



Do bank hierarchies affect the use of guarantees?

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ABSTRACT

This paper studies how bank managers' hierarchy influences guarantee use. Analyzing 17,900 Italian loan contracts, we show lower-level managers mitigate information asymmetries via relationship lending, while higher-level managers rely on quantitative data, increasing guarantee requirements. Results remain robust across subsamples.

1. Introduction

Guarantees play a key role in reducing asymmetric information in bank lending, especially for SMEs, which are more opaque (Bester, 1985; Boot and Thakor, 1994; Inderst and Mueller, 2007). Relationship lending, based on trust and soft information, can ease access to credit and reduce the need for collateral, whereas transaction-based lending typically relies more on guarantees (Petersen and Rajan, 1994; Berger and Udell, 1995; Cole, 1998; Degryse and Van Cayseele, 2000). However, the accumulation of soft information can lead to agency problems, as it is difficult to verify and transmit within the bank. Only a few studies (Berger and Udell, 2002; Jiménez and Saurina, 2004; Berger et al., 2005) suggest that these frictions may be addressed by structuring the bank as a small, closely held organization with few managerial layers. This paper extends prior research by showing that information asymmetries can also vary along the bank's internal hierarchy.² We argue that lower-level officers, due to their geographic and relational

proximity to clients, are better positioned to assess borrowers' skills, integrity, and financing needs. This soft information, which is difficult to codify and transmit, is mainly gathered and used at branch or area level. Higher hierarchical managers rely primarily on transaction-based technologies and hard financial data, suggesting a greater likelihood of requiring guarantees to mitigate information asymmetry (Besanko and Thakor, 1987; Ongena and Smith, 2001; Berger and Udell, 2006). Using a proprietary dataset of 17,900 loans from an Italian regional bank (2010–2012), large enough to encompass both lending technologies,³ we investigate how hierarchical structure influences collateral use.⁴ We find that information asymmetries are more effectively mitigated through relationship lending at the branch level. Finally, this study contributes to the literature on collateral determinants (Voordeckers and Steijvers, 2006; Beck et al., 2008; Bellucci et al., 2021; Mayor-domo et al., 2021), by distinguishing between collateral and personal guarantees.

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² Financial intermediaries, as complex entities, often employ a combination of both technologies, with transaction-based lending playing an increasing role in larger banks (Bartoli et al., 2013).

³ This period marked a transition following the adoption of the Internal Ratings-Based (IRB) approach under Basel II and the first EU Capital Requirements Directives. Lower-level bank officers likely continued relying on relationship-based lending to assess firms' creditworthiness, while higher management increasingly adopted the IRB methodology and transaction-based lending.

⁴ Calcagnini et al. (2025) show that loans approved at higher managerial levels exhibit a higher probability of default but do not analyze their impact on guarantees.

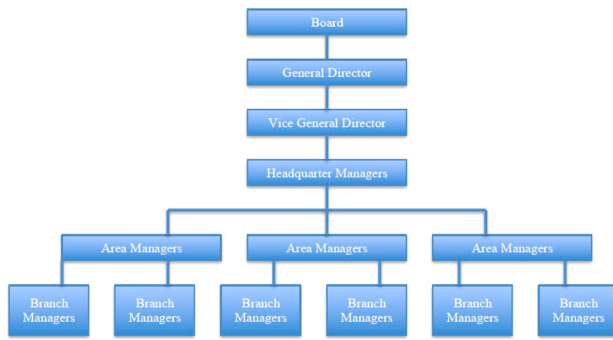


Fig. 1. Illustration of the managerial hierarchy of the bank.

Table 1

Summary statistics.

	Mean	SD	Min	Median	Max
Dependent variables					
Pers. guar.	0.272	0.445	0	0	1
Collateral	0.097	0.295	0	0	1
Independent variables					
Hqs	0.385	0.487	0	0	1
Rating	2.536	0.338	0	2.639	3.219
Loan characteristics (L)					
Loan size ^a	1.445	7.716	-49.85	0.310	270.0
Days	1.666	1.368	0	1.792	5.768
Firm characteristics (F)					
Sales	7.938	1.130	0.011	7.784	13.422
Net assets ^a	0.016	0.106	-0.181	0.002	6.435
Age	2.533	0.864	0	2.639	4.663
Relationship lending variables (R)					
New client	0.046	0.210	0	0	1
Tot application	1.989	0.741	0.693	1.946	4.500
Other services	0.309	0.462	0	0	1
Portfolio	0.443	0.497	0	0	1

Notes: the sample size is $N = 17,900$.

