9
Euribor	European Central Bank	%	3,808	2.377	1.637	0.952	5.219
Eonia	European Central Bank	%	3,808	1.652	1.576	0.341	4.299
Sovereign spread	European Central Bank	%	3,808	1.414	0.952	0.582	2.774

**TABLE 2.** Pairwise correlations of variables

This matrix reports the correlations between dependent and independent variables. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0; *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledged a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP); *Core Tier I* is the ratio of common stock to risk-weighted assets; *Tier I* is the ratio of core capital to total assets; *Euribor* is the 6-month rate at which a selection of European banks lend to one another; *Eonia* is the 1-day overnight rate at which a selection of European banks lend to one another; *Sovereign Spread* is the difference in the yield-to-maturity of 10-year domestic government bonds and their identical bunds. \* denotes significance at the 1% confidence level.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Dependent</i>															
Maturity	<b>1</b>	1													
<i>Independent</i>															
<i>Firm</i>															
Low risk	<b>2</b>	0.017	1												
Intermediate risk (control)	<b>3</b>	-0.038	-0.528*	1											
High risk	<b>4</b>	0.016	-0.601*	-0.359*	1										
Relationship	<b>5</b>	0.327*	-0.042*	-0.013	0.058*	1									
<i>Contract</i>															
Personal guarantee	<b>6</b>	0.395*	0.004	-0.041*	0.033	0.208*	1								
Size	<b>7</b>	0.203*	0.030	0.006	-0.039	0.032	-0.010	1							
<i>Bank</i>															
Nonperforming loans	<b>8</b>	-0.036	-0.037	0.039*	0.004	-0.028	0.070*	-0.010	1						
<i>Macroeconomic</i>															
Volatility of GDP	<b>9</b>	-0.014	-0.008	0.011	-0.001	0.009	0.060*	0.003	-0.128*	1					
<i>Robustness</i>															
Core Tier1	<b>10</b>	-0.040	-0.034	0.036	0.004	-0.023	0.078*	0.004	0.999*	-0.090*	1				
Tier 1	<b>11</b>	-0.040	-0.034	0.036	0.004	-0.023	0.078*	0.004	0.999*	-0.079*	1.000*	1			
Euribor	<b>12</b>	0.041	0.034	-0.033	-0.007	0.020	-0.068*	-0.007	-0.965*	0.176*	-0.962*	-0.961*	1		
Eonia	<b>13</b>	0.033	0.033	-0.031	-0.008	0.025	-0.075*	-0.010	-0.964*	0.190*	-0.960*	-0.959*	0.994*	1	
Sovereign spread	<b>14</b>	-0.026	-0.032	0.036	0.002	-0.012	0.108*	0.009	0.721*	0.594*	0.747*	0.755*	-0.660*	-0.649*	1

**TABLE 3.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans

This table reports the findings for the testing of hypotheses H1-H6 [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Column I reports the findings for the OLS with the full set of variables. Column II reports the findings for the OLS grouping firm features (Column II.1) and loan terms that include personal guarantees (Column II.2) and loan terms that include size (Column II.3); Column III reports the findings for the first stage (Column III.1) and second stage (Column III.2) of the 2-SLS instrumented with prior default. Column III also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I	Column II			Column III	
	OLS Coefficient (Std. Errors)	Column II.1	Column II.2	Column II.3	Column III.1 First-stage	Column III.2 Second-stage
<i>Dependent</i>	$\ln(\text{Maturity}+1)$	$\ln(\text{Maturity}+1)$			Personal guarantee	$\ln(\text{Maturity}+1)$
<i>Independent</i>						
<i>Firm</i>						
Low risk	0.171*** (0.038)	0.219*** (0.044)	0.181*** (0.038)	0.174*** (0.038)	0.018 (0.021)	-0.175 (0.171)
High Risk	0.052 (0.041)	0.082* (0.047)	0.047 (0.041)	0.055 (0.041)	0.032 (0.022)	-0.232 (0.180)
Relationship	0.010*** (0.001)	0.014*** (0.001)	0.011*** (0.001)	0.010*** (0.001)	0.003*** (0.001)	-0.015** (0.006)
<i>Contract</i>						
Personal guarantee	0.975*** (0.032)		0.956*** (0.033)	0.969*** (0.032)		8.471*** (1.696)
Size	0.104*** (0.014)			0.104*** (0.014)	-0.027*** (0.007)	0.292*** (0.071)
<i>Bank</i>						
Nonperforming loans	-0.096** (0.044)				0.115*** (0.023)	-1.038*** (0.279)
<i>Macroeconomic</i>						
Volatility of GDP	-0.005 (0.007)				0.016*** (0.004)	-0.129*** (0.041)
<i>Instrument</i>						
Prior default					-0.103*** (0.022)	
<i>Fixed Effects</i>						
Loan	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	2.056*** (0.285)	2.350*** (0.262)	2.219*** (0.245)	1.772*** (0.251)	-0.094 (0.126)	3.219*** (0.976)
#	3,808	3,808	3,808	3,808	3,808	3,808
R-square	0.350	0.170	0.339	0.349	0.072	
Cragg-Donald F-statistic					21.068***	
Wu-Hausman F test						375.605***
Durbin-Wu-Hausman Chi-Sq.						343.361***



**TABLE 4.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans (interaction of low risk and personal guarantees)

This table reports the findings for the testing of hypothesis H7, including the interaction term *Low Risk x Personal Guarantees* [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Column I reports the findings for the OLS with the full set of variables; Column II reports the findings for the first stage (Column II.1-2) and second stage (Column II.3) of the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B- and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledged a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

