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► **To cite this version:**

Jérémie Bertrand, Paul-Olivier Klein. Creditor information registries and relationship lending. *International Review of Law and Economics*, 2021, 65, pp.105966 -. 10.1016/j.irl.2020.105966 . hal-03493585

**HAL Id: hal-03493585**

**<https://hal.science/hal-03493585>**

Submitted on 15 Dec 2022

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# Creditor Information Registries and Relationship Lending

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*November 2020*

## **Abstract**

Banks rely on information to assess the creditworthiness of borrowers. They can secure this information in two ways: on the one hand, they can access public information on the firm from credit databases. On the other hand, they can build a relationship with the firm and secure private, more precise, information on the firm's prospects. In this paper, we investigate what happens to the collection of private information, when banks have access to a broader scope of public information. We argue that banks can either focus on public information and reduce their collection of private information (which is costly), or see the collection of private information as strategic, giving them an advantage when allocating credit.

To settle this question, we employ an empirical approach and use a firm-level survey of 2,292 firms in seven European countries in 2009. We find that when the coverage of credit registries increases, banks invest less in long-term relationship with their clients. Hence, when public information is widely available, banks do collect less private information on borrowers. This substitution only holds for firms with public information. We investigate if this reduction in the collection of private information alters firms' access to credit, and we do not find a negative effect. The results are robust to alternative specifications and robustness tests.

**JEL Codes:** G21; L13.

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**Keywords:** Creditor information; Relationship lending; Information asymmetries

## 1. Introduction

Banks fundamentally rely on information to assess the creditworthiness of borrowers. They can secure this information in two ways: by sourcing it directly from the firm, or by obtaining it from public or private credit databases. It seems straightforward that if banks can access information from external sources, this might substitute to collecting the information from the borrowers themselves. However, banks can still have an interest in collecting information from the firm, since it gives them access to private information on borrowers, that cannot be easily shared or even recorded in credit databases. Banks can see the collection and retention of this private information as strategic, giving them an advantage compared to their competitors. In this paper, we analyse this dynamic. We look at what happens to the collection of private information, when banks have access to a broader scope of either public or private credit databases.

Private information (we will refer to it as soft information) is gathered through regular interactions between the bank and its clients, a technique known as relationship lending. The objective is to build a *relationship* with the client, that helps to secure private, non-recordable information, such as opinions, ideas, prospects. The key points are that this information is not available through credit databases, which provide public information (such as credit history, balance-sheet and income statements) and is more precise. The bank can then build on this information to better allocate credit. From this perspective, private information gives an informational advantage to the bank. However, the collection of private information is costly for the bank: it involves time and effort, without necessary the immediate associated rewards. The question we aim to answer in this paper is: what happens to the use of relationship lending when the bank can easily source public information on borrowers through a better credit registry coverage? Does the expansion of credit registries substitute to relationship lending, or is relationship lending still strategically used by the bank?

The literature suggests two opposite answers to that question. On the one hand, a higher level of creditor information available through credit registries may be associated with less relationship lending. Three reasons underlie this substitution effect. First, both credit registries and relationship lending reduce information asymmetries between the bank and the borrower and ease the access to credit (*e.g.* Petersen and Rajan, 1994; Cenni et al., 2015; Berger et al., 2017; Jappelli and Pagano, 2002; Barron and Staten, 2003; Kallberg and Udell, 2003). In short, they fulfil similar objectives and achieve similar outcomes. Second, putting in place a long-term relationship with borrowers is costly for banks (Berger and Udell, 2006).

Accessing information on borrowers through public credit registries or private credit bureaus does not entail the same costs and so reduces the incentives of banks to invest in relationship lending. Third, the use of relationship lending exposes both the bank and the firm to potential negative effects. Firms can get trapped in the relationship and pay an excessive interest rate (Sharpe, 1990); conversely, the bank can maintain the relationship despite its own interest, because of the costs associated in building the relationship in the first place (Dewatripont and Maskin, 1995).<sup>1</sup> Accessing public information through credit registries do not result in similar negative effects. Hence, banks might prefer to reduce the use of relationship lending in the context of high creditor information provided by credit registries.

On the other hand, banks have incentives to strategically invest in private information when public information becomes widely available. Karapetyan and Stacescu (2014) show that generalizing the access to borrowers' public information (for example, through credit registries) increases the relative value of soft information (privately obtained through relationship lending). If all banks can have access to public information through credit registries, banks that invest in relationship lending will obtain valuable private information. Soft information then becomes a competitive advantage which motivates banks to invest in relationship lending (Schenone, 2010). In that case, an increase in creditor information provided by credit registries would be associated with greater use of relationship lending.

