Mutual Guarantees in Portuguese Loan Markets: Evidence during the Financial Crisis

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ABSTRACT:

This study scrutinizes the role of mutual guarantees for Portuguese banks lending to small and medium-sized enterprises (SMEs). With data provided by one of the largest Portuguese banks, this article provides an initial appraisal of Portuguese mutual guarantee schemes (MGS) in response to the recent financial crisis. In particular, the analysis identifies the characteristics of the firm accessing mutual guaranteed loans and investigates the impact of MGS in loan pricing and on the ex post performance of borrowers. The findings provide comprehensive insights, confirming the value of MGS to improve Portuguese loan activity, especially for good SMEs operating in stressful contexts, by reducing the costs of borrowing and improving the ex post default rate. Mutual guarantees also can improve the loan recovery rate and enable banks to meet their commitments to banking regulation and supervision. Finally, these effects are especially notable with the combination of third-party guarantees and collateral.

JEL classification: D82; G18; G21; H12

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1. Introduction

Asymmetric information between banks and borrowers leads to significant misallocation in credit markets. A lack of information about individual borrowers can prompt banks to raise interest rates inefficiently high, such that even worthy borrowers get driven out of the credit market (Stiglitz and Weiss, 1981). Yet firms with negative net present value projects could obtain financial support by taking advantage of the cross-subsidization of borrowers with worthy projects (Mankiw, 1986; De Meza and Webb, 1987). In both cases, the market fails, because banks cannot assess the actual riskiness of borrowers and are forced to offer the same contracts, with varying probabilities of success. When borrowers' wealth is sufficient, banks may bypass information asymmetries by offering a menu of contracts, in which collateral requirements act as a sorting device. Risky borrowers self-select, by choosing contracts marked by high repayment demands (i.e., high interest rates) and low collateral, while safe borrowers choose contracts with high collateral and low repayment demands (Bester, 1985; Besanko and Thakor, 1987a).

Providing collateral can lessen the credit rationing that firms face, especially among small or medium-sized enterprises (SMEs) (Beck et al., 2010; Berger and Udell, 1998). First, it decreases lenders' risk in the event of default (Coco, 2000). Second, collateral rectifies credit market imperfections related to adverse problems (Deelen and Molenaar, 2004). Third, it reduces the costs of monitoring (Cowling and Mitchell, 2003). However, these features also depend on unique characteristics of the individual loan and firm (Berger and Udell, 1998; Columba et al., 2010), as well as on the legal procedures available for loan recovery (Zecchini and Ventura, 2009). If firms, especially smaller and/or the younger ones, cannot post collateral and also have only a short credit history; or if they cannot meet rigorous reporting requirements and public information about them is scarce (Columba et al., 2010); or when the legal system is inadequate to protect creditor rights (Zecchini and Ventura, 2009), SMEs' access to bank credit likely remains restricted, especially during economic downturns, with negative effects on industry dynamics, competitiveness, and growth (Beck and Demirgüc-Kunt, 2006).

In most countries, loan guarantee funds thus have been created to help small and micro-enterprises gain access to the credit market (Green, 2003; Gonzàles et al., 2006; Beck et al., 2010; Cowling, 2010; Honohan, 2010). Europe has a long tradition diffusing mutual guarantee associations (AECM, 2010), and mutual guarantee schemes (MGS) are increasingly well developed in South and North America (Oehring, 1997;

Riding and Haines, 2001), East Asia (Hatekayama et al., 1997), and North Africa (De Gobbi, 2003). These MGS are multilateral agreements that allow lenders, guarantors, and borrowers to interact with one another. The lenders are generally private financial intermediaries; guarantors may be private or public in nature. Both institutions interact to promote loan access for borrowers that typically have been underserved by formal credit markets. In this multi-party environment, guarantors facilitate borrowers' access to debt capital by distributing (costly) credit guarantees, which creates helpful conditions for firms, in terms of their investment and business activity cycles. The MGS appear likely to gain importance in the aftermath of the Basel II (and III) Capital Accords, which note that such guarantees, as long as they comply with certain requirements, can serve to help banks mitigate credit risk in their small business lending and thus save regulatory resources (SPGM, 2007; Cardone-Riportella et al., 2008). The allocation of mutual guarantees thus has gained momentum recently, especially in Organization for Economic Co-operation and Development (OECD) countries onset of the international financial sector crisis. In this context, MGS represent preferred instruments to extend credit to SMEs, without compromising banks' capital requirements (Uesugi et al., 2010).

However, whether third-party guarantees are effective instruments to promote lending to SMEs remains unclear, in both academic and policy literature. Some articles indicate the effectiveness of MGS for providing additional credit (e.g., Boocock and Shariff, 2005; Gale, 1991; Riding et al., 2007) or decreasing the costs of borrowing (e.g., Zecchini and Ventura, 2009; Columba et al., 2010). But others argue that their effect on ex post performance is ambiguous (e.g., Cowling, 2010; Boschi et al., 2014). Moreover, it is not clear that MGS offer perfect substitutes for collateral, considering their distinctive value as signaling instruments (Honohan, 2010). Noting this lack of consensus about the efficiency of MGS as instruments to promote lending to small firms (Zecchini and Ventura, 2009), we consider the types of borrowers covered by a MGS, the relation between mutual guarantees and loan collateralization, and the impact of third-party guarantees on loan prices and ex post firm performance. With these assessments, we contribute to policy and practice related to the evaluation of credit operations under MGS.

With data from one of the major commercial banks operating in Portugal, covering 11,181 loans granted to SMEs (54.61% granted under MGS, 78.52% collateralized by owner or business assets) between 2008 and 2010, this study provides consistent

answers to those questions in a scenario marked by economic and financial adversity. During this period, the economy and Portugal's financial market suffered from the international financial crisis, which laid bare the structural weaknesses of the nation's economy and the failures in bank supervision. The Portuguese government therefore instituted a set of actions to prevent bank freezes, including the exploitation of MGS, in line with recommendations to OECD countries. The events during this period greatly deteriorated the credit conditions for small businesses, increasing interest in the value of MGS. Some key influences, according to both OECD (2014) and BdP (2010) surveys, were the increase of sovereign debt and deep economic recession, which had the potential to invoke a crowding out effect on financial markets; the increase of nonperforming loans, which may have led to decreased credit activity by nonfinancial firms; and adjustments to bank capital ratios, in line with the Basel II (III) Capital Accord, which revealed banking supervision failures, such as those related to the bankruptcy of the *Banco Privado Português* and the public bailout of the *Banco Português de Negócios* (both unlisted on stock exchanges).

With these analyses, we make several contributions. First, this article provides an initial study of Portuguese MGS for SME lending in the context of the financial crisis. Second, the data source does not support a panel data analysis, but it provides information about borrowers after they received loans, namely, whether they defaulted or not. With this information, we can examine the "effectiveness" of MGS in an adversity setting (Uesugi et al., 2010). Third, we use data about the financial institution to control for the effect of the adjusted banking capital ratios imposed by the Basel Capital Accord on third-party guarantees. Fourth, this study is the first one to test explicitly the relation between mutual guarantees and collateral (business and personal), such that it helps clarify their potential substitution effect. To the best of our knowledge, this assumption has not been tested previously (e.g., Honohan, 2010).

Therefore, Section 2 reviews the relevance of mutual guarantees for SMEs, and Section 3 characterizes Portuguese MGS specifically. Section 4 describes the data, method, and variables, followed by Section 5, which reports the results of the study, and Section 6, which contains robustness tests. Section 7 summarizes the main conclusions.

2. The relevance of mutual guarantees: An overview

In the past two decades, policy tools aimed at providing credit guarantees to SMEs have become extremely popular forms of public intervention to promote growth in the private sector, in both advanced and emerging economies (Boschi et al., 2014). A

survey by the OECD (2013) noted that 19 of 23 countries had strengthened or introduced credit guarantee programs following the onset of the financial crisis.

The vast dissemination of MGS is based on the argument that mutual guaranteed loans reduce inefficiencies in banking markets for granting loans to SMEs. The MGS can help mitigate asymmetric information problems in the credit market for opaque borrowers, because the borrowers' creditworthiness is better known to a well-capitalized guarantor than to a lender (Honohan, 2010). With MGS, private information about the firm, beyond what the bank can normally see, is accessible in that MGS implicitly reveal to the bank that private information about the firm is good (Bartoli et al., 2013). That is, banks can interpret the MGS as a signal of the good quality of the borrower (Columba et al., 2010; Bartoli et al., 2013). Furthermore, MGS may help firms achieve joint responsibility, through increased peer monitoring, because members incur a penalty in the case of default by any single member (Columba et al., 2010). As a consequence, loan guarantee schemes may substitute for loan collateralization (Busetta and Zazzaro, 2012) and help small businesses avoid moral hazard or adverse information problems that can lead to credit rationing (Stiglitz and Weiss, 1981). Accordingly, the participation of a third-party in a loan contract may lead to reduced interest rates and increased credit availability for previously unfunded but potentially profitable projects (e.g., Gale 1990, 1991; Boocock and Shariff, 2005; Riding et al., 2007). Furthermore, the MGS alleviates some of the financial constraints of undercapitalized banks, which tend to miss profitable lending opportunities in uncertain settings (Diamond, 1989), such that they can better fund profitable projects. Overall then, the ex post performance of program participants should improve.

However, if MGS receive contributions from government agencies, mutual guarantees instead could exacerbate information problems and worsen credit conditions, such that they would reduce the incentives for financial institutions to monitor guarantee users or smooth collateral requirements at an inefficient point (Freixas and Rochet, 2008; Uesugi et al., 2010). Prior literature also provides evidence that managers of firms that have pledged no collateral are less likely to exert managerial effort (Boot et al., 1991) but tend to make riskier investments (Stulz and Johnson, 1985). If the bank loan is granted under a third-party guarantee, especially with public participation, the ex post performance of borrowers thus might worsen (de Meza 2002).