Dependent	Column I	Column II		
	OLS Coefficient (Std. Error)	Column II.1 First Stage Personal guarantee	Column II.2 First Stage Personal guarantee x Low Risk	Column II.3 Second-Stage $\ln(\text{Maturity}+1)$
<i>Firm</i>				
Low risk	0.248*** (0.052)	0.016 (0.022)	0.575*** (0.012)	-0.880 (2.318)
High Risk	0.048 (0.041)	0.032 (0.022)	-0.007** (0.003)	-0.225 (0.184)
Relationship	0.010*** (0.001)	0.003*** (0.001)	0.002*** (0.001)	-0.018 (0.011)
<i>Contract</i>				
Personal Guarantees	1.044*** (0.043)			8.582*** (1.875)
Personal Guarantees x Low risk	-0.144** (0.061)			1.253 (4.077)
Linear combination of Personal Guarantees x Low risk	1.291*** (0.081)			7.702*** (2.353)
Size	0.103*** (0.014)	-0.027*** (0.007)	-0.018*** (0.005)	0.318*** (0.119)
<i>Bank</i>				
Nonperforming Loans	-0.094** (0.044)	0.115*** (0.023)	0.070*** (0.016)	-1.142** (0.480)
<i>Macroeconomic</i>				
Volatility of GDP	-0.004 (0.007)	0.016*** (0.004)	0.010*** (0.003)	-0.143** (0.067)
<i>Instrument</i>				
Prior default		-0.107*** (0.025)	0.033*** (0.005)	
Prior default x Low Risk		0.020 (0.055)	-0.124** (0.050)	
<i>Fixed Effects</i>				
Loan	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes
Intercept	2.012*** (0.282)	-0.095 (0.122)	-3.778*** (0.085)	3.712* (1.939)
#	3,808	3,808	3,808	3,808
R-squared	0.351	0.072	421	7.79
Cragg-Donald F-statistic		10.92	7.79	
Wu-Hausman F test			184.994***	
Durbin-Wu-Hausman Chi-Sq. test			338.845***	

**TABLE 5.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans (interaction of high risk and personal guarantees)

This table reports the findings for the testing of hypothesis H7, including the interaction term *High Risk x Personal Guarantees* [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Column I reports the findings for the OLS with the full set of variables; Column II reports the findings for the first stage (Column II.1-2) and second stage (Column II.3) of the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledged a personal guarantee, otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of growth* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I	Column II		
	OLS Coefficient (Std. Error)	Column II.1 First Stage Personal guarantee	Column II.2 First Stage Personal guarantee x High Risk	Column II.3 Second-Stage $\ln(\text{Maturity}+1)$
<i>Firm</i>				
Low risk	0.171*** (0.038)	0.025 (0.022)	0.006** (0.002)	-0.301 (0.276)
High Risk	0.014 (0.057)	0.051** (0.025)	0.619** (0.017)	1.759 (1.543)
Relationship	0.010*** (0.001)	0.003*** (0.001)	0.001*** (0.001)	-0.022** (0.011)
<i>Contract</i>				
Personal Guarantees	0.956*** (0.037)			11.963*** (3.795)
Personal Guarantees x High risk	0.070 (0.066)			-3.758 (2.928)
Linear combination of Personal Guarantees x High risk	0.969*** (0.078)			13.722*** (5.188)
Size	0.104*** (0.014)	-0.26*** (0.007)	-0.008** (0.004)	0.357*** (0.105)
<i>Bank</i>				
Nonperforming Loans	-0.096** (0.044)	0.115*** (0.023)	0.029** (0.012)	-1.319*** (0.450)
<i>Macroeconomic</i>				
Volatility of GDP	-0.005 (0.007)	0.016*** (0.004)	0.004** (0.002)	-0.164*** (0.063)
<i>Instrument</i>				
Prior default		-0.075** (0.029)	0.016*** (0.004)	
Prior default x High Risk		-0.066 (0.044)	-0.211*** (0.033)	
<i>Fixed Effects</i>				
Industry	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes
Intercept	2.068*** (0.285)	-0.103 (0.123)	-0.200*** (0.074)	2.650** (1.279)
#	3,808	3,808	3,808	3,808
R-squared	0.350	0.068	0.519	
Cragg-Donald F-statistic		12.00	58.93	
Wu-Hausman F test			185.603***	
Durbin-Wu-Hausman Chi-Sq. test			339.862***	

**TABLE 6.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans by risk

This table reports the robustness of findings re-estimating the baseline model (Table 3) separately for Low and High risk firms: Column I for *Low risk=1* and Column II for *High Risk=1* [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Column I.1 and II.1 reports the findings for the OLS with the full set of variables; Column I.2 and II.2 report the findings for the first stage (Columns I.2.1 and II.2.1) and second stage (Columns I.2.2 and II.2.2) of the 2-SLS instrumented with prior default for Low risk and High risk firms, respectively. Columns I.2 and II.2 also report the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior Default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I Low Risk			Column II High Risk		
	Column I.1	Column I.2		Column II.1	Column II.2	
	OLS	2-SLS		OLS	2-SLS	
	Coefficient	Coefficient		Coefficient	Coefficient	
	(Std. Errors)	(Std. Errors)		(Std. Errors)	(Std. Errors)	
	Column I.1	Column I.2.1	Column I.2.2	Column II.1	Column II.2.1	Column II.2.2
		First-stage	Second-stage		First-stage	Second-stage
	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$
<i>Independent Firm</i>						
Relationship	0.009*** (0.001)	0.004*** (0.001)	-0.026 (0.023)	0.012*** (0.001)	0.003*** (0.001)	-0.004 (0.005)
<i>Contract</i>						
Personal guarantee	0.915*** (0.047)		10.559* (6.111)	0.972*** (0.062)		6.035*** (1.378)
Size	0.076*** (0.020)	-0.031*** (0.010)	0.369* (0.213)	0.098*** (0.026)	-0.032** (0.013)	0.274*** (0.088)
<i>Bank</i>						
Nonperforming loans	-0.113* (0.065)	0.121*** (0.033)	-1.345 (0.850)	0.014 (0.079)	0.078* (0.042)	-0.494* (0.260)
<i>Macroeconomic</i>						
Volatility of GDP	-0.017* (0.010)	0.022*** (0.005)	-0.229 (0.146)	0.025** (0.013)	0.016** (0.007)	-0.063 (0.044)
<i>Instrument</i>						
Prior default		-0.081* (0.050)			-0.136*** (0.034)	
<i>Fixed Effects</i>						
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	2.320*** (0.509)	-0.238 (0.167)	4.935** (2.404)	1.783*** (0.398)	0.105 (0.216)	1.669 (1.124)
#	1,810	1,810	1,810	1,113	1,113	1,113
R-square	0.301	0.085		0.420	0.130	
Cragg-Donald F-statistic		2.629*			15.802***	
Wu-Hausman F test			67.201***			133.8***
Durbin-Wu-Hausman Chi-Sq. test			65.352***			120.99***