^a All continuous variables are in logs, except *Loan size* and *Net assets*, which are in €10,000 and untransformed due to occasional negative values. Appendix provides a detailed description of each variable.

2. Data and outcome variables

The empirical analysis relies on a proprietary dataset from a regional Italian bank, covering 17,900 approved loans and credit lines (both new and renegotiation) to 3266 firms — mainly local SMEs — between January 2010 and December 2012. The data include information on the presence of personal guarantees and collateral, the internal credit rating of the applicant firm, and the hierarchical level of the approving manager. Fig. 1 describes the managerial hierarchy of the bank. There are 6 management levels: *Board*, *General Director (Gd)*, *Vice General Director (Vgd)* and *Headquarters Managers (Hqm)*, which are all included in the *Headquarters level (Hqs)*. Under it, *Area* and *Branch Managers* cover distinct geographical zones across the region.

To enrich the dataset, firm-level balance sheet data from AIDA⁵ have been merged, allowing control for financial indicators not fully captured by internal ratings. The dataset includes loan and firm characteristics, and relationship lending variables. All continuous independent variables are expressed in logarithms, except for *Loan size* and *Net assets*, which are in ten thousands € due to occasional negative values. Table 1 shows summary statistics for the variables, and Appendix provides detailed descriptions.

⁵ AIDA - Computerized analysis of Italian companies - is produced and distributed by Bureau van Dijk S.p.A. It covers 1 million companies in Italy and contains detailed accounts following the 4th Directive CEE scheme and IFRS standards (indicators, trade description of firms, ownership and management, consolidated accounts, etc.).

3. Methodology

Drawing from the literature, we test the following hypotheses:

H1: Higher-level managers are more likely to rely on hard information and require personal guarantees and collateral, while lower-level officers, engaged in relationship lending, tend to require fewer guarantees, ceteris paribus.

We expect that headquarters managers, with limited access to soft information, tend to prioritize hard data and transaction-based lending, increasing their reliance on guarantees as a risk-mitigation tool. In contrast, branch and area-level officers are closer to borrowers and better positioned to collect soft information through repeated interactions, allowing them to substitute informal trust and qualitative assessments for formal guarantees.

H2: A stronger and more intense bank-firm relationship reduces the likelihood of requiring personal guarantees and collateral, ceteris paribus.

Close and long-term relationships foster trust and the accumulation of soft information. This mitigates informational asymmetries and, in turn, the need for formal guarantees.

We estimate several econometric models based on the following general equations:

$$Pers. guar. = \beta_h Hqs_{it} + \beta_g Rating_{it} + \sum_{l=3}^4 \beta_l L_{it} + \sum_{f=5}^7 \beta_f F_{it} + \sum_{r=8}^{11} \beta_r R_{it} + C_{it} + \epsilon_{it} \quad (1)$$

$$Collateral = \gamma_h Hqs_{it} + \gamma_g Rating_{it} + \sum_{l=3}^4 \gamma_l L_{it} + \sum_{f=5}^7 \gamma_f F_{it} + \sum_{r=8}^{11} \gamma_r R_{it} + C_{it} + \epsilon_{it} \quad (2)$$

In all specifications, the binary outcomes of requiring *Pers. guar.* and *Collateral* are modeled as a function of the same set of independent variables. Specifically, *Hqs* represents the bank's *Headquarters level* (with *Area* and *Branch Managers* as the excluded category), *Rating* is the logarithm of the rating variable, *L* captures *loan characteristics*, *F* includes *firm characteristics*, *R* represents *relationship lending variables*, and *C* is a set of *controls variables*, including sector and legal form of the firms, loan typology, and time fixed effects. The indices $-i, -t$ refer to approved loan observations and the time period in quarters, respectively.

We begin by estimating Probit models for Eqs. (1) and (2) separately, modeling the probability of requiring personal guarantees and collateral as independent outcomes. We then adopt a Bivariate Probit (Bi-Probit) model to account for potential interdependence between the two decisions, which may reflect joint components of the same lending contract. This specification also captures unobserved common factors — such as borrower risk perception or internal bank policies — as well as possible complementarities or substitutability between guarantee types. Finally, to allow for correlation in the error terms across equations without imposing the joint normality assumption required by the Bi-Probit, we estimate a Seemingly Unrelated Regression (SUREG) model. These three approaches constitute the main specification strategy reported in Table 2.