Furthermore, if the firms requesting mutual guarantees are not a random sample but rather represent a subsample that particularly needs the certification effect provided by

MGS, third-party–guaranteed loans may attract firms that were rejected by banks (Columba et al., 2010) or discouraged borrowers (for a discussion of discouragement, see Brown et al., 2011). These firms tend to be riskier than average (i.e., adverse selection effect). Honohan (2010) thus argues that during credit appraisals, lenders do not see a third-party guarantee as a perfect substitute for collateral. Under competitive pressure for bank loans, MGS instead might be used inefficiently, in the presence of self-selecting contracts, when borrowers cannot provide collateral to signal their information and credit quality. Furthermore, valuable collateral can act as a deterrent to moral hazard, reducing the likelihood of default (as is well established by theoretical literature; e.g., Besanko and Thakor, 1987a). Because MGS also do not cover the lender's entire exposure to risk, the bank has little incentive to grant attractively priced loans to the borrower (Boschi et al., 2014). Lenders thus may have no real interest in replacing collateral with mutual guarantees, because this substitution does not allow them to raise the loan's recovery rate in the case of default (Columba et al., 2010). Alternatively, the bank could establish the value of the guarantee offered by the MGS to the borrowing firm, which would reduce both the probability of default and the loss given default (Vogel and Adams, 1997). In this sense, the MGS acts as an additional collateral available to the bank rather than to the borrower (Bartoli et al., 2013). If the purpose of mutual guarantees is not to allow the lender to bring an otherwise insufficiently secured loan into compliance with regulatory requirements but rather to reduce the lender's risk exposure and the loss due to default for the lender, the benefits of MGS, in terms of social welfare, may be minimal (Honohan, 2010).[1]

Empirically, Zecchini and Ventura (2009) and Columba et al. (2010) find that small firms affiliated with Italian MGS pay less for credit and that banks benefit from the willingness of MGS to post collateral, because it implies better screening and monitoring of firms. Boschi et al. (2014) caution though that guarantees below 25% of the loan amount are ineffective, because the Italian Partial Guarantee Scheme does not allow lenders to require additional business collateral or personal commitments against the portion of the loan backed by the fund guarantee. These authors therefore advise firms to decline guarantees and avoid the related costs if the coverage ratio is below the 25% threshold. By examining the effects of a massive credit guarantee program

[1] Studying MGS in Malaysia, Boocock and Shariff (2005) find that the requirement for collateral is almost compulsory, which suggest the instruments are not substitutes. In such cases, the credit availability proved by mutual guarantees may diminish or be null (NERA, 1990).

implemented by the Japanese government from 1998 to 2000, Uesugi et al. (2010) show that the ex post performance of participants, with the exception of firms with sizable net worth, deteriorated relative to that of their nonparticipating counterparts. Furthermore, the availability of loans did not increase for these program participants. Rather, major banks frequently used the MGS to replace non-guaranteed loans with guaranteed loans, to reduce their exposure to risky assets.

The cloud of doubt hovering over the actual social welfare of mutual guarantees may thicken during financial crises or while the banking market adjusted to the capital requirements of the Basel II (III) Capital Accords. Bartoli et al. (2013) study the role of MGS in affecting the lending policies undertaken by banks at the peak of the 2007–2009 crisis in Italy. Small firms supported by MGS were less likely to experience financial tensions, even at that time of utmost financial stress. Furthermore, MGS served a signaling function, beyond the simple provision of collateral, so the information provided was significant in enhancing bank–firm relations, through scoring and rating systems (for surveys of MGS, see Gudger, 1998).

3. Characteristics of Portuguese mutual guarantee systems

Mutual guarantee systems first emerged in Portugal in 1992, due to a public initiative by the Institute to Support Small and Medium Enterprises and Innovation (IAPMEI). Similar to other European Union (EU) countries, where alternative SMEs financing systems already existed (e.g., Germany, France, Italy, Spain; Columba et al., 2010; AECM 2010), the Portuguese Society of Mutual Guarantees (SPGM)[2] was created to implement quality assurance operations and other services to SMEs. In 2003, three MGS were introduced, *Garval*, *Lisgarante,* and *Norgarante*, which took over all SPGM operations associated with guarantee provisions. In 2007, *Agrogarante* was created specifically to support the primary sector.

In Portugal, three parties are involved in credit guarantee transactions: the small business borrower, a financial institution, and (at least) one mutual guarantee society that represents the national "reinsurance" fund (i.e., Mutual Counter Guarantee Fund), which itself is backed mainly, but not exclusively, by the government, using public funds to cover part of the risk of MGS and leverage their ability to support SMEs. Other institutions may participate, such as the IAPMEI or Portuguese Institute of Tourism.

[2] The SPGM's activity is regulated by legal norms listed in the *Decreto-Lei nº. 309-A/07* published by the *Diário da República Portuguesa.*

Most guarantee applications are filed by banks or financial institutions on behalf of the borrowers, though some firms opt to file the application on their own. In the former case, the financial institution may conduct a preliminary screening before actually submitting the application to a mutual guarantee society. The society examines the application and makes a credit decision, on the basis of the track record of the firm and its shareholders; the conditions for growth for the firm's activity; the market in which it operates; its financial and economic situation; and its direct or indirect relationships with other firms. The maximum amount guaranteed to a borrower from the entire system is €1,000,000.00, conditional on a maximum of €500,000.00 provided by each society. The mutual guarantee covers 50–75% of bank loans or other financial products (e.g., leasing contracts, factoring). For example, for bank loans with a maturity of at least three years granted to smaller companies (fewer than 100 employees), the ratio could reach 75% of capital, benefiting from a counter-guarantee provided by the European Investment Fund (SPGM, 2007).

If the application is approved and there is an institution available to provide the loan, the credit granting process starts immediately (otherwise, the SPGM can collaborate to seek a lender). First, to obtain guaranteed loans, SMEs must become shareholders in the SPGM. Their share position corresponds to 2% of the issued guarantee they acquire from the promoter or from another mutualist (i.e., shareholder), which can be sold at their nominal value to SPGM or another firm, after the expiration of the guarantee. The mutualist character of these agreements helps support the SMEs and their development on favorable terms. The SMEs are not mere customers but also shareholders, which helps ensure strong customization and a real emphasis on assessing and meeting their needs. Second, the borrower must pay a guarantee commission annually, usually corresponding to minimum of 0.5% and a maximum of 4.5% of the outstanding amount of the guarantee, depending on the type of guarantee and the firm's own risk assessment. Third, the SPGM, or a debt collection institution, collects the loan.

4. Data, method, and variables

4.1. Data

This study uses data from one of the major commercial banks operating in Portugal, gathered between January 2008 and December 2010.[3] These data represent the Portuguese banking environment reasonably well, in that they came from a long-term

[3] We guaranteed this bank confidentiality and anonymity for it and its customers.

credit decision period and cover most of this large bank's credit portfolio for different geographical regions. Interviews with account managers also revealed that the bank maintains a single general credit policy, according to which account managers may approve credit requests below a certain threshold on their own; if the credit request surpasses this threshold, the decision occurs at a central bank level. The degree of market concentration, measured by the Herfindahl-Hirschman index, was 1303, which indicated a moderately concentrated market (APB 2012: 29, 63).[4]

In Portugal, SMEs represent 99.6% of businesses and create 75.2% of private employment and 56.4% of trade (BdP, 2013). Accordingly, the data set comprises 11,181 loans granted to SMEs.[5] Most of the loans were issued in 2010 (43.08%) and 2009 (38.72%), rather than 2008 (18.20%). Previous research reveals that loan terms can differ as a function of the type of business operation (Berger and Udell, 1998), so we sought to focus on financial loans[6] and excluded unincorporated business, for which the assets are not separate from the owner's (usually classified as households).

4.2. Method

First, we investigate the determinants of the incidence of third-party guarantees. On the basis of our literature review and the characteristics of the Portuguese MGS, we consider the role of the borrower risk type and the impact of the lender's capital ratios on the decision to grant mutual guaranteed loans (e.g., SPGM, 2007; Cardone-Riportella et al., 2008; Ono et al., 2013). To test for the controversial substitution effect between collateral and mutual guarantees (Honohan, 2010), we also include the borrower´s collateralization profile, which controls for the different types of assets provided to secure the loan. We also control for the loan size and sector of activity. By including interactions between risk type variables, we note the potential cross-effect between observed risk and private information on mutual guaranteed loans. We assume that the bank holds all bargaining power in the lending relation, but the borrower gains non-

[4] Values of this ratio below 1000 suggest little bank concentration, values between 1000 and 1800 indicate moderate concentration, and values greater than 1800 imply a highly concentrated market.

[5] We define SMEs in line with the European Commission (2003/361/EC) and the Basel II agreement, as firms with fewer than 250 employees and annual business volumes less than €50 million or assets that do not exceed €43 million (EC, 2003).

[6] We also exclude loans that are mainly transaction driven (e.g., mortgages, equipment loans, motor vehicle loans, loans based on the purchase of fixed assets), because they are typically granted on a (business) collateral basis; in asset-based lending of this type (Steijvers and Voordeckers 2009; Berger and Udell, 2002), it is frequently mandatory to provide the assets funded by the loan as collateral, independent of the observable or private borrower's information. Including these loans in the sample would likely skew the global results, especially when we test the relation between mutual guarantees and loan collateralization.

observable private benefits from accessing the credit market and conducting its entrepreneurial activity (e.g., Busetta and Zazzaro, 2012). Therefore, we test the following model with a Probit estimator:

$$y_i = \beta_1 \text{borrower risk type}_i + \beta_2 \text{collateralization profile}_i + \beta_3 \text{lender characteristics}_i + \beta_4 \text{control variables}_i + \beta_5 \text{ interactions variables}_i + \varepsilon_i \quad \text{for } i = 1, \ldots, N \qquad (1)$$

where y_i is a binary variable that takes a value of 1 if the firm receives a mutual guaranteed loan and 0 otherwise.