**TABLE 7.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans by year

This table reports the robustness of findings re-estimating the baseline model (Table 3) separately by the year in which the loans were granted [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Column I for the OLS with the full set of variables (I.1- 2008; I.2-2009, I.3-2010), and Column II for the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I OLS Coefficient (Std. Errors)			Column II 2-SLS Coefficient (Std. Errors)					
	Column I.1	Column I.2	Column I.3	Column II.1.1	Column II.1.2	Column II.2.1	Column II.2.2	Column II.3.1	Column II.3.2
	Year	2008	2009	2010	2008		2009		2010
				First-stage	Second-stage	First-stage	Second-stage	First-stage	Second-stage
<i>Dependent</i>	$\ln(\text{Maturity}+1)$			Personal guarantee	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$
<i>Independent</i>									
<i>Firm</i>									
Low risk	0.155** (0.071)	0.154** (0.063)	0.222*** (0.065)	0.021 (0.038)	-0.226 (0.356)	-0.032 (0.036)	0.177 (0.229)	0.059 (0.036)	-0.497 (0.422)
High Risk	0.004 (0.075)	-0.070 (0.067)	0.242*** (0.069)	0.028 (0.040)	-0.274 (0.365)	-0.001 (0.037)	-0.078 (0.247)	0.077** (0.037)	-0.490 (0.447)
Relationship	0.007*** (0.001)	0.011*** (0.001)	0.011*** (0.001)	0.004*** (0.001)	-0.030* (0.016)	0.003*** (0.001)	-0.009 (0.008)	0.002*** (0.001)	-0.007 (0.009)
<i>Contract</i>									
Personal guarantee	1.038*** (0.059)	0.942*** (0.055)	0.891*** (0.056)		9.779*** (3.576)		7.481*** (2.424)		9.055** (3.525)
Size	0.137*** (0.025)	0.134*** (0.022)	0.027 (0.024)	-0.022* (0.012)	0.319** (0.133)	-0.011 (0.012)	0.186** (0.082)	-0.050*** (0.012)	0.427** (0.208)
<i>Instrument</i>									
Prior default				-0.086** (0.034)		-0.110*** (0.039)		-0.104** (0.044)	
<i>Fixed Effects</i>									
Loan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	1.960*** (0.482)	1.739*** (0.328)	1.281*** (0.307)	0.178 (0.187)	0.742 (1.819)	0.237 (0.147)	0.369 (1.102)	0.236** (0.104)	-0.507 (1.222)
#	1,236	1,338	1,234	1,236	1,236	1,338	1,338	1,234	1,234
R-square	0.356	0.406	0.321	0.098		0.087		0.068	
Cragg-Donald F-statistic				6.272**		7.803***		5.714**	
Wu-Hausman F test				130.374***		103.161		143.57***	
Durbin-Wu-Hausman Chi-Sq. test				119.332***		96.852***		130.119***	

**TABLE 8.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans controlling for capital requirements

This table reports the robustness of findings re-estimating the baseline model (Table 3) controlling for regulatory pressure exerted on banks. For this purpose, this table includes the variables Core Tier I (Column I) and Tier I (Column II) ratios [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Columns I.1 (for Core Tier I) and II.2 (for Tier I) report the findings for the OLS with the full set of variables. Columns I.2.1 (for Core Tier I) and II.2.1 (for Tier I) report the findings for the first stage and Columns I.2.2 (for Core Tier I) and II.2.2 (for Tier I) for the second stage of the 2-SLS instrumented with prior default. Columns I.2 and II.2 also report the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Core Tier I* is the ratio of common stock to risk-weighted assets and *Tier I* is the ratio of core capital to total assets; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable prior to default equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I Core Tier I			Column II Tier I		
	Column I.1	Column I.2		Column II.1	Column II.2	
	OLS	2-SLS		OLS	2-SLS	
	Coefficient (Std. Errors)	Coefficient (Std. Errors)		Coefficient (Std. Errors)	Coefficient (Std. Errors)	
	Column I.2.1	Column I.2.2		Column II.2.1	Column II.2.2	
	First-stage	Second-stage		First-stage	Second-stage	
<i>Dependent</i>	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$
<i>Independent</i>						
<i>Firm</i>						
Low risk	0.171*** (0.038)	0.018 (0.021)	-0.175 (0.171)	0.171*** (0.038)	0.018 (0.021)	-0.175 (0.171)
High Risk	0.052 (0.041)	0.032 (0.022)	-0.232 (0.180)	0.052 (0.041)	0.032 (0.022)	-0.232 (0.180)
Relationship	0.010*** (0.001)	0.003*** (0.001)	-0.015** (0.006)	0.010*** (0.001)	0.003*** (0.001)	-0.015** (0.006)
<i>Contract</i>						
Personal guarantee	0.975*** (0.032)		8.471*** (1.696)	0.975*** (0.032)		8.471*** (1.696)
Size	0.104*** (0.014)	-0.027*** (0.007)	0.292*** (0.071)	0.104*** (0.014)	-0.027*** (0.007)	0.292*** (0.071)
<i>Bank</i>						
Core Tier I	-0.039** (0.018)	0.047*** (0.009)	-0.425*** (0.114)			
Tier I				-0.041** (0.019)	0.049*** (0.010)	-0.443*** (0.119)
<i>Macroeconomic</i>						
Volatility of GDP	-0.003 (0.007)	0.015*** (0.004)	-0.113*** (0.038)	-0.004 (0.007)	0.015*** (0.004)	-0.120*** (0.039)
<i>Instrument</i>						
Prior default		-0.103*** (0.022)			-0.103*** (0.022)	
<i>Fixed Effects</i>						
Loan	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	2.094*** (0.293)	-0.139 (0.128)	3.629*** (1.040)	2.116*** (0.299)	-0.165 (0.131)	3.866*** (1.080)
#	3808	3808	3808	3808	3808	3808
R-square	0.350	0.072		0.350		
Cragg-Donald F-statistic		21.068***			21.068***	
Wu-Hausman F test		375.605***			375.605***	
Durbin-Wu-Hausman Chi-Sq. test		343.361***			343.361***	