4. Results

In the main specification of Table 2, loans approved at the headquarters level are associated with a significantly higher likelihood — by 5.0 percentage points (p.p.) — of requiring personal guarantees and collateral, compared to those approved by area or branch managers. This result supports *H1*: soft information tends to deteriorate as it moves up the organizational hierarchy, increasing informational asymmetries. As a result, higher-level decision-makers are more likely to require guarantees to mitigate perceived credit risk, *ceteris paribus*.

Table 2
Pers. guar. and collateral determinants - Main specification.

Variable	Probit		Bi-Probit		SUREG	
	Pers. guar.	Collateral	Pers. guar.	Collateral	Pers. guar.	Collateral
Hqs	0.0500*** (.0095)	0.0498*** (.0066)	0.0499*** (.0095)	0.0503*** (.0066)	0.0464*** (.0079)	0.0574*** (.0056)
Rating	0.115*** (.013)	0.022** (.011)	0.113*** (.013)	0.022** (.011)	0.118*** (.009)	0.025*** (.006)
Loan size ^a	.0021*** (.0005)	.0010*** (.0003)	.0020*** (.0005)	.0010*** (.0003)	.0023*** (.0004)	.0027*** (.0003)
Days	0.097*** (.003)	0.032*** (.002)	0.097*** (.003)	0.032*** (.002)	0.105*** (.003)	0.028*** (.002)
Sales	-0.029*** (.005)	-0.007** (.003)	-0.028*** (.005)	-0.007** (.003)	-0.039*** (.004)	-0.013*** (.003)
Net assets ^a	-0.460** (.181)	-0.057 (.055)	-0.450** (.178)	-0.050 (.053)	-0.043 (.028)	-0.034* (.020)
Age	-0.029*** (.006)	-0.014*** (.004)	-0.029*** (.006)	-0.014*** (.004)	-0.029*** (.004)	-0.013*** (.003)
New client	0.049*** (.018)	-0.027** (.013)	0.048*** (.018)	-0.027** (.013)	0.085*** (.015)	-0.026** (.011)
Tot application	-0.043*** (.006)	0.007 (.005)	-0.043*** (.006)	0.006 (.005)	-0.040*** (.004)	0.010*** (.003)
Other services	0.029*** (.009)	0.060*** (.006)	0.028*** (.009)	0.060*** (.006)	0.030*** (.006)	0.065*** (.004)
Portfolio	-0.028*** (.011)	0.008 (.007)	-0.028*** (.011)	0.008 (.007)	-0.022*** (.008)	0.013** (.005)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	17,889	17,887	17,893	17,893	17,893	17,893
R ²	0.2985	0.2833	–	–	0.3083	0.2233
Log lik.	-7339.2	-4067.7	-7339.2	-4067.7	–	–
χ ²	4603.5	2410.3	10 137.2	10 137.2	7976.7	5144.0

Notes: the table reports marginal effects from Probit, Bi-Probit, and SUREG with firm clustered and robust standard errors in parentheses.

Controls: all models include sector, legal form, loan type, and quarterly time fixed effects.

^a All continuous variables are in logs, except *Loan size* and *Net assets*, which are in €10,000 and untransformed due to negative values. [Appendix](#) provides a detailed description of each variable.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

It is relevant to remark that these estimates control for rating, firm and loan fixed effects, and time-varying factors such as macroeconomic conditions and monetary policy.

Borrowers with lower credit ratings are 11.5 p.p. more likely to be required to provide personal guarantees and 2.2 p.p. more likely to post collateral. These findings indicate that both forms of guarantees are used to mitigate moral hazard, with personal guarantees emerging as the bank's preferred risk-mitigation tool (i.e., they are not perfect substitutes). Longer approval times (in days) are associated with a higher likelihood of requiring personal guarantees (+9.7 p.p.) and collateral (+3.2 p.p.), suggesting that extended evaluation periods reflect more in-depth assessments of borrowers' financial condition. Larger loans are associated with a higher probability of requiring guarantees, particularly personal ones (+0.21 p.p. vs +0.10 p.p. for collateral). However, according to *H2*, this effect diminishes for firms with long-standing relationships with the bank, highlighting the potential advantage of soft information.