Second, in line with Columba et al. (2010), this study examines the effect of MGS on the explicit loan price (i.e., interest rate). Because the negotiation of the interest rate may depend on the borrower's characteristics, we include borrower risk type in this model. We also analyze bank loans granted during a period of adjustment (Basel II), so we include the lender's financial characteristics in the model too. We control for loan size and the sector of activity. Finally, we control for the cross-effect between mutual guarantees and collateral availability on the loan interest rate, because the cost of borrowing frequently depends on the presence of MGS (Columba et al. 2010) and the collateral pledged (Zecchini and Ventura, 2009). The model is:

$$y_i = \alpha_1 + \beta_1 MG_i + \beta_2 \text{borrower risk type}_i + \beta_3 \text{lender characteristics}_i + \beta_4 \text{control variables}_i + \beta_5 \text{interaction effect}_i + \varepsilon_i \quad \text{for } i = 1, \ldots, N \qquad (2)$$

where y_i is the interest rate premium (IRP) charged by the bank, beyond the index (i.e., Euribor 12 months), and MG is the mutual guaranteed loan.

When testing for the effect of mutual guarantees (and the interaction effect of mutual guarantees and collateralization) on the loan interest rate paid, we assume the possibility that these variables are jointly determined,[7] which may promote endogeneity concerns, caused by the correlation between the endogenous variables and the error term. We therefore followed the instrumental variables (IV) method proposed by Rivers and Vuong (1988) and Wooldridge (2010). First, ordinary least squares (OLS) serve to regress the mutual guarantee (and collateral variables) as possible endogenous variables on all independent and control variables, including IVs, to obtain the reduced form of the residuals (i.e., reduced form regression). Second, the OLS regression expands to the IRP on all exogenous variables, including residuals obtained in the first step (e.g., Ono and Uesugi, 2009). If the residual t-statistics are not statistically significant, the results

[7] Brick and Palia (2007) proved that loan interest rate negotiation and collateral requirements are jointly determined. See also Columba et al. (2010).

do not reject the null hypothesis that the contract terms are exogenous. If we find evidence of endogeneity, we perform Durbin (1954) and Wu-Hausman (Wu, 1974; Hausman, 1978) tests of the null hypotheses that the MG (Collateral) is exogenous. If the contract terms are endogenous, we must replace the OLS model with a two-stage least squares (2SLS) model for IRP. As checks on the validity of the estimations and instruments, we used the Durbin and Wu-Hausman tests expanded to Wooldridge's (1995) robust score and robust regression-based tests (see Baum, 2006), as well as the F-test and Cragg and Stock and Yogo (2005) test for weak identification (H_0: The instrumental variable is weak, such that Corr (x, z) = 0).

Finally, to investigate the socio-economic welfare effect of MGS (Honohan, 2013) we explicitly test the outcome of mutual guarantees in terms of the firm's ex post performance. The ex post performance of a borrower likely is linked to its current risk, so we include borrower risk type; the model also controls for the loan size and sector of activity. Again, we test the cross-effect between mutual guarantees and the incidence of collateral on the ex post performance of the firm, thus extending the investigation to its relation.[8] We use a Probit estimator to test the following model:

$$y_i = \beta_1 MG_i + \beta_2 \text{borrower risk type}_i + \beta_3 \text{interaction effect}_i + \varepsilon_i \quad \text{for } i = 1, \ldots N \quad (3)$$

Because our data set does not include information about the financial performance of borrowing firms, we focus on loan performance (Uesugi et al., 2010; Cowling, 2010). That is, y_i is a binary variable that takes a value of 1 if the borrower does not have any loans in default at the time the loan was granted but defaults after obtaining the loan.

4.3. Variables

4.3.1. Dependent variables

The dependent variable *MG* in Equation 1 is binary; it is equal to 1 if the firm receives a mutual guaranteed loan and 0 otherwise. In Equation 2, *IRP* is the dependent variable, reflecting the interest rate premium charged by the bank, beyond the index (i.e., Euribor 12 months). *Default* is the dependent variable in Equation 3, and it takes a value of 1 if the borrower does not have any loan in default at the time the loan was granted but then defaults after obtaining the loan and 0 otherwise (Jiménez et al., 2009).

4.3.2. Independent variables

The lender and MGS examine the application for mutual guaranteed loans and make credit decisions, on the basis of their risk perceptions of the borrower, the market

[8] We do not include the lender's characteristics in this model, because theoretically, bank capital ratios should not influence the borrower's ex post performance.

conditions in which the firm operates, its financial and economic situation, and the firm's track record (SPGM, 2007). Therefore, to analyze borrowers' risk type, this study relies on *industry risk* (Han et al., 2009), *financial tension* (Bartoli et al., 2013), and *credit score* (Ono et al., 2013).[9] *Industry risk* is the ratio of the defaulted to total loans granted by the average industry.[10] *Financial tension* is the ratio between the loan amount approved by the bank to the firm and the total credit available in the entire financial system for this firm (as a percentage).[11,12] For a given loan size, high ratio values indicate relative financial distress for further funding rounds. *Credit score* is defined by the lender at the time it grants the loan, using an internal ratings–based approach. This score combines data about the personal credit history of the small business owner with firm financial data, then allows for the definition of three binary credit score groups: *high credit score* equals 1 if the score is classified as AAA to BB; *medium credit score* equals 1 if the score if classified as BB- to B-; and *low credit score* is 1 for scores of CCC and C. Each variable equals 0 otherwise.[13]

Academic and empirical literature suggests that a mutual guarantee replaces the need to provide collateral, at least to some extent. By legal imposition, MGS limits the percentage of the loan that can be secured by a third-party guarantee though. This limitation can make mutual guarantees inefficient and unattractive for lenders and borrowers in the absence of collateral (Boschi et al., 2014). Furthermore, by posting their own collateral, borrowers provide a more credible signal of their creditworthiness and ex post commitment, which deters adverse selection (Bester, 1985; Chan and Kanatas, 1985) and moral hazard (Boot et al., 1991) and thereby reduces the likelihood

[9] Age and size are commonly used to measure the opacity of an SME and firm sales or profitability to measure firm risk. However, our data set comprises substantial information about the loan granted to a borrower, without much information about the borrower firm.

[10] Han et al. (2009) use industry profitability and industry risk to predict the incidence of collateral and the loan interest rate. Industry profitability is measured by industry average pre-tax income to total assets, and industry risk is measured by the standard deviation of profitability.

[11] Portuguese law mandates that all institutions report, on a monthly basis to the Banco de Portugal (BdP), all loans above 50 euros. This information is maintained in the Central Credit Register (CRC). Thus, when granting a new loan, a bank can observe the total amount borrowed from other banks, as well if the applicant has any credit overdue.

[12] Bartoli et al. (2013) define *Financial tension* as binary variable, equal to 1 if in December 2008, the firm was using more than 70% of its line of credit granted by the banking system and if in March 2009 (the peak of the crisis) it was using more than 80% (i.e., increase of more than 10%). It takes a value of 0 otherwise. Data limitations prevent us from using this measure, because we do not know the evolution of available credit in the banking system for the firm during the maturity of the loan.

[13] The database provided by the bank reports four credit score categories: (1) Credit Score AAA to BB; (2) Credit Score BB-; (3) Credit Score B+ to B-; and (4) Credit Score CCC to C. Our objective is to examine behavior in the two extreme categories, high and low, so we aggregated the two intermediate levels.

of default (Besanko and Thakor, 1987a). Therefore, posting extra collateral should help the borrower access a third-party guaranteed loan. In this framework, if collateral is required to receive a mutual guaranteed loan, both the borrower and lender likely privilege the use of personal assets, because personal collateral is more effective in limiting the borrower's risk preferences, in that it increases the chances that the borrower will feel any losses due to default personally (Mann, 1997a, b; Voordeckers and Steijvers, 2006; Menkhoff et al., 2012). Alternatively, the substitution effect might exist for business collateral if mutual guarantees promote lending activity even when the firm's business assets are constrained. To test whether posting extra collateral increases access to a mutual guaranteed loan, this study uses a binary variable that equals 1 if the borrower receives a mutual guaranteed loan with extra collateral and 0 otherwise (i.e., *Collateral*). To make the test of differences explicit, we use two alternative binary variables: *Business collateral* equals 1 if the borrower has pledged firm assets as collateral, and *Personal collateral* equals 1 if the borrower has pledged personal assets as collateral to receive the loan. Each variable equals 0 otherwise.

To control for adjustments to the bank capital ratios, in line with the Basel II Capital Accord, we measured lender characteristics, in the form of *Tier 1* and *Solvability ratio* variables. *Tier 1* is the ratio of total equity, less revaluation reserves, to risk-based assets; *Solvability* is the ratio of equity to debt. We also control for the *loan size* and *sector* of activity. To examine the possibility of endogeneity in *MG* (and interaction effects of MGS and collateralization) and the IRP variables in Equation 2, we use *Project Finance*, a dummy variable that equals 1 if the loan was granted to finance a project and 0 otherwise (Godlewski and Weill, 2011) as an IV.

The interaction effects among *credit score*, *industry risk,* and *financial tension* in Equation 1 seek to control for the relation between mutual guarantees and the firm´s risk. Therefore, *Inter1* is the interaction between *High credit score* and *Industry Risk*; *Inter2* is the interaction between *High credit score* and *Financial Tension*; *Inter3* is the interaction between *Low credit score* and *Industry Risk*; and *Inter4* is the interaction between *Low credit score* and *Financial Tension*. To control the relation between mutual guarantees and IRP (Equation 2) and ex post default (Equation 3), we use the variable *Inter 5*, which reflects the interaction of *MG* and *Collateral*. With this interaction, we test explicitly for the impact of posting extra collateral, as a signal of borrowers' credit quality, on both loan prices and ex post default. Appendix A provides the definitions of the variables in more detail.