**TABLE 9.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans controlling for quantitative easing

This table reports the robustness of findings re-estimating the baseline model (Table 3) controlling for quantitative easing programs. For this purpose, this table includes the variables Euribor (Column I) and Eonia (Column II) ratios [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Columns I.1 (for Euribor) and II.2 (for Eonia) report the findings for the OLS with the full set of variables. Columns I.2.1 (for Euribor) and II.2.1 (for Eonia) report the findings for the first stage and Columns I.2.2 (for Euribor) and II.2.2 (for Eonia) for the second stage of the 2-SLS instrumented with prior default. Columns I.2 and II.2 also report the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Euribor* is the 6-month rate at which a selection of European banks lend to one another; *Eonia* is the 1-day overnight rate at which a selection of European banks lend to one another; The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I Euribor			Column II Eonia		
	Column I.1 OLS	Column I.2 2-SLS		Column II.1 OLS	Column II.2 2-SLS	
	Coefficient (Std. Errors)	Coefficient (Std. Errors)		Coefficient (Std. Errors)	Coefficient (Std. Errors)	
		Column I.2.1 First-stage	Column I.2.2 Second-stage		Column II.2.1 First-stage	Column II.2.2 Second-stage
<i>Dependent</i>	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$	$\ln(\text{Maturity}+1)$	Personal guarantee	$\ln(\text{Maturity}+1)$
<i>Independent Firm</i>						
Low risk	0.171*** (0.037)	0.016 (0.021)	-0.158 (0.169)	0.171*** (0.037)	0.016 (0.021)	-0.161 (0.170)
High Risk	0.053 (0.041)	0.03 (0.022)	-0.217 (0.177)	0.052 (0.041)	0.03 (0.022)	-0.217 (0.179)
Relationship	0.010*** (0.001)	0.003*** (0.001)	-0.015** (0.006)	0.010*** (0.001)	0.003*** (0.001)	-0.015** (0.006)
<i>Contract</i>						
Personal guarantee	0.974*** (0.031)		8.401*** (1.668)	0.974*** (0.031)		8.478*** (1.707)
Size	0.104*** (0.013)	-0.026*** (0.007)	0.283*** (0.069)	0.104*** (0.013)	-0.026*** (0.007)	0.286*** (0.070)
<i>Bank</i>						
Nonperforming loans	-0.006 (0.162)	0.186** (0.086)	-1.395* (0.743)	-0.229 (0.159)	0.033 (0.084)	-0.455 (0.668)
<i>Macroeconomic</i>						
Euribor	0.019 (0.034)	0.019 (0.018)	-0.103 (0.144)			
Eonia				-0.031 (0.035)	-0.016 (0.019)	0.109 (0.150)
<i>Instrument</i>						
Prior default		-0.104*** (0.022)			-0.103*** (0.023)	
<i>Fixed Effects</i>						
Time	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	1.745*** (0.575)	-0.306 (0.306)	4.229* (2.446)	2.475*** (0.546)	0.197 (0.288)	1.120 (2.308)
#	3,808	3,808	3,808	3,808	3,808	3,808
R-square	0.350	0.067		0.350	0.067	
Cragg-Donald F- Wu-Hausman F test		21.383***			21.068***	
Durbin-Wu-Hausman Chi-Sq. test			376.563***			375.605***
			344.157***			343.361***

**TABLE 10.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans controlling for sovereign spread

This table reports the robustness of findings re-estimating the baseline model (Table 3) controlling for sovereign debt crisis. For this purpose, this table includes the variable Sovereign spread [**Dependent variable:  $\ln(\text{Maturity}+1)$** ]. Column I reports the findings for the OLS with the full set of variables. Column II.1 reports the findings for the first stage and Column II.2 for the second stage of the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Sovereign Spread* is the difference in the yield-to-maturity of 10-year domestic government bonds and their identical bunds; The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	<b>Column I</b>	<b>Column II</b>	
	OLS	2-SLS	
	Coefficient	Coefficient	
	(Std. Errors)	(Std. Errors)	(Std. Errors)
		Column II.1	Column II.2
		First-stage	Second-stage
		Personal guarantee	$\ln(\text{Maturity}+1)$
<i>Independent Firm</i>			
Low risk	0.171*** (0.037)	0.018 (0.021)	-0.175 (0.171)
High Risk	0.052 (0.041)	0.032 (0.022)	-0.232 (0.180)
Relationship	0.010*** (0.001)	0.003*** (0.001)	-0.015** (0.006)
<i>Contract</i>			
Personal guarantee	0.975*** (0.031)		8.471*** (1.696)
Size	0.104*** (0.013)	-0.027*** (0.007)	0.292*** (0.071)
<i>Bank</i>			
Nonperforming loans	-0.069 (0.057)	0.016 (0.030)	-0.262 (0.236)
<i>Macroeconomic</i>			
Sovereign Spread	-0.018 (0.029)	0.066*** (0.150)	-0.515*** (0.162)
<i>Instrument</i>			
Prior default		-0.103*** (0.022)	
<i>Fixed Effects</i>			
Time	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Location	Yes	Yes	Yes
Intercept	1.981*** (0.251)	0.173 (0.129)	1.136 (1.017)
#	3,808	3,808	3,808
R-square		0.072	
Cragg-Donald F-statistic		21.068***	
Wu-Hausman F test		375.605***	
Durbin-Wu-Hausman Chi-Sq test		343.361***	

**TABLE 11.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans

This table reports the robustness of findings related to hypotheses H1-H6 reported in the table 3 [**Dependent variable: Maturity**]. Column I reports the findings for the OLS with the full set of variables. Column II reports the findings for the OLS grouping firm features (Column II.1) and loan terms that include personal guarantees (Column II.2) and loan terms that include size (Column II.3); Column III reports the findings for the first stage (Column III.1) and second stage (Column III.2) of the 2-SLS instrumented with prior default. Column III also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	<b>Column I</b>	<b>Column II</b>			<b>Column III</b>	
	OLS Coefficient (Std. Errors)	Column II.1	Column II.2	Column II.3	Column III.1	Column III.2
	Maturity		Maturity		First-stage Personal guarantee	Second-stage Maturity
<i>Independent</i>						
<i>Firm</i>						
Low risk	2.794*** (0.967)	3.894*** (1.058)	3.180*** (0.984)	3.019*** (0.972)	0.018 (0.021)	-5.753 (4.254)
High Risk	1.091 (1.035)	1.723 (1.139)	1.070 (1.048)	1.247 (1.037)	0.032 (0.022)	-5.952 (4.461)
Relationship	0.226*** (0.015)	0.298*** (0.015)	0.240*** (0.015)	0.230*** (0.015)	0.003*** (0.001)	-0.402*** (0.154)
<i>Contract</i>						
Personal guarantee	18.886*** (0.821)		18.150*** (0.831)	18.466*** (0.817)		204.294*** (41.987)
Size	2.513*** (0.382)			2.459*** (0.384)	-0.027*** (0.007)	7.164*** (1.763)
<i>Bank</i>						
Nonperforming loans	-5.413*** (1.144)				0.115*** (0.023)	-28.696*** (6.855)
<i>Macroeconomic</i>						
Volatility of GDP	-0.439** (0.180)				0.016*** (0.004)	-3.509*** (1.009)
<i>Instrument</i>						
Prior default					-0.103*** (0.022)	
<i>Fixed Effects</i>						
Loan	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	26.666*** (7.689)	23.446*** (7.103)	20.962*** (6.687)	10.334 (6.865)	-0.094 (0.126)	55.449** (23.783)
#	3,808	3,808	3,808	3,808	3,808	3,808
R-square	0.254	0.133	0.239	0.249	0.072	
Cragg-Donald F-statistic					21.068***	
Wu-Hausman F test					343.829***	
Durbin-Wu-Hausman Chi-Sq. test					316.728***	