Indeed, we find that stronger and more extensive bank-firm relationships reduce the likelihood of requiring personal guarantees, while having a limited impact on collateral requirements. Specifically, a one p.p. increase in the number of the firm's past credit applications lowers the probability of requiring personal guarantees by 4.3 p.p., but has no significant effect on collateral. New clients are 4.9 p.p. more likely to provide personal guarantees and 2.7 p.p. less likely to pledge collateral, whereas firms in the bank's portfolio are 2.8 p.p. less likely to provide personal guarantees. These findings support the view that relationship lending builds trust and mitigates information asymmetry, reducing the need for personal guarantees ([Chakraborty and Hu, 2006](#); [Jiménez et al., 2009](#); [Bellucci et al., 2019](#)). A hold-up effect emerges when

firms benefit from additional financial services provided by the bank, increasing the probability of both personal guarantees (+2.9 p.p.) and collateral (+6.0 p.p.). This shows some degree of market power exerted by the bank, consistent with the literature on oligopolistic banking models ([Klein, 1971](#); [Bacchiocchi et al., 2022](#)).

4.1. Robustness test

In many banking systems, riskier and larger loans are generally approved at higher hierarchical levels. In our dataset, however, credit decisions are not allocated in a strictly mechanical way according to firm size or risk category. Rather, loans approval seem to be influenced by a broader set of factors — including subjective assessments and internal organizational procedures — that determine how responsibilities are distributed within the hierarchy. As a result, it is not uncommon to observe loans with comparable size and risk characteristics being approved either by headquarters or by area managers. To address this potential heterogeneity and strengthen the robustness of our results, we segment the sample along three dimensions that are central to credit allocation: internal credit rating, loan amount, and firm size. More specifically, we classify borrowers between safe, medium, and high risk; loans into small, medium, and large; and firms into micro, small, and medium-to-large.⁶ Our subsample analyses in [Table 3](#) provide evidence consistent with the idea that lower-level officers — who rely more

⁶ For the sake of space, [Table 3](#) estimates show only the key independent variables *Hqs* and *Rating*, all the other marginal effects are in line with the main specification. See [Table 3](#) notes for further details on subsets thresholds.

Table 3

Pers. guar. and collateral determinants - Robustness for different subsets.

Panel (a): Rating Score						
Variable	Safe rating		Medium rating		Risky rating	
	Pers. guar.	Collateral	Pers. guar.	Collateral	Pers. guar.	Collateral
Hqs	0.0223 (.014)	0.0350*** (.009)	0.0472*** (.0118)	0.0388*** (.0077)	0.0960*** (.017)	0.0781*** (.013)
Rating	0.045** (.018)	−0.022** (.010)	0.182*** (.066)	0.038 (.044)	0.098 (.086)	0.046 (.060)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	5,562	5,562	7,086	7,086	5,245	5,245
Log lik.	−2090.0	−996.6	−2901.0	−1526.6	−2232.4	−1413.8
χ^2	2841.8	2841.8	–	–	12911.2	12911.2
Panel (b): Loan Size						
Variable	Small loan		Medium loan		Large loan	
	Pers. guar.	Collateral	Pers. guar.	Collateral	Pers. guar.	Collateral
Hqs	0.0376*** (.012)	0.0284*** (.007)	0.0182 (.014)	0.0252*** (.007)	.00006 (.018)	0.0756*** (.017)
Rating	0.046*** (.015)	.0004 (.012)	0.124*** (.021)	0.173 (.011)	0.209*** (.024)	0.070*** (.023)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	6,718	6,718	6,197	6,197	4,978	4,978
Log lik.	−1853.2	−968.2	−2491.5	−1093.8	−2651.8	−1859.9
χ^2	2079.3	2079.3	9110.1	9110.1	2024.4	2024.4
Panel (c): Firm Size						
Variable	Micro size		Small size		Medium–large size	
	Pers. guar.	Collateral	Pers. guar.	Collateral	Pers. guar.	Collateral
Hqs	0.0350** (.014)	0.0441*** (.008)	0.0649*** (.013)	0.0495*** (.010)	0.1108*** (.030)	0.0864*** (.021)
Rating	0.054*** (.018)	0.012 (.011)	0.157*** (.019)	0.031* (.017)	0.131*** (.037)	0.064** (.027)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	7,675	7,675	8,032	8,032	2,186	2,186
Log lik.	−3220.1	−1596.4	−3197.1	−1888.8	−750.5	−468.2
χ^2	10654.3	10654.3	–	–	–	–

Notes: the table reports marginal effects from Bi-Probit with firm clustered and robust standard errors in parentheses. Panel (a): safe-rated firm if *rating* < 11, medium-rated firm if $11 \leq \text{rating} < 15$, and risky-rated firm if *rating* ≥ 15 . Panel (b): small loan if *loan size* < 2,000,000€, medium loan if $2,000,000\text{€} \leq \text{loan size} < 10,000,000\text{€}$, and large loan if *loan size* $\geq 10,000,000\text{€}$. Panel (c): micro firm if *sales* < 2,000,000€, small firm if $2,000,000\text{€} \leq \text{sales} < 10,000,000\text{€}$, and medium-to-large firm if *sales* $\geq 10,000,000\text{€}$.