5. Results

5.1. Descriptive statistics and univariate tests

Table 1 reports the descriptive statistics. The sample comprises 11,181 loans with a maximum volume of 65 million euros. Of these loans, 55% were supported by mutual guarantees and 79% were collateralized. According to this preliminary finding, collateral posted by borrowers is relevant for obtaining a loan in an MGS (Boschi et al., 2014). The sample includes 5,839 (52.2%) loans classified as high credit scores. Almost 17% of the sample loans experienced default, and the mean interest rate premium is 2.89%. The mean of the Tier 1 ratio is 8.4%; that of the solvency ratio is 12.13%, both above the minimum value required by the Basel II. The mean value of the loans granted is €251,984. The industry sectors most widely represented in the sample are wholesale and retail, repair of motor vehicles and motorcycles (Sector G, 34.5%), and manufacturing (Sector C, 25%). The least represented include electricity, gas, steam, hot and cold water, and cold air industries (Sector D, 0.1%), as well as artistic activities, entertainment, sports, and recreation (Sector R, 0.5%); service activities (Sector S, 0.6%); collection, purification, and distribution of water, sanitation waste management, and remediation activities (Sector E, 0.6%); education (Sector P, 0.7%); financial and insurance activities (Sector K, 0.8 %); and the extractive industry (Sector B, 1%).

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

Table 2 contains the results of the nonparametric univariate tests, for *MG* (Panel A) and *Default* (Panel B). At the mean level, mutual guaranteed loans go to firms that pay lower interest rates (2.55% vs. 3.3%) and with lower ex post default events (11% vs. 24%). Panel A also shows that borrowers with high credit scores tend to receive these loans (59% vs. 44%), according to the positive relation between the *Industry Risk* (*Financial Tension)* and *MG*. We find a positive relation between mutual guaranteed loans and the incidence of collateral (incidence = 61% in nonguaranteed loans, 93% in mutual guaranteed loans). In line with prior literature and Table 1, this result suggests that poorly guaranteed firms do not obtain additional financing if their collateral guarantee intensity is too low (e.g., Boschi et al., 2014). With regard to the type of collateral, the results indicate a negative (positive) link between MG and business (personal) collateral. If the borrower is business collateral constrained, the lender may require personal collateral to provide (costly) guarantees (93% vs. 58%). Therefore, the coverage ratio between the guaranteed and lending amount is an important tool to mitigate moral hazard, such that it serves as a performance bond against post-loan

managerial shirking and risk-taking activities (Boot and Thakor 1990). In exchange, firms face lower loan interest rates (2.55% vs. 3.3%) (Gama and Duarte, 2015).

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

The results of Panel B further indicate that, at the mean, the incidence of default is higher for non-guaranteed loans, for loans granted to firms operating in riskier industries and with low credit scores, and among firms that pay higher loan interest rate premiums.

5.2. Determinants of mutual guaranteed loans

Table 3 contains the results for the determinants of mutual guaranteed loans (i.e., Equation 1).[14] Because we have several collateral and lender characteristics variables, we estimate different regressions to avoid multicollinearity. Regression [1] includes only borrower risk type variables; Regressions [2] and [3] add collateral profile variables, Regressions [4] and [5] include lender characteristics but exclude collateral variables, Regression [6] features the borrower's risk profile and all control variables, and Regressions [7]–[11] employ the interactions variables, with different combinations of the collateral and lender characteristics variables. According to the Probit estimations, firms operating in riskier industries (*Industry risk* $p < .01$, regressions [1], [2], [3] and [5]; $p < .05$ regression [4]) and in contexts with higher *financial tension* are more likely to obtain mutual guaranteed loans, regardless of the lender's preference for firms with *high credit score* (the coefficients are statistically significant in regressions [1]–[5], $p < .01$). Interaction effects (regressions estimations [7]–[11]) confirm that firms operating in riskier sectors and/or with greater financial difficulties have the most likely access to mutual guaranteed loans, if and only if the bank identifies them as having high credit scores (positive coefficients of *Inter 1* are statistically significant in all regressions, $p < .01$; positive coefficients of *Inter 2* are statistically significant at the 1% level in regressions [10] and [11] and the 5% level in regression [7]; the negative coefficients of *Inter 3* and *Inter 4* are statistically significant at the 1% level in regressions [10]–[11] and [7]–[10], respectively).

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

[14] We isolate *Industry risk* and *Sector* variables when the first variable also varies depending on the activity sector. *Collateralization profile* and activity *sector* are isolated, because the ability to provide collateral relates closely to the characteristics of the individual loan and firm (Berger and Udell, 1998) which may vary across sectors. *Loan size* and *collateralization profile* are also isolated; these variables can be jointly determined, and it is very difficult to find a good instrumental variable for the loan size that is not related to the incidence of collateral (e.g., Brick and Palia, 2007).

The probability of benefiting from a mutual guaranteed loan thus ranges from 47% to 55%. A mutual guaranteed loan is more likely for borrowers that provide *collateral* ($p < .01$, regression [2]). Yet a closer analysis reveals that MG and business collateral are substitutes ($p < .01$, regression [3]), whereas MG is a complement to personal collateral ($p < .01$, regression [3]). In line with the univariate tests results, we find that lenders value the provision of extra collateral, in the form of personal assets, in their credit decisions, either as a deterrent to moral hazard (e.g., Besanko and Thakor 1987a) or simply to increase coverage of the secured loan.

Moreover, an increase of bank capital ratios (Tier 1 and Solvability ratio) increases the number of loans granted under MGS ($p < .01$, regressions [4] and [5]). It appears that under the new set-up imposed by Basel II, the relevance of MGS increases for Portuguese banks, because these schemes, in certain conditions (e.g., Basel II categorizes most MGS as guarantors; Gai, 2005; Vallascas, 2005), can help mitigate banks' SMEs portfolio risks and reduce regulatory capital requirements. Furthermore, smaller loans are more likely to attract a mutual guarantee ($p < .01$, regression [6]). Assuming that loan size is a good proxy for firm size (e.g., Columba et al., 2010), this result indicates that mutual guarantees actually are used to extend credit to smaller firms, which tend to be constrained in their business assets (Menkhoff et al., 2012), and to fund previously unfunded, profitable projects (Gale 1990, 1991). Human capital–intensive activities, such as information and communication (Sector J) or human health (Sector Q) sectors, are most likely to benefit from mutual guarantees. Agriculture, animal production, or fishing (Sector A),[15] financial and insurance activities (Sector K), and real estate (Sector L) are the sectors less likely to benefit from them. The results for Regressions [8]–[11] (panel B) remain unchanged, compared with those reported in estimations [2]–[5] (panel A).

5.3. Mutual guaranteed loans and the cost of borrowing

Tables 4 and 5 report estimations of the effect of mutual guarantees on loan interest rates (Equation 2). Because mutual guarantees, the effect of posting extra collateral (*Inter 5*), and the cost of borrowing (IRP) could be jointly determined, in Table 4 we report benchmark estimations to evaluate the potential presence of endogeneity among these variables. We first regress the IRP on all variables, assuming that *MG* and *Inter 5* (i.e., interaction effect between *MG* and *Collateral*) are exogenous (Ono and Uesugi,

[15] The early development stage of Portuguese MGS in Sector A during the study period might explain this result (see Section 3).

2009). Then we report endogeneity tests: the residual t-statistics of the potential endogenous variables (*MG* and *Inter5*) in the first step, as well as the Durbin chi-square (Durbin, 1954) and Wu-Hausman F-test (Wu, 1974; Hausman, 1978).

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

For the OLS estimations, the residual t-statistics in the regressions that include the *MG* variable (Regressions [1]–[4]) fail to reject the null hypothesis of exogeneity at a 10% statistical significance level. When we interact *MG* with *Collateral* (*Inter 5*), the residual t-statistics reject the null hypothesis at a 1% statistical significance level. The Durbin chi-square and Wu-Hausman F-test confirm the previous results. With this mixed evidence about the presence of endogeneity, we refit the estimations using a 2SLS model (Ono and Uesugi, 2009). The IV for *MG* and *Inter 5* variables is *Project Finance*.

Table 5 contains these results; they are very similar to those obtained from OLS (table 4). Regression [1] includes only the fitted value of MG and the borrower's risk type; Regressions [2] and [3] include the lender characteristics; Regression 4 replaces industry risk with sector variables and the loan size (i.e., control variables). Then Regressions 5–8 follow the same pattern but substitute the fitted value of MG by *Inter 5* (fitted value). These results broadly confirm that borrowers benefit from a reduction in loan interest rates due to a willingness to provide MG (negative coefficients in Regressions [1]–[4] are statistically significant, $p < .01$), in line with Zecchini and Ventura (2009) and Columba et al. (2010). This reduction is particularly noteworthy if the firm provides extra collateral (negative coefficients of fitted values of *Inter 5* in Regressions [5]–[8] are statistically significant, $p < .01$). These results are partially in line with Boschi et al. (2014): Below a certain level of the third-party guarantee, the borrower benefits in terms of its costs when it posts extra collateral. If borrowers offer collateral and the loan is mutual guaranteed, the lender interprets it as a good signal while also enjoying reduced risk exposure. In turn, these borrowers benefit from a discounted IRP. This evidence also confirms Honohan's (2010) prediction that, in terms of credit decisions, lenders do not regard mutual guarantees as a perfect substitute for collateral, despite academic predictions that they offer identical signaling value (e.g., Busetta and Zazzaro, 2012).