**TABLE 12.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans (interaction of low risk and personal guarantees)

This table reports the robustness of findings related to hypothesis H7 (reported in the Table 4), including the interaction term *Low Risk x Personal Guarantees*. [**Dependent variable: Maturity**]. Column I reports the findings for the OLS with the full set of variables; Column II reports the findings for the first stage (Column II.1-2) and second stage (Column II.3) of the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledged a personal guarantee, otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of growth* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I	Column II		
	OLS Coefficient (Std.)	Column II.1 First-stage Personal guarantee	2-SLS Coefficient (Std. Errors) Column II.2 First-stage Personal guarantee x Low risk	Column II.3 Second-stage Maturity
<i>Independent Firm</i>				
Low risk	4.778*** (1.313)	0.016 (0.022)	0.575*** (0.012)	-18.422 (54.895)
High Risk	0.991 (1.034)	0.032 (0.022)	-0.007** (0.003)	-5.822 (4.534)
Relationship	0.226*** (0.015)	0.003*** (0.001)	0.002*** (0.001)	-0.446* (0.263)
<i>Contract</i>				
Personal guarantee	20.635*** (1.086)			206.287*** (45.452)
Personal guarantee x Low risk	-3.694** (1.558)			22.504 (96.644)
Linear combination of Personal guarantee x Low risk	25.414*** (2.013)			187.864*** (57.598)
Size	2.490*** (0.381)	-0.027*** (0.007)	-0.018*** (0.005)	7.623*** (2.834)
<i>Bank</i>				
Nonperforming loans	-5.366*** (1.142)	0.115*** (0.023)	0.070*** (0.016)	-30.572*** (11.370)
<i>Macroeconomic</i>				
Volatility of GDP	-0.432** (0.180)	0.016*** (0.004)	0.010*** (0.003)	-3.759** (1.582)
<i>Instrument</i>				
Prior default		-0.107*** (0.025)	0.033*** (0.005)	
Prior default x Low risk		0.020 (0.055)	-0.124** (0.050)	
<i>Fixed Effects</i>				
Loan	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes
Intercept	25.535*** (7.617)	-0.095 (0.122)	-3.778*** (0.085)	64.302 (46.044)
#	3,808	3,808	3,808	3,808
R-square	0.255	0.072	0.421	
Cragg-Donald F-statistic		10.579	23.641	
Wu-Hausman F test			169.26***	
Durbin-Wu-Hausman Chi-sq. test			312.391***	

**TABLE 13.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans (interaction of high risk and personal guarantees)

This table reports the robustness of findings related to hypothesis H7 (reported in the Table 5), including the interaction term *High Risk x Personal Guarantees*. [**Dependent variable: Maturity**]. Column I reports the findings for the OLS with the full set of variables; Column II reports the findings for the first stage (Column II.1-2) and second stage (Column II.3) of the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledged a personal guarantee, otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of growth* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	Column I	Column II		
	OLS Coefficient (Std. Errors)	Column II.1 First-stage Personal guarantee	Column II.2 First-stage Personal guarantee x High risk	Column II.3 Second-stage Maturity
<i>Independent Firm</i>				
Low risk	2.813*** (0.968)	0.025 (0.022)	0.006** (0.002)	-8.210 (6.151)
High Risk	0.107 (1.395)	0.051** (0.025)	0.619*** (0.017)	37.130 (34.471)
Relationship	0.225*** (0.015)	0.003*** (0.001)	0.001*** (0.001)	-0.510** (0.237)
<i>Contract</i>				
Personal guarantee	18.379*** (0.957)			261.580*** (84.470)
Personal guarantee x High risk	1.780 (1.684)			-80.306 (65.355)
Linear combination of Personal guarantee x High risk	18.486*** (1.929)			298.701*** (115.45)
Size	2.517*** (0.382)	-0.26*** (0.007)	-0.008** (0.004)	7.859*** (2.349)
<i>Bank</i>				
Nonperforming loans	-5.417*** (1.143)	0.115*** (0.023)	0.029** (0.012)	-32.864*** (9.994)
<i>Macroeconomic</i>				
Volatility of GDP	-0.440** (0.180)	0.016*** (0.004)	0.004** (0.002)	-4.043*** (1.415)
<i>Instrument</i>				
Prior default		-0.075** (0.029)	0.016*** (0.004)	
Prior default x High risk		-0.066 (0.044)	-0.211*** (0.033)	
<i>Fixed Effects</i>				
Loan	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes
Intercept	26.972*** (7.685)	-0.103 (0.123)	-0.200*** (0.074)	46.983* (28.213)
#	3,808	3,808	3,808	3,808
R-square	0.254	0.068	0.519	
Cragg-Donald F-statistic		11.852	27.727	
Wu-Hausman F test			171.314***	
Durbin-Wu-Hausman Chi-sq. test			315.867***	

**TABLE 14.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans by risk

This table reports the robustness of findings re-estimating the baseline model (Table 11) separately for Low and High risk firms: Column I for *Low risk=1* and Column II for *High Risk=1* [**Dependent variable: Maturity**]. Column I.1 and II.1 reports the findings for the OLS with the full set of variables; Column I.2 and II.2 report the findings for the first stage (Columns I.2.1 and II.2.1) and second stage (Columns I.2.2 and II.2.2) of the 2-SLS instrumented with prior default for Low risk and High risk firms, respectively. Columns I.2 and II.2 also report the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