Controls: all models include sector, legal form, loan type, and quarterly time fixed effects.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

heavily on relationship lending — are better able to mitigate informational asymmetries than higher-level managers, who tend to adopt transaction-based approaches and more frequently require guarantees. These findings confirm that soft information gathered at the branch or area level may be more effective in addressing borrower opacity than hard information alone.

5. Conclusion

This study examines how the hierarchical level of bank managers influences the use of collateral and personal guarantees in lending decisions. Controlling for credit ratings, firm characteristics, and loan features, we find that higher-level managers, who rely more on transaction-based lending and hard information, are more likely to demand guarantees. By contrast, lower-level officers tend to rely on relationship lending, which appears more effective in mitigating informational asymmetries, thereby reducing the need for guarantees. Soft information plays a crucial role: firms with long-standing banking relationships and multiple past loan applications face lower requirements for personal guarantees, whereas new clients are more likely to pledge personal guarantees but not collateral. This suggests that guarantees are not perfect substitutes but rather serve different functions depending on

loan type and borrower risk. Future research could explore how regulation, sustainability considerations (see, e.g., [D., 2021](#); [Bacchiocchi et al., 2024](#)) and AI adoption (see, e.g., [Boot et al., 2021](#); [Gambacorta et al., 2025](#)) may reshape the balance between hard and soft information, as well as the role of hierarchical structures in bank lending decisions.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix. Description of variables

See [Table A.1](#).

Table A.1
Description of variables.

Variable	Definition
Dependent variables	
Pers. guar.	Indicator that takes value of 1 if the financing is secured by personal guarantees of the borrower, 0 otherwise.
Collateral	Indicator that takes value of 1 if the financing is secured by collateral of the borrower, 0 otherwise.
Independent variables	
Hqs	Indicator that takes value of 1 if the financing is approved by Headquarters level, 0 otherwise (i.e., if it is approved by Area and Branch managers).
Rating	Logarithm of the rating score of the firm (progressive number from 1 - “very low probability of default” to 24 - “default”) given by the bank at the moment of the loan request.
Loan characteristics (L)	
Loan size ¹	Loan size expressed in 10 thousands € (¹ not in logarithm as it presents negative values).
Days	Logarithm of the number of days between the loan request and its approval.
Firm characteristics (F)	
Sales	Logarithm of the sales of the firm at the moment of the loan approval.
Net assets ¹	Net assets of the firm at the moment of the loan approval, expressed in 10 thousands € (¹ not in logarithm as it presents negative values).
Age	Logarithm of the age of the firm (in years) since its foundation.
Relationship lending variables (R)	
New client	Indicator equals to 1 if the firm is a new client of the bank; 0 otherwise.
Tot application	Logarithm of the number of total financing applications granted by the bank to the borrower up to the current loan request.
Other Services	Indicator equals to 1 if the bank offers additional financial services to the borrower beyond the granted financing (e.g. investment services, financial instruments, insurance, etc.), 0 otherwise.
Portfolio	Indicator equals to 1 if the bank considers the firm as part of its corporate market, 0 if it is part of its small business market.
Control variables (C)	
Firms' sector	A step variable that identifies 21 firms' economic sector according to ATECO 2007 - Classification of Economic Activity of ISTAT (Italian National Statistics Institute).
Firms' legal types	A step variable that identifies the legal entity of private companies included in the dataset, i.e. 8 legal typologies: “Joint Stock Company”, “Limited Liability Partnership”, “Cooperative Enterprise”, “Cooperative Enterprise No-profit”, “Single Member Limited Liability Partnership”, “Limited Partnership”, “Informal Partnership”, and “General Partnership”.
Loans' typology	A step variable that identifies 4 typologies of loan: “Line of credit”, “Unsecured loans”, “Mortgages”, and “Secured loans” (that includes “Loan Guarantee Consortia - Confidi” or other public guarantees).
Time fixed effects	Indicators that equal to 1 if the financing is approved in the quarter considered, 0 otherwise. It includes 12 dummies from “Q1 2010” to “Q4 2012”.

Data availability

The data that has been used is confidential.

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