Furthermore, the results confirm that firms operating in a stressful context (i.e., in riskier industries, or with high financial tension) and those with low credit scores pay higher IRP, while those with higher credit scores pay lower IRP ($p < .01$; Han et al.,

2009). The results suggest that increasing bank capital ratios (Tier 1 and Solvability ratio) increases loan pricing—a result that was expected once the Portuguese banking sector committed to increasing its capital ratios and constrained credit provision by increasing interest rates (Stiglitz and Weiss, 1981). The negative coefficients of *LoanSize* in Regressions [4] and [8] ($p < .01$) confirm that large loans relate negatively to IRP (Gama and Duarte, 2015). In addition, the extractive industry (Sector B); collection, purification, and distribution of water, sanitation waste management and remediation activities (Sector E); financial and insurance activities (Sector K); and scientific and technical consultancies (Sector M) pay higher IRP for their bank loans.

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

5.4. Mutual guaranteed loans and ex post performance

Table 6 reports Probit estimations of the effect of MG and *Inter 5* on ex post performance loans (Equation 3). The first estimation comprises only the MG variable and borrower's risk variables, the second substitute's industry risk with sector activity variables and loan size, and then the subsequent estimations follow the previously set pattern by including the interaction variable (*Inter 5*). The negative coefficients of *MG* and *Inter 5* (statistically significant in all regressions, $p < .01$) suggest that mutual guaranteed loans are less likely to enter into default, independent of whether the loan is collateralized (i.e., marginal effects of *MG* and *Inter 5* in the *Default* likelihood are very similar ≈ 14%). These results confirm that borrowers who benefit from MGS show higher ex post performance, in partial contrast with the findings of Ono et al. (2013)[16] and in line with Bartoli et al. (2013). In line with our predictions, firms operating in riskier industries have a higher likelihood of default (positive coefficients of *industry risk* in Regressions [1] and [3] are statistically significant, $p < .01$). Yet firms operating in contexts marked by greater financial tension have a lower probability of ex post default (positive coefficients of *financial tension* are statistically significant, $p < .01$ in Regressions [1] and [3] and $p < .05$ in Regressions [2] and [5]). As expected, borrowers assigned a high (low) credit score entered default less (more) (negative [positive] coefficients of *high [low] credit score* are statistically significant at the 1% [5%] level in all regressions). This evidence reinforces the outcomes from Table 3, as well as the value of public mutual guarantees to provide funds to good firms that simply are

[16] Ono el al. (2013) show that the ex post performance of firms that received mutual guaranteed loans, in an emergency program, deteriorated more than that of firms that received non-emergency mutual guaranteed loans. They do not find such a performance "deterioration" effect when a non-main bank extended the emergency mutual guaranteed loans though.

operating in adverse contexts (i.e., greater financial tension) and thus facing difficulties receiving funds (Gale, 1990, 1991). However, the lack of a significant effect of *loan size* on ex post performance does not confirm the prediction that large loans tend to be riskier (Leeth and Scott, 1989). Extractive (Sector B), manufacturing (Sector C), construction (Sector F), wholesale and retail repair of motor vehicles and motorcycles (Sector G), transportation and storage (Sector H), real estate (Sector H), and scientific and technical consultancies (Sector M) are the sectors most likely to enter default.

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

6. Post-estimation and robustness tests

With post-estimation tests, we check the *IRP* and *MG* (and *Inter 5*) to confirm the results of the Durbin and Wu-Hausman tests. The F-statistic for *Project Finance* as an IV (statistically significant at 1% in all estimations) is greater than 10, so the IV is not weak (Stock et al., 2002). The Stock and Yogo (2005) tests also reject the null hypothesis of a weak IV (10% rejection rate), after we confirm that the Cragg and Donald (1993) minimum Eigenvalue statistics are higher than the critical value obtained in the 2SLS Wald test.[17]

In Appendices B–D, we provide the results of a subsample analysis.[18] The results generally confirm the previously identified relations. Appendix B contains the results related to determinants of mutual guaranteed loans and confirm that third-party guaranteed loans are granted mainly to good firms operating in adverse contexts (i.e., risker industries or high financial tension). These results also confirm the predicted probability of obtaining a mutual guaranteed loan (with independent variables at their mean values), such that Prob (MG) is higher for collateralized loans (65%) than for non-collateralized loans (17%). Furthermore, borrowers classified with a high credit score are more likely to obtain a mutual guaranteed loan (62%) than those with low credit scores (45%) when both provide extra collateral.

The results of the robustness test related to the effect of *MG* on *IRP* show that mutual guaranteed loans pay lower loan prices, especially for collateralized loans (Appendix C). The positive effect of banking capital ratios on loan price is even higher for non-collateralized loans. Appendix D reports on the robustness test for the influence of *MG* on ex post performance, such that this performance improves with mutual credit

[17] These results are available on request.
[18] The robustness tests do not include the control variables (i.e., loan size and sector activity). These results are available on request.

guarantees, independent of collateral requirements. However, the predicted probability of default when the independent variables are at their mean (Prob (Default)) is higher for noncollateralized loans (i.e., 22% vs. 12%).

These results support the thesis that the efficiency of mutual guarantees does not exempt loan collateralization. However, they reveal that banks use third-party guarantees to extend (cheaper) credit to good firms that are suffering increased exposure to credit rationing. Doing so reduces the banks' risk exposure and losses in the case of default, while increasing the ex post performance of the borrowers. These effects are especially noticeable when third-party guarantees combine with collateral.

7. Concluding remarks

Credit guarantee schemes might emerge for three main reasons. First, the informational advantages they provide can help overcome information asymmetries, improve borrowers' access to bank loans, and reduce the costs of borrowing for certain borrowers. Second, MGS help diversify risk across lenders that exhibit sectorial or geographic specialization. Third, MGS can exploit regulatory arbitrage, if they are not subject to the same regulatory requirements as the lender (e.g., Beck et al., 2010; Columba et al., 2010). The importance of mutual guarantees in Portugal thus has increased, serving as privileged instruments to absorb the negative impacts of the international financial crisis of 2008–2009 on the banking sector, even as this sector reacts to the Basel II (and III) Accords.

The many competing pressures for public funds suggests the strong need to evaluate the effectiveness of MGS that include the participation of government agencies. To the best of our knowledge, this study is the first comprehensive evaluation of the types of loan covered by mutual guarantees, the relation between guarantees and extra collateral, and the effectiveness of mutual guarantees in terms of reducing borrowing costs and affecting the ex post performance of both the firm and the loan.

With this study, we find that MGS privileges less risky borrowers, such that mutual guarantees and collateral (broadly measured) are complementary loan tools. However, MG and business collateral function more as substitutes, while MG complements personal collateral. These results suggest that lenders value the provision of extra collateral in the form of personal assets, either as a deterrent to moral hazard and to adverse selection or as a means to increase their coverage of a secured loan. In light of the Basel II (and III) Accords, MGS allow banks to mitigate their credit risk associated to business lending, save regulatory capital, and redub both the probability of default

and the losses if default occurs. Accordingly, an increase of bank capital ratios increases the number of loans granted. The results further confirm that mutual guaranteed loans pay lower interest rate premiums, especially in the presence of collateralized loans. In contrast with de Meza (2002), we find that MGS reduce the probability of ex post default, independent of the collateral requirements, though the evidences suggests that this negative relation increases in the presence of mutual guaranteed and collateralized loans.

The comprehensive insights confirm the value of MGS as a tool to improve Portuguese banking loan activity, especially for good SMEs operating in stressful contexts, and to reduce borrowers' ex post default, while still enabling banks to adhere to new banking regulations. However, efficiency of these mutual guarantees does not exempt borrowers from loan collateralization. The intervention of the government in credit guarantee systems thus is important for providing additional funds to constrained SMEs but has less relevance for risk assessment, screening, and monitoring. In line with Boschi et al. (2014), we assert that it is unacceptable to ignore the heterogeneity in guarantees or consider all firms equally. In addition to the signaling role of MGS, the pure provision of guarantees is still required, so collateral remains virtually compulsory. The obstacles to access bank loans remain for SMEs that cannot provide collateral.

Future investigations should address the impact of MGS using the value of the guarantees provided. From a financial stability perspective, the coverage ratio—namely, the ratio between the guaranteed and borrowed amount—constitutes an important instrument for minimizing risk, by limiting moral hazard problems for both borrowers and lenders (Boschi et al., 2014). Empirical studies of the value of mutual guarantees largely neglect this approach, mainly due to data limitations that prevent clear analyses of the financial impact of partial versus total coverage ratios on banks' and firms' performance. Further research should investigate the relation between mutual guarantees and the coverage ratios of business or personal collateral. We show that mutual guarantees and collateral are complementary, mainly by increasing signals of the borrower's creditworthiness. Nonetheless we wonder if, once the signal exists, borrowers might receive a "discount" on the ratio of collateral required, in the presence of a mutual guaranteed loan.