<i>Dependent</i>	<b>Column I</b> Low Risk			<b>Column II</b> High Risk		
	Column I.1	Column I.2		Column II.1	Column II.2	
	OLS	2-SLS		OLS	2-SLS	
	Coefficient (Std. Errors)	Coefficient (Std. Errors)		Coefficient (Std. Errors)	Coefficient (Std. Errors)	
	Column I.2.1	Column I.2.2		Column II.2.1	Column II.2.2	
	First-stage	Second-stage		First-stage	Second-stage	
	Personal guarantee	Maturity		Personal guarantee	Maturity	
<i>Independent Firm</i>						
Relationship	0.205*** (0.023)	0.004*** (0.001)	-0.627 (0.538)	0.266*** (0.027)	0.003*** (0.001)	-0.146 (0.134)
<i>Contract</i>						
Personal guarantee	17.189*** (1.223)		246.524* (144.644)	18.918*** (1.590)		148.842*** (35.323)
Size	2.054*** (0.541)	-0.031*** (0.010)	9.027* (5.057)	2.037*** (0.711)	-0.032** (0.013)	6.539*** (2.263)
<i>Bank</i>						
Nonperforming loans	-6.011*** (1.695)	0.121*** (0.033)	-35.321* (20.129)	-2.158 (2.049)	0.078* (0.042)	-15.200** (6.546)
<i>Macroeconomic</i>						
Volatility of GDP	-0.619** (0.267)	0.022*** (0.005)	-5.669 (3.450)	-0.073 (0.331)	0.016** (0.007)	-2.347** (1.141)
<i>Instrument</i>						
Prior default		-0.081* (0.050)			-0.136*** (0.034)	
<i>Fixed Effects</i>						
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	30.487*** (11.625)	-0.238 (0.167)	92.675 (57.028)	15.292 (9.651)	0.105 (0.216)	12.359 (29.172)
#	1,810	1,810	1,810	1,113	1,113	1,113
R-square	0.206	0.085		0.313	0.130	
Cragg-Donald F-statistic		2.629*			15.802***	
Wu-Hausman F test			55.481***			132.601***
Durbin-Wu-Hausman			54.296***			120.027***
Chi-Sq. test						

**TABLE 15.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans by year  
 This table reports the robustness of findings re-estimating the baseline model (Table 11) separately by the year in which the loans were granted [**Dependent variable: Maturity**]. Column I for the OLS with the full set of variables (I.1- 2008; I.2-2009, I.3-2010), and Column II for the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions.  $\ln(\text{Maturity}+1)$  is the natural logarithm of the number of months (plus one) for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I			Column II					
	OLS			2-SLS					
Year	Coefficient			Coefficient					
	(Std. Errors)			(Std. Errors)					
	Column I.1	Column I.2	Column I.3	Column II.1.1	Column II.1.2	Column II.2.1	Column II.2.2	Column II.3.1	Column II.3.2
	2008	2009	2010	2008		2009		2010	
				First-stage	Second-stage	First-stage	Second-stage	First-stage	Second-stage
Dependent		Maturity		Personal guarantee	Maturity	Personal guarantee	Maturity	Personal guarantee	Maturity
<i>Independent Firm</i>									
Low risk	2.178 (1.849)	2.907* (1.581)	3.655** (1.662)	0.021 (0.038)	-7.651 (9.187)	-0.032 (0.036)	3.483 (5.749)	0.059 (0.036)	-12.953 (9.835)
High Risk	-1.087 (1.892)	0.128 (1.659)	4.460** (1.812)	0.028 (0.040)	-8.243 (9.426)	-0.001 (0.037)	-0.064 (6.202)	0.077** (0.037)	-12.464 (10.403)
Relationship	0.145*** (0.027)	0.247*** (0.026)	0.272*** (0.026)	0.004*** (0.001)	-0.803** (0.408)	0.003*** (0.001)	-0.272 (0.210)	0.002*** (0.001)	-0.136 (0.204)
<i>Contract</i>									
Personal guarantee	23.263*** (1.498)	17.185*** (1.376)	15.498*** (1.446)		248.537*** (92.547)		181.330*** (60.739)		204.274** (81.890)
Size	3.353*** (0.664)	2.819*** (0.587)	1.161 (0.744)	-0.022* (0.012)	8.050** (3.425)	-0.011 (0.012)	4.123** (2.079)	-0.050*** (0.012)	10.399** (4.851)
<i>Instrument</i>									
Prior default				-0.086** (0.034)		-0.110*** (0.039)		-0.104** (0.044)	
<i>Fixed Effects</i>									
Loan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	11.982 (11.480)	12.323 (10.590)	-2.246 (5.721)	0.178 (0.187)	-19.425 (46.186)	0.237 (0.147)	-22.064 (27.310)	0.236** (0.104)	-43.595 (27.434)
#	1,236	1,338	1,234	1,236	1,236	1,338	1,338	1,234	1,234
R-square	0.292	0.292	0.207	0.098		0.087		0.068	
Cragg-Donald F-statistic				6.272**		7.803***		5.714**	
Wu-Hausman F test				136.712***		102.174***		99.881***	
Durbin-Wu-Hausman Chi-Sq. test				124.548***		95.992***		93.524***	

**TABLE 16.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans controlling for capital requirements

This table reports the robustness of findings re-estimating the baseline model (Table 11) controlling for regulatory pressure exerted on banks. For this purpose, this table includes the variables Core Tier I (Column I) and Tier I (Column II) ratios [**Dependent variable: Maturity**]. Columns I.1 (for Core Tier I) and II.2 (for Tier I) report the findings for the OLS with the full set of variables. Columns I.2.1 (for Core Tier I) and II.2.1 (for Tier I) report the findings for the first stage and Columns I.2.2 (for Core Tier I) and II.2.2 (for Tier I) for the second stage of the 2-SLS instrumented with prior default. Columns I.2 and II.2 also report the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Core Tier I* is the ratio of common stock to risk-weighted assets and *Tier I* is the ratio of core capital to total assets; *Volatility of GDP* is the three-year standard deviation of gross domestic product (GDP). The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I Core Tier I			Column II Tier I		
	Column I.1 OLS Coefficient (Std. Errors)	Column I.2 2-SLS Coefficient (Std. Errors)	Column I.2.2 Second-stage Maturity	Column II.1 OLS Coefficient (Std. Errors)	Column II.2 2-SLS Coefficient (Std. Errors)	Column II.2.2 Second-stage Maturity
<i>Dependent</i>	Maturity	Personal guarantee	Maturity	Maturity	Personal	Maturity
<i>Independent</i>						
<i>Firm</i>						
Low risk	2.794*** (0.967)	0.018 (0.021)	-5.753 (4.254)	2.794*** (0.967)	0.018 (0.021)	-5.753 (4.254)
High Risk	1.091 (1.035)	0.032 (0.022)	-5.952 (4.461)	1.091 (1.035)	0.032 (0.022)	-5.952 (4.461)
Relationship	0.226*** (0.015)	0.003*** (<0.001)	-0.402*** (0.154)	0.226*** (0.015)	0.003*** (<0.001)	-0.402*** (0.154)
<i>Contract</i>						
Personal guarantee	18.886*** (0.821)		204.294*** (41.987)	18.886*** (0.821)		204.294*** (41.987)
Size	2.513*** (0.382)	-0.027*** (0.007)	7.164*** (1.763)	2.513*** (0.382)	-0.027*** (0.007)	7.164*** (1.763)
<i>Bank</i>						
Core Tier I	-2.219*** (0.469)	0.047*** (0.009)	-11.763*** (2.810)			
Tier I				-2.310*** (0.488)	0.049*** (0.010)	-12.245*** (2.925)
<i>Macroeconomic</i>						
Volatility of GDP	-0.356** (0.178)	0.015*** (0.004)	-3.073*** (0.950)	-0.394** (0.179)	0.015*** (0.004)	-3.272*** (0.976)
<i>Instrument</i>						
Prior default		-0.103*** (0.022)			-0.103*** (0.022)	
<i>Fixed Effects</i>						
Loan	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	28.801*** (7.906)	-0.139 (0.128)	66.769*** (25.356)	30.037*** (8.041)	-0.165 (0.131)	73.323*** (26.350)
#	3,808	3,808	3,808	3,808	3,808	3,808
R-square	0.254	0.072		0.254	0.072	
Cragg-Donald F-		21.068***			21.068***	
Wu-Hausman F test		343.829***			343.829***	
Durbin-Wu-Hausman		316.728***			316.728***	
Chi-Sq. test						

**TABLE 17.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans controlling for quantitative easing

This table reports the robustness of findings re-estimating the baseline model (Table 11) controlling for quantitative easing programs. For this purpose, this table includes the variables Euribor (Column I) and Eonia (Column II) ratios [**Dependent variable: Maturity**]. Columns I.1 (for Euribor) and II.2 (for Eonia) report the findings for the OLS with the full set of variables. Columns I.2.1 (for Euribor) and II.2.1 (for Eonia) report the findings for the first stage and Columns I.2.2 (for Euribor) and II.2.2 (for Eonia) for the second stage of the 2-SLS instrumented with prior default. Columns I.2 and II.2 also report the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Euribor* is the 6-month rate at which a selection of European banks lend to one another; *Eonia* is the 1-day overnight rate at which a selection of European banks lend to one another; The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I Euribor			Column II Eonia		
	Column OLS Coefficient (Std. Errors)	Column I.2 2-SLS Coefficient (Std. Errors)	Column I.2.2 Second-stage	Column II.1 OLS Coefficient (Std. Errors)	Column II.2 2-SLS Coefficient (Std. Errors)	Column II.2.2 Second-stage
<i>Dependent</i>		Column I.2.1 First-stage	Column I.2.2 Second-stage		Column II.2.1 First-stage	Column II.2.2 Second-stage
		ln(Maturity+1)	Personal guarantee		Personal guarantee	ln(Maturity+1)
<i>Independent</i>						
<i>Firm</i>						
Low risk	2.846*** (0.966)	0.016 (0.021)	-5.291 (4.179)	2.842*** (0.965)	0.016 (0.021)	-5.365 (4.224)
High Risk	1.144 (1.062)	0.03 (0.022)	-5.541 (4.392)	1.117 (1.062)	0.03 (0.022)	-5.541 (4.428)
Relationship	0.227*** (0.015)	0.003*** (0.001)	-0.392*** (0.151)	0.227*** (0.015)	0.003*** (0.001)	-0.398*** (0.154)
<i>Contract</i>						
Personal guarantee	18.748** (0.789)		202.385*** (41.291)	18.732*** (0.788)		204.104*** (42.216)
Size	2.485*** (0.338)	-0.026*** (0.007)	6.907*** (1.719)	2.479*** (0.338)	-0.026*** (0.007)	6.966*** (1.744)
<i>Bank</i>						
Nonperforming loans	-3.743 (4.178)	0.186** (0.086)	-38.101** (18.310)	-11.056*** (4.103)	0.033 (0.084)	-16.626 (16.477)
<i>Macroeconomic</i>						
Volatility of GDP						
<i>Monetary Policy</i>						
Euribor	0.284 (0.884)	0.019 (0.018)	-2.743 (3.552)	-1.374 (0.902)	-0.016 (0.019)	2.095 (3.692)
Eonia						
<i>Instrument</i>						
Prior default		-0.104*** (0.022)			-0.103*** (0.023)	
<i>Fixed Effects</i>						
Loan	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	20.384 (14.820)	-0.306 (0.306)	81.806 (60.182)	44.049*** (14.069)	0.197 (0.288)	10.578 (56.796)
#	3808	3808	3808	3808	3808	3808
R-square	0.253	0.067		0.254	0.067	
Cragg-Donald F-statistic		21.383***			20.818***	
Wu-Hausman F test		343.915***			341.690***	
Durbin-Wu-Hausman Chi-Sq. test		316.801***			314.921***	

**TABLE 18.** Ordinary least squares (OLS) and two-stage least squares (2-SLS) regressions to determine maturity of bank loans controlling for sovereign spread

This table reports the robustness of findings re-estimating the baseline model (Table 11) controlling for sovereign debt crisis. For this purpose, this table includes the variable Sovereign spread [**Dependent variable: Maturity**]. Columns I reports the findings for the OLS with the full set of variables. Column II.1 reports the findings for the first stage and Column II.2 for the second stage of the 2-SLS instrumented with prior default. Column II also reports the Cragg-Donald F-statistic and the Wu-Hausman and Durbin-Wu-Hausman statistics testing the validity of 2-SLS regressions. *Maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0; *Relationship* is the ratio of the loan amount contracted with the bank to the total amount of bank loans contracted with all banks in the country; *Personal guarantee* provided by the owner equals 1 if the owner pledges a personal guarantee, and otherwise 0; *Size* is the amount of loan in thousand euros (used in the regressions as the natural logarithm); *Nonperforming loans* is the ratio of impaired loans to total assets of the bank; *Sovereign Spread* is the difference in the yield-to-maturity of 10-year domestic government bonds and their identical bunds; The instrumental variable *Prior default* equals 1 if the firm defaulted previously and 0 otherwise. Robust standard errors in parenthesis. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% confidence levels.