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Table 1. Descriptive Statistics

	Observations	Mean	Standard	Min.	Max.
Dependent variables					
MG	11,181	0.546	0.498	0	1
IRP	11,181	2.890	1.145	0.50	13.78
Default	11,181	0.172	0.377	0	1
Borrower risk type					
Industry risk	11,181	4.689	1.803	0.125	7.075
Financial Tension	11,181	39.370	27.001	0.024	100
High credit score	11,181	0.522	0.500	0	1
Medium credit score	11,181	0.444	0.497	0	1
Low credit score	11,181	0.033	0.179	0	1
Collateralization profile					
Collateral	11,181	0.785	0.411	0	1
Business collateral	11,181	0.078	0.268	0	1
Personal collateral	11,181	0.770	0.421	0	1
Lender characteristics					
Tier 1	11,181	8.399	0.684	7	8.90
Solvability Ratio	11,181	12.125	0.686	10.70	12.60
Interaction variables					
Inter1	11,181	2.466	2.689	0	7.075
Inter2	11,181	19.710	26.814	0	100
Inter3	11,181	0.134	0.800	0	7.075
Inter4	11,181	1.626	10.103	0	100
Inter5	11,181	0.506	0.500	0	1
Control variables					
LoanSize	11,181	251,984.500	1,304,331.000	5,000	65,000,000
Sector_A	11,181	0.017	0.130	0	1
Sector_B	11,181	0.010	0.101	0	1
Sector_C	11,181	0.250	0.433	0	1
Sector_D	11,181	0.001	0.025	0	1
Sector_E	11,181	0.006	0.078	0	1
Sector_F	11,181	0.129	0.335	0	1
Sector_G	11,181	0.345	0.475	0	1
Sector_H	11,181	0.037	0.189	0	1
Sector_I	11,181	0.039	0.194	0	1
Sector_J	11,181	0.019	0.135	0	1
Sector_K	11,181	0.008	0.087	0	1
Sector_L	11,181	0.021	0.143	0	1
Sector_M	11,181	0.051	0.220	0	1
Sector_N	11,181	0.023	0.151	0	1
Sector_P	11,181	0.007	0.083	0	1
Sector_Q	11,181	0.026	0.158	0	1
Sector_R	11,181	0.005	0.074	0	1
Sector_S	11,181	0.006	0.075	0	1
Project Finance	11,181	0.323	0.468	0	1

Notes: MG = 1 if a borrower receives a mutual guaranteed loan (0,1); *IRP* = difference between the contractual interest rate for the loan and the prime rate; *Default* = 1 if the borrower did not default previously but defaulted after the loan was granted (0,1); *Industry risk* = ratio of default loans divided by total loans granted by industry; *Financial Tension* = ratio between the loan amount approved by the bank to the firm and the total credit available in the entire financial system for the firm (%); *High credit score* = 1 if the loan is classified with an internal credit score of AAA to BB (0, 1); *Medium credit score* = 1 if the loan is classified with an internal credit score of BB- to B- (0,1); *Low credit score* = 1 if the loan is classified with an internal credit score of CCC to C (0,1); *Collateral* = 1 if the borrower has pledged collateral (0,1); *Business collateral* = 1 if the borrower has pledged firm assets as collateral (0,1); *Personal collateral* = 1 if the borrower has pledged personal assets as collateral (0,1); *Tier 1* = ratio [(total equity – revaluation reserves)/risk-based assets]; *Solvability* = ratio (equity/debt). *Inter1* = [High credit score × Industry Risk]; *Inter2* = [High credit score × Financial Tension]; *Inter3* = [Low credit score × Industry Risk]; *Inter4* = [Low credit score × Financial Tension]; *Inter5* = [MG × Collateral]; *LoanSize* is the loan amount measured in euros; *Sector_A* = 1 if borrower belongs to the agriculture, animal production, or fishing industry (0,1); *Sector_B* = 1 if borrower belongs to the extractive industry (0,1); *Sector_C* = 1 if borrower belongs to the manufacturing industry (0,1); *Sector_D* = 1 if borrower belongs to the electricity, gas, steam, hot and cold water, and cold air industry (0,1); *Sector_E* = 1 if borrower belongs to the collection, purification, and distribution of water, sanitation waste management and remediation activities (0,1); *Sector_F* = 1 if borrower belongs to the construction industry (0,1); *Sector_G* = 1 if borrower belongs to the transportation and storage industry (0,1); Sector_H= 1 if borrower belongs to the transportation and storage industry (0,1); *Sector_I* = 1 if borrower belongs to the lodging, restaurant and similar industries (0,1); *Sector_J* = 1 if borrower belongs to the information and communication activities industry (0,1); *Sector_K* = 1 if borrower belongs to the financial and insurance industry (0,1); *Sector_L* = 1 if borrower belongs to the real estate industry (0,1); *Sector_M* = 1 if borrower belongs to the scientific and technical consultancy industry (0,1); *Sector_N* = 1 if borrower belongs to the administrative and support services industry (0,1); *Sector_P* = 1 if borrower belongs to the education industry (0,1); *Sector_Q* = 1 if borrower belongs to the human health activities and social support (0,1); *Sector_R* = 1 if borrower belongs to the artistic activities, entertainment, sports, and recreation (0,1); *Sector_S* = 1 if borrower belongs to another service activities industry (0,1). *Project Finance* = 1 if the loan was granted to finance a project (0, 1).

Table 2. Univariate Test (nonparametric)

Panel A: Mutual Guarantees (*MG*)

	Without Mutual Guarantees					*With Mutual Guarantees*					*Mean Diff*
Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Obs.	Mean	Std. Dev.	Min.	Max.	
Dependent variables											
IRP	5,075	3.30	1.31	0.50	13.78	6,106	2.55	0.84	0.88	8.00	2.89***
Default	5,075	0.24	0.43	0	1	6,106	0.11	0.31	0	1	0.13***
Industry risk	5,075	4.33	1.84	0	7.08	6,106	4.99	1.71	0	7.08	-0.66***
Financial Tension	5,075	36.89	27.92	0	100	6,106	41.43	26.04	0	100	-4.54***
High credit score	5,075	0.44	0.50	0	1	6,106	0.59	0.49	0	1	-0.15***
Low credit score	5,075	0.05	0.22	0	1	6,106	0.02	0.13	0	1	0.04***
Collateral	5,075	0.61	0.49	0	1	6,106	0.93	0.26	0	1	-0.31***
Business collateral	5,075	0.14	0.35	0	1	6,106	0.02	0.15	0	1	0.12***
Personal collateral	5,075	0.58	0.49	0	1	6,106	0.93	0.26	0	1	-0.34***
Tier 1	5,075	8.18	0.80	7.00	8.90	6,106	8.58	0.51	7.00	8.90	-0.40***
Solvability Ratio	5,075	11.92	0.82	10.70	12.60	6,106	12.30	0.49	10.70	12.60	-0.38***
LoanSize	5,075	367,920.30	1,907,672.0	5,000	65,000,000	6,106	155,624.50	265,398.90	5,000	4,830,319	212,295.8**

Panel B: Ex post default (*Default*)

	Not Defaulted					*Defaulted*					*Mean Diff*
Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Obs.	Mean	Std. Dev.	Min.	Max.	
Dependent variables											
MG	9,262	0.59	0.49	0	1	1,919	0.35	0.48	0	1	0.23***
IRP	9,262	2.82	1.08	1	13	1,919	3.21	1.35	1	14	-0.40***
Industry risk	9,262	4.68	1.81	0	7	1,919	4.71	1.76	0	7	-0.028
Financial Tension	9,262	39.77	26.55	0	100	1,919	37.45	28.99	0	100	2.31***
High credit score	9,262	0.59	0.49	0	1	1,919	0.20	0.40	0	1	0.39***
Low credit score	9,262	0.03	0.16	0	1	1,919	0.07	0.26	0	1	-0.04***

Notes: *MG* = 1 if the borrower received a mutual guaranteed loan (0,1); *IRP* = difference between the contractual interest rate for the loan and the prime rate; *Default* = 1 if the borrower did not default previously but defaulted after the loan was granted (0,1). The left-hand column reports the difference in means: Panel A Mean (MG = 0) – Mean (MG = 1), and Panel B Mean (Default = 0) – Mean (Default = 1). *** $p < .01$. ** $p < .05$. * $p < .1$.

Table 3. Mutual Guaranteed Loans

Panel A: Probit Marginal Effects
Dependent variable: *MG*

	(1)	(2)	(3)	(4)	(5)	(6)
Borrower risk type						
Industry risk	0.053***	0.050***	0.049***	0.012**	0.021***	
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	
Financial tension	0.002***	0.001***	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High credit score	0.143***	0.139***	0.132***	0.165***	0.159***	0.139***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Low credit score	-0.207***	-0.214***	-0.225***	-0.206***	-0.213***	-0.239***
	(0.027)	(0.028)	(0.028)	(0.028)	(0.027)	(0.026)
Collateralization profile						
Collateral		0.451***				
		(0.010)				
Business collateral			-0.454***			
			(0.012)			
Personal collateral			0.491***			
			(0.009)			
Lender characteristics						
Tier 1				0.212***		
				(0.009)		
Solvability					0.190***	
					(0.008)	
Control variables						
Ln(LoanSize+1)						-0.249***
						(0.065)
Sector						
Sector_A						-0.237***
						(0.058)
Sector_J						0.141**
						(0.066)
Sector_K						-0.429***
						(0.054)
Sector_L						-0.154***
						(0.071)
Sector_Q						0.117**
						(0.066)
Pr(MG)	0.548	0.541	0.536	0.545	0.545	0.545
Observations	11,181	11,181	11,181	11,181	11,181	11,181
LR chi^2	802.89	2,305.61	3,250.51	1,415.50	1,349.68	694.62
Prob.>chi^2	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.052	0.150	0.211	0.092	0.088	0.045

Notes: This panel reports the marginal effects in the Probit estimations for *MG*. *dMG/dx* is the discrete change of the dummy variable from 0 to 1. All industry sectors are controlled but only statistically significant sectors are reported: *Sector_A* = agriculture, animal production, or fishing industry; *Sector_J* = information and communication activities; *Sector_K* = financial and insurance activities; *Sector_L* = real estate industry; *Sector_Q* = human health activities and social support. Including binary variables for sectors implies the non-inclusion of *Industry Risk variable*, due to the potential for collinearity. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Panel B: Probit Marginal Effects

Dependent variable: *MG*

	(7)	(8)	(9)	(10)	(11)
Interaction variables					
Inter 1	0.039***	0.042***	0.038***	0.017***	0.019***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Inter 2	0.001**	-0.001	0.001	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
Inter 3	-0.005	0.001	0.006	-0.038***	-0.036***
	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
Inter 4	-0.002***	-0.003***	-0.004***	-0.001***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Collateralization profile					
Collateral		0.454***			
		(0.008)			
Business collateral			-0.415***		
			(0.010)		
Personal collateral			0.492***		
			(0.008)		
Lender characteristics					
Tier 1				0.276***	
				(0.006)	
Solvability Ratio					0.270***
					(0.006)
Pr(MG)	0.490	0.475	0.465	0.466	0.469
Observations	12,474	12,474	12,474	12,474	12,474
LR chi^2	663.49	2,642.71	3,715.89	2,969.20	2,800.61
Prob.>chi^2	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.038	0.153	0.215	0.172	0.162