	Column I	Column II	
	OLS	2-SLS	
	Coefficient	Coefficient	
	(Std. Errors)	(Std. Errors)	
<i>Dependent</i>	<i>Maturity</i>	Column II.1	Column II.2
<i>Independent</i>		First-stage	Second-stage
		Personal guarantee	<i>Maturity</i>
<i>Firm</i>			
Low risk	2.794*** (0.967)	0.018 (0.021)	-5.753 (4.254)
High Risk	1.091 (1.035)	0.032 (0.022)	-5.952 (4.461)
Relationship	0.226*** (0.015)	0.003*** (0.001)	-0.402*** (0.154)
<i>Contract</i>			
Personal guarantee	18.886*** (0.790)		204.294*** (41.987)
Size	2.513*** (0.382)	-0.027*** (0.007)	7.164*** (1.763)
<i>Bank</i>			
Nonperforming loans	-2.769** (1.459)	0.016 (0.300)	-7.550 (5.823)
<i>Macroeconomic</i>			
Volatility of GDP			
<i>Sovereign Debt Exposure</i>			
Public Debt to Total Assets	-1.756** (0.735)	0.066*** (0.150)	-14.043*** (4.038)
<i>Instrument</i>			
Prior default		-0.103*** (0.022)	
<i>Fixed Effects</i>			
Loan	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Location	Yes	Yes	Yes
Intercept	19.566*** (6.456)	0.173 (0.129)	-1.341 (24.862)
#	3,808	3,808	3,808
R-square	0.254	0.072	
Cragg-Donald F-statistic		21.068***	
Wu-Hausman F test		343.829***	
Durbin-Wu-Hausman Chi-Sq. test		316.728***	

**TABLE 19** Mean Differences

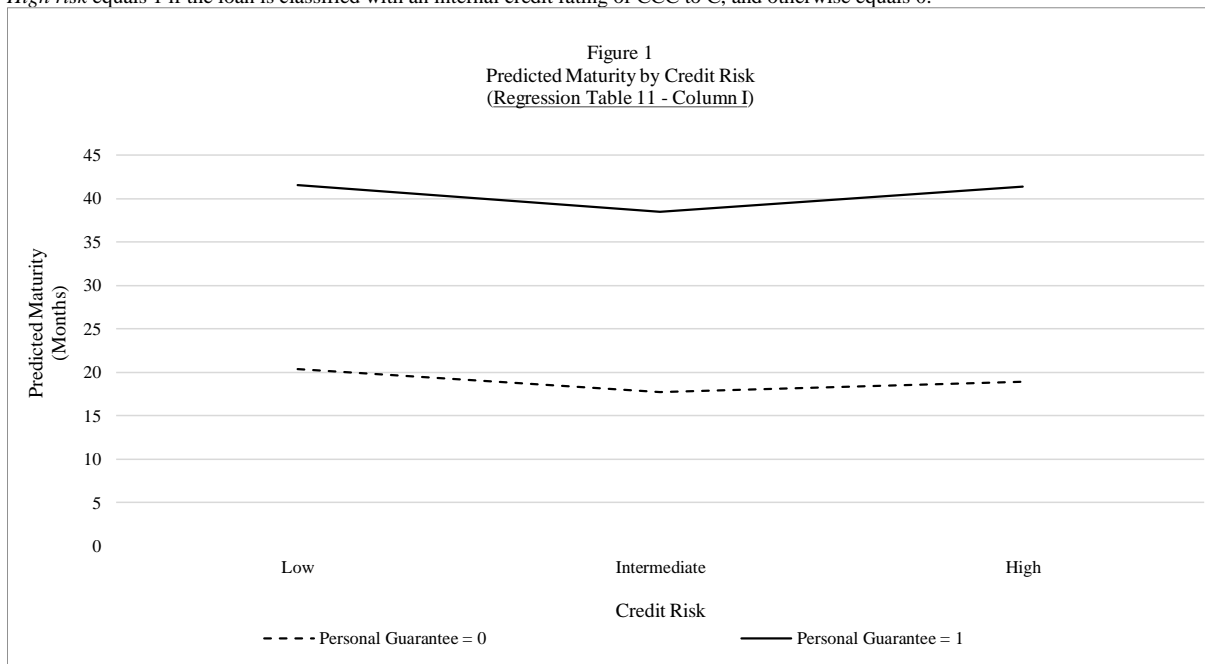
This table reports the mean differences in predicted maturities of bank loans from ordinary least squares regressions (OLS) reported in Tables 11-13

Maturity is the number of months for which the bank has contracted the loan with firms; Personal guarantee provided by the owner equals 1 if the owner pledged a personal guarantee, otherwise 0. Low risk equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; Intermediate risk equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0 (control); High risk equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0.

Panel A	Column I (Table 11)		Column II (Table 12)		Column III (Table 13)	
	Personal Guarantees = 1	Personal Guarantees = 0	Personal Guarantees x Low Risk = 1	Personal Guarantees x Low Risk = 0	Personal Guarantees x High Risk = 1	Personal Guarantees x High Risk = 0
t-test	(Mean Difference: p-value<0.01)		(Mean Difference: p-value<0.01)		(Mean Difference: p-value<0.01)	
Observations	2,097	1,711	1,004	2,804	636	3,172
Average	40.841	19.324	40.727	27.752	41.917	29.019
Standard Deviation	0.180	0.211	0.244	0.259	0.320	0.240
Panel B	Column I (Table 11)		Column II (Table 11)		Column II (Table 11)	
	Low Risk = 1	Low Risk = 0	Low Risk = 1 Personal Guarantees = 1	Low Risk = 1 Personal Guarantees = 0	Low Risk = 0 Personal Guarantees = 1	Low Risk = 0 Personal Guarantees = 0
t-test	(Mean Difference: p-value<0.01)		(Mean Difference: p-value<0.01)		(Mean Difference: p-value<0.01)	
Observations	1,810	1,998	1,004	806	1,093	905
Average	32.153	30.285	41.580	20.410	40.161	18.357
Standard Deviation	0.311	0.312	0.245	0.296	0.261	0.297
Panel C	Column I (Table 11)		Column II (Table 11)		Column II (Table 11)	
	High Risk = 1	High Risk = 0	High Risk = 1 Personal Guarantees = 1	High Risk = 1 Personal Guarantees = 0	High Risk = 0 Personal Guarantees = 1	High Risk = 0 Personal Guarantees = 0
t-test	(Mean Difference: p-value<0.10)		(Mean Difference: p-value<0.01)		(Mean Difference: p-value<0.01)	
Observations	1,113	2,695	636	477	1,461	1,234
Average	31.763	30.929	41.383	18.937	40.605	19.474
Standard Deviation	0.419	0.262	0.320	0.413	0.218	0.246



This Figure shows the relation between predicted maturity and personal guarantees by risk classes. *Predicted maturity* is the number of months for which the bank has contracted the loan with firms; *Low risk* equals 1 if the loan is classified with an internal credit rating of AAA to BB, and otherwise equals 0; *Intermediate risk* equals 1 if the loan is classified with an internal credit rating of BB- to B-, and otherwise equals 0; *High risk* equals 1 if the loan is classified with an internal credit rating of CCC to C, and otherwise equals 0.



**FIGURE 1.** Plot of credit risk by predicted maturities of bank loans