Notes: This panel reports the marginal effects after Probit estimations for *MG*, controlling for interaction effects. *dMG/dx* is the discrete change of a dummy variable from 0 to 1. Inter 1 = [High credit score × Industry Risk]; Inter 2 = [High credit score × Financial Tension]; Inter 3 = [Low credit score × Industry Risk]; Inter 4 = [Low credit score × Financial Tension]. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Table 4. Mutual Guaranteed Loans and Loan Interest Rate
Panel A: First Stage, Ordinary Least Squares

Dependent variable: *IRP*								
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
MG	-0.785***	-0.922***	-0.849***	-0.735***				
	(0.021)	(0.021)	(0.021)	(0.021)				
Borrower risk type								
Industry risk	0.102***	0.008	0.064***		0.096***	0.007	0.062***	
	(0.006)	(0.006)	(0.006)		(0.006)	(0.006)	(0.006)	
Financial tension	0.002***	0.002***	0.002***	0.002***	0.002***	0.001***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High credit score	-0.251***	-0.198***	-0.230***	-0.237***	-0.265***	-0.217***	-0.247***	-0.250***
	(0.021)	(0.020)	(0.020)	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)
Low credit score	0.274***	0.282***	0.271***	0.196***	0.306***	0.318***	0.305***	0.230***
	(0.057)	(0.055)	(0.057)	(0.058)	(0.058)	(0.056)	(0.057)	(0.058)
Lender characteristics								
Tier 1		0.491***				0.465***		
		(0.017)				(0.017)		
Solvability			0.231***				0.210***	
			(0.017)				(0.017)	
Control variables								
Ln(LoanSize+1)				-0.093***				-0.091***
				(0.008)				(0.008)
Sector								
Sector_B				0.774*				0.736*
				(0.414)				(0.418)
Sector_E				0.935**				0.898**
				(0.422)				(0.425)
Sector_K				0.794*				0.790*
				(0.418)				(0.421)
Sector_M				0.759*				0.717*
				(0.405)				(0.408)
Interaction variables								
Inter5					-0.716***	-0.836***	-0.771***	-0.670***
					(0.021)	(0.021)	(0.021)	(0.021)
Constant	2.867***	-0.738***	0.278	3.749***	2.840***	-0.575***	0.480**	3.710***
	(0.035)	(0.131)	(0.191)	(0.415)	(0.035)	(0.132)	(0.193)	(0.419)
Observations	11,181	11,181	11,181	11,181	11,181	11,181	11,181	11,181
F	395.13	488.41	366.57	82.23	344.89	424.40	317.27	72.18
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.150	0.208	0.165	0.140	0.134	0.186	0.146	0.125
Adj. R-squared	0.150	0.207	0.164	0.138	0.133	0.185	0.145	0.123
Exogeneity tests for *MG (Inter5)*								
Resid_MG(Inter5)	-0.001	0.077	0.037	0.012	0.171***	0.286***	0.228***	0.173***
	(0.021)	(0.050)	(0.051)	(0.049)	(0.052)	(0.054)	(0.055)	(0.052)
Durbin chi-squared	0.0002	2.393	0.528	0.063	10.694***	28.458***	17.431***	11.181***
Wu-Hausman F-stat	0.0003	2.394	0.528	0.063	10.690***	28.406***	17.416***	11.194***

Notes: This panel reports the single OLS estimator for *IRP* on all exogenous variables, including the possible *MG (Inter5)* endogenous variable, plus the residuals of IRP obtained in the first step. Inter 5 = [MG × Collateral]. All industry sectors are controlled (Regressions 4 and 8), but only statistically significant coefficients sectors are reported. *Sector_B* = 1 if borrower belongs to the extractive industry (0,1); Sector_E = 1 if borrower belongs to the collection, purification, and distribution of water, sanitation waste management and remediation activities (0,1); Sector_K = 1 if borrower belongs to the financial and insurance activities industry (0,1), *Sector_M* = 1 if borrower belongs to the scientific and technical consultancy industry (0,1). Including the sector binary variables implies the non-inclusion of *Industry Risk* variable, due to the potential for collinearity. Residual t-statistics and Durbin and Wu-Hausman tests are reported, to test the hypothesis of endogeneity of *MG* (*Inter5*) explaining IRP, such that H_0: The variable *MG* (*Inter5*) is exogenous. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Table 5. Mutual Guaranteed Loans and Loan Interest Rate - Two- Stage Least Squares

Dependent variable: *IRP*								
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
MG (*fitted values)*	-0.784***	-0.982***	-0.878***	-0.744***				
	(0.043)	(0.044)	(0.045)	(0.042)				
Borrower risk type								
Industry risk	0.102***	0.009	0.064***		0.103***	0.010	0.065***	
	(0.006)	(0.006)	(0.006)		(0.006)	(0.007)	(0.006)	
Financial tension	0.002***	0.002***	0.002***	0.002***	0.003***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High credit score	-0.251***	-0.189***	-0.226***	-0.235***	-0.247***	-0.183***	-0.221***	-0.232***
	(0.021)	(0.021)	(0.021)	(0.022)	(0.022)	(0.021)	(0.022)	(0.022)
Low credit score	0.275***	0.271***	0.266***	0.194***	0.284***	0.283***	0.276***	0.202***
	(0.058)	(0.056)	(0.057)	(0.058)	(0.058)	(0.057)	(0.058)	(0.059)
Lender characteristics								
Tier 1		0.503***				0.508***		
		(0.019)				(0.019)		
Solvability			0.236***				0.241***	
			(0.018)				(0.019)	
Control variables								
Ln(LoanSize+1)				-0.093***				-0.093***
Sector_B				0.777*				0.775*
				(0.414)				(0.418)
Sector_E				0.937**				0.921**
				(0.422)				(0.426)
Sector_K				0.793*				0.770*
				(0.418)				(0.422)
Sector_M				0.762*				0.757*
				(0.405)				(0.409)
Interaction variables								
Inter5 (*fitted values)*					-0.853***	-1.070***	-0.957***	-0.809***
					(0.047)	(0.049)	(0.050)	(0.046)
Constant	2.867***	-0.814***	0.226	3.752***	2.860***	-0.859***	0.158	3.755***
	(0.035)	(0.140)	(0.204)	(0.415)	(0.035)	(0.143)	(0.208)	(0.420)
Observations	11,181	11,181	11,181	11,181	11,181	11,181	11,181	11,181
F	177.70	238.79	161.23	39.61	173.63	229.82	156.60	38.78
Prob.>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.150	0.207	0.164	0.140	0.130	0.176	0.140	0.121
R-squared	0.150	0.207	0.164	0.140	0.130	0.176	0.140	0.121

Notes: This panel reports the two-stage least squares for *IRP*. *Project Finance* is the instrumental variable for endogenous MG (Inter5). Inter 5 = [MG × Collateral]. All industry sectors are controlled (Regressions 4 and 8) but only statistically significant coefficients are reported. *Sector_B* = 1 if borrower belongs to the extractive industry (0,1); Sector_E = 1 if borrower belongs to the collection, purification, and distribution of water, sanitation waste management, and remediation activities (0,1); Sector_K = 1 if borrower belongs to the financial and insurance industry (0,1), *Sector_M* = 1 if borrower belongs to the scientific and technical consultancy industry (0,1). Including the sector binary variables implies the non-inclusion of *Industry Risk* variable, due to potential problems of collinearity. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Table 6. Mutual Guaranteed Loans and Ex Post Performance

Probit Marginal Effects
Dependent variable: *Default*

	(1)	(2)	(3)	(4)
MG	-0.102***	-0.100***		
	(0.007)	(0.007)		
Borrower risk type				
Industry Risk	0.007***		0.007***	
	(0.002)		(0.002)	
Financial Tension	-0.001***	-0.001**	-0.001***	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
High credit score	-0.213***	-0.212***	-0.203***	-0.212***
	(0.007)	(0.007)	(0.007)	(0.007)
Low credit score	0.045**	0.036**	0.048**	0.039**
	(0.019)	(0.018)	(0.019)	(0.018)
Control variables				
Ln(LoanSize+1)		-0.004		-0.003
		(0.003)		(0.003)
Sector_B		0.360***		0.358***
		(0.109)		(0.108)
Sector_C		0.194***		0.194***
		(0.073)		(0.073)
Sector_F		0.339***		0.336***
		(0.090)		(0.089)
Sector_G		0.158**		0.157**
		(0.064)		(0.064)
Sector_H		0.172**		0.172**
		(0.087)		(0.087)
Sector_L		0.368***		0.369***
		(0.101)		(0.101)
Sector_M		0.141*		0.140*
		(0.081)		(0.081)
Interaction variables				
Inter 5			-0.101***	-0.099***
			(0.007)	(0.007)
Pr(Default)	0.140	0.133	0.139	0.147
Observations	11,181	11,174	11,181	11,174
LR chi^2	1,251.10	1,514.79	1,252.16	1,516.44
Prob.>chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.122	0.148	0.122	0.148

Notes: This table reports the marginal effects after Probit estimations for *MG* controlling for interaction effects. *dMG/dx* is the discrete change of dummy variable from 0 to 1. Inter 5 = [MG × Collateralization]. All industry sectors are controlled (Regressions 2 and 4) but only statistically significant coefficients are reported. *Sector_B* = extractive industry; *Sector_C* = manufacturing industry; *Sector_F* = construction industry; *Sector_G* = wholesale and retail repair of motor vehicles and motorcycles industry; *Sector_H* = transportation and storage industry; *Sector L* = real estate industry; *Sector_M* = scientific and technical consultancy. Including the sector binary variables implies the non-inclusion of *Industry Risk* variable, due to potential problems of collinearity. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Appendix A. Variables Definitions

Variable	Definition
Dependent variables	
MG	Equals 1 if borrower receives a mutual guaranteed loan (0,1)
IRP	Difference between the contractual interest rate for the loan and the prime rate
Default	Equals 1 if borrower did not default previously but defaulted after the loan was granted (0,1)
Independent variables	
Borrower risk type	
Industry risk	Ratio of the default loans divided by total loan granted by industry
Financial tension	Ratio between the loan amount approved by the bank to the firm and the total credit available in the entire financial system for the firm (%)
High credit score	Equals 1 if the loan is classified with an internal credit score of AAA to BB (0, 1).
Medium credit score	Equals 1 if the loan is classified with an internal credit score of BB- to B- (0,1)
Low credit score	Equals 1 if the loan is classified with an internal credit score of CCC to C (0,1)
Collateralization profile	
Collateral	Equals 1 if borrower has pledged collateral (0,1)
Business collateral	Equals 1 if borrower has pledged firm assets as collateral (0,1)
Personal collateral	Equals 1 if borrower has pledged personal assets as collateral (0,1)
Lender characteristics	
Tier 1	Ratio [(total equity – revaluation reserves)/risk-based assets]
Solvability	Ratio (equity/debt)
Interaction variables	
Inter1	[High credit score × Industry Risk]
Inter2	[High credit score × Financial Tension]
Inter3	[Low credit score × Industry Risk]
Inter4	[Low credit score × Financial Tension]
Inter5	[MG × Collateral]
Control Variables	
LoanSize	Loan amount measured in euros
Sector_A	Equals 1 if borrower belongs to the agriculture, animal production, or fishing industry (0,1)
Sector_B	Equals 1 if borrower belongs to the extractive industry (0,1)
Sector_C	Equals 1 if borrower belongs to the manufacturing industry (0,1)
Sector_D	Equals 1 if borrower belongs to the electricity, gas, steam, hot and cold water, and cold air industry (0,1)
Sector_E	Equals 1 if borrower belongs to the collection, purification and distribution of water, sanitation waste management
Sector_F	Equals 1 if borrower belongs to the construction industry (0,1)
Sector_G	Equals 1 if borrower belongs to the wholesale and retail repair of motor vehicles and motorcycles industry (0,1)
Sector_H	Equals 1 if borrower belongs to the transportation and storage industry (0,1)
Sector_I	Equals 1 if borrower belongs to the lodging, restaurant, and similar industries (0,1)
Sector_J	Equals 1 if borrower belongs to the information and communication activities industry (0,1)
Sector_K	Equals 1 if borrower belongs to the financial and insurance activities industry (0,1)
Sector_L	Equals 1 if borrower belongs to the real estate industry (0,1)
Sector_M	Equals 1 if borrower belongs to the scientific and technical consultancy industry (0,1)
Sector_N	Equals 1 if borrower belongs to the administrative and support services industry (0,1)
Sector_P	Equals 1 if borrower belongs to the education industry (0,1)
Sector_Q	Equals 1 if borrower belongs to the human health activities and social support (0,1)
Sector_R	Equals 1 if borrower belongs to the artistic activities, entertainment, sports, and recreation (0,1)
Sector_S	Equals 1 if borrower belongs to the other service activities industry (0,1)
Instrumental Variable	
Project Finance	Equals 1 if the loan was granted to finance a project (0,1)

Notes: The *Default* variable is based on information available in the Central Credit Register. *Industry risk* is calculated as the ratio of nonperforming loans to total loans granted, by industrial sector. *Credit Scores* are internal scores assigned by the risk department of the bank to the loan applicant. The Tier 1 and Solvability ratios are available in the annual report of the financial institution.

Appendix B. Robustness Tests: Mutual Guaranteed Loans

Probit Marginal Effects

Dependent variable: *MG*

	Collateral=1			Collateral=0			High credit score=1			High credit score=0		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Risk type												
Industry risk	0.048***	0.048***	0.023***	0.027***	-0.003	0.007	0.048***	0.012***	0.022***	0.131***	0.012***	0.022***
	(0.003)	(0.009)	(0.003)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.010)	(0.004)	(0.004)
Financial tension	0.001***	0.001*	0.001**	0.002***	0.002***	0.002***	0.001***	0.001***	0.002***	0.003***	0.002***	0.002***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High credit score	0.136***	0.156***	0.152***	0.068***	0.077***	0.072***						
	(0.011)	(0.011)	(0.011)	(0.016)	(0.016)	(0.016)						
Low credit score	-0.199***	-0.200***	-0.205***	-0.135***	-0.121***	-0.130***						
	(0.032)	(0.033)	(0.033)	(0.024)	(0.024)	(0.023)						
Collateralization profile												
Collateral							0.481***			0.405***		
							(0.015)			(0.013)		
Lender characteristics												
Tier 1		0.172***			0.123***			0.184***			0.244***	
		(0.009)			(0.124)			(0.011)			(0.014)	
Solvability			0.170***			0.090***			0.156***			0.232***
			(0.009)			(0.012)			(0.010)			(0.013)
Pr(MG)	0.651	0.652	0.651	0.172	0.159	0.163	0.621	0.621	0.620	0.454	0.458	0.457
Observations	8,779	8,779	8,779	2,402	2,402	2,402	5,839	5,839	5,839	5,342	5,342	5,342
LR chi^2	550.59	894.46	916.54	132.92	223.36	187.94	1,108.83	537.29	485.22	901.43	593.10	584.04
Prob.>chi^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.048	0.078	0.080	0.058	0.097	0.081	0.143	0.069	0.062	0.122	0.080	0.079

Notes: This table reports the marginal effects after Probit estimations for *MG*. *dMG/dx* is the discrete change of the dummy variable from 0 to 1. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Appendix C. Robustness Tests: Mutual Guaranteed Loans and Loan Interest Percentage

Dependent variable: *IRP*

	OLS estimations						**2SLS estimations**					
	Collateral=1			Collateral=0			Collateral=1			Collateral=0		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
MG	-1.113***	-1.158***	-1.132***	-0.585***	-0.744***	-0.669***	-1.049***	-1.114***	-1.075***	-0.606***	-0.850***	-0.734***
	(0.049)	(0.050)	(0.050)	(0.025)	(0.024)	(0.025)	(0.096)	(0.100)	(0.098)	(0.054)	(0.054)	(0.056)
Risk type												
Industry risk	0.095***	0.051***	0.074***	0.103***	-0.007	0.060***	0.093***	0.051***	0.073***	0.104***	-0.005	0.061***
	(0.011)	(0.014)	(0.013)	(0.006)	(0.007)	(0.007)	(0.011)	(0.014)	(0.013)	(0.007)	(0.007)	(0.007)
Financial tension	0.004***	0.004***	0.004***	0.003***	0.002***	0.003***	0.004***	0.003***	0.004***	0.003***	0.002***	0.003***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
High credit score	-0.205***	-0.190***	-0.199***	-0.266***	-0.193***	-0.236***	-0.210***	-0.194***	-0.203***	-0.263***	-0.178***	-0.227***
	(0.038)	(0.038)	(0.038)	(0.024)	(0.022)	(0.023)	(0.039)	(0.039)	(0.039)	(0.025)	(0.024)	(0.024)
Low credit score	-0.057	-0.043	-0.054	0.399***	0.400***	0.393***	-0.049	-0.038	-0.047	0.395***	0.380***	0.380***
	(0.100)	(0.099)	(0.100)	(0.067)	(0.063)	(0.066)	(0.100)	(0.100)	(0.100)	(0.068)	(0.064)	(0.067)
Lender characteristics												
Tier 1		0.159***			0.657***			0.154***			0.675***	
		(0.031)			(0.020)			(0.033)			(0.022)	
Solvability			0.081***			0.319***			0.077***			0.331***
			(0.029)			(0.020)			(0.029)			(0.022)
Constant	3.154***	2.066***	2.293***	2.635***	-2.298***	-1.004***	3.157***	2.102***	2.341***	2.642***	-2.402***	-1.111***
	(0.061)	(0.222)	(0.310)	(0.041)	(0.156)	(0.233)	(0.061)	(0.232)	(0.318)	(0.044)	(0.163)	(0.247)
Observations	2,402	2,402	2,402	8,779	8,779	8,779	2,402	2,402	2,402	8,779	8,779	8,779
F	122.06	107.12	103.35	212.75	376.53	224.36	43.93	38.07	36.87	126.17	255.36	132.84
Prob.>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-squared	0.203	0.212	0.206	0.108	0.205	0.133	0.202	0.211	0.205	0.108	0.203	0.132
Adj. R-squared	0.201	0.210	0.204	0.108	0.204	0.133	0.201	0.211	0.203	0.108	0.203	0.132

Notes: This table reports the OLS and 2SLS for *IRP* by subsamples. The MG in the 2SLS estimation is the fitted value of MG obtained using *Project Finance* as the IV. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.

Appendix D. Robustness Tests: Mutual Guaranteed Loans and Ex Post Performance

Probit Marginal Effects		
Dependent variable: *Default*		
	Collateral =1	Collateral=0
MG	-0.090**	-0.077***
	(0.021)	(0.021)
Risk type		
Industry risk	0.007***	0.007
	(0.002)	(0.005)
Financial tension	-0.001	-0.001***
	(0.000)	(0.000)
High credit score	-0.179***	-0.294***
	(0.008)	(0.017)
Low credit score	0.031**	0.106**
	(0.020)	(0.049)
Pr(Default)	0.122	0.220
Number of observations	8,779	2,402
LR chi^2	812.25	344.24
Prob.>chi^2	0.000	0.000
Pseudo R^2	0.110	0.127

Notes: This table reports the marginal effects after Probit estimations for *MG*. *dMG/dx* is the discrete change of dummy variable from 0 to 1. Standard errors are reported in brackets. *** $p < .01$. ** $p < .05$. * $p < .1$.