We investigate which effect prevails using the EU-EFIGE/Bruegel-UniCredit dataset (EFIGE dataset). This dataset provides firm-level answers to a survey conducted in 2010 in seven European countries (Austria, France, Germany, Hungary, Italy, Spain, and the United Kingdom). We select firms that used credit in 2009 and merge these data with the Amadeus database for financial information, for a sample of 2,292 firms. The EFIGE dataset provides valuable information on the type of lending banks employ. We use the survey responses to construct an index of relationship lending. We measure creditor information available to banks using the quality and coverage of credit registries in each country. We then assess the role of information available through credit registries in the use of relationship lending.

We assess the impact of two types of credit registries: public credit registries and private credit bureaus (Pagano and Jappelli, 1993). Credit bureaus are private companies that sells information on borrowers – for instance, the CRIF in Italy. Alternatively, the state can put in place credit registries that collect and make publicly available information on

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<sup>1</sup> We further detail this effect and the notions of the hold-up problem and soft budget constraint in Section 2.

borrowers – for instance the Risk Information Centre in Spain.<sup>2</sup> Both mechanisms aim at collecting and disseminating information on borrowers.

We also investigate whether a decline in relationship lending would be associated with a reduced access to credit for viable borrowers (*i.e.*, credit rationing, see Jaffee and Stiglitz, 1989). While banks may have an interest in reducing relationship lending when public information on borrowers is widely available, firms may or may not benefit from such a shift.

The main result of our study is that an increase in creditor information from credit registries is associated with a decrease in relationship lending. This result lends support to the view that both creditor registries and relationship lending achieve similar objectives for banks and show that the informational environment affects the collection of soft information by banks. This effect can be attributed to both private credit bureaus and public credit registries. We find no evidence that this change is associated with a reduced access to credit for firms; on the contrary, we provide evidence of a shift towards lending relying on hard information in countries with higher credit registry coverage.

We test the robustness of our results with six tests. First, we use two alternative indicators of creditor information to replace our key variables. Second, considering that our indicator on relationship lending is based on EFIGE survey responses and may depend on firms' perceptions, especially after the financial crisis, we employ four other measures that have been used in existing literature. Third, we challenge our interpretation. If our interpretation is accurate, we should not observe a substitution effect for firm that do not convey enough hard information to be recorded in credit registries. We confirm this view, showing that the effect is opposite for these firms. Fourth, because the legal environment also determines bank credit (e.g., Djankov, Hart, et al., 2008) and may supplant the information effect (e.g., Cho et al., 2014), we control for the role of creditor rights and contracts' enforcement. Fifth, we consider a potential endogeneity bias in creditor information: banks may increase the degree of creditor information in the economy (e.g., by setting up private bureaus) *because* they do not use relationship lending. We address this issue by performing an Instrumental Variable (IV) regression. We use banks' historical membership in associations and agreement with memoranda that aim to foster the level of information in the country as instruments. Sixth, because creditor information reduces the use of relationship lending, some firms may be excluded from the credit market and may not appear in our

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<sup>2</sup> The Risk Information Center is administrated by the Spanish Central Bank, which defines it as is “a public database management service where virtually all the loans, credits, bank endorsements and risks in general that financial institutions have with their customers are recorded.” (source: bde.es)

sample. We therefore use the Heckman (1976) correction to control for a potential selection bias. Our results are robust to all these potential caveats.

Our study provides new evidence for both the lending technology and the creditor information literature streams. We contribute to the large literature stream that investigates the determinants and role of relationship lending (e.g., Petersen and Rajan, 1994; Berger and Udell, 2002; Stein, 2002; Berger et al., 2005; Bolton et al., 2016). We notably show that the degree of creditor information in a country is an important determinant of relationship lending and that a higher level of creditor information substitutes for relationship lending, without generating a credit constraint for the firm. We also add new evidence on the legal environment literature in general (e.g., La Porta et al., 1998; La Porta et al., 2006; McLean et al., 2012), its role in debt markets (e.g., Djankov et al., 2007; Qian and Strahan, 2007; Bae and Goyal, 2009), and the specific role of creditor information in bank debt (e.g., Pagano and Jappelli, 1993; Jappelli and Pagano, 2002; Brown et al., 2009; Vig, 2013; Cho et al., 2014).

The remainder of the paper is organized as follows. Section 2 presents the literature and states the hypotheses. Section 3 is devoted to the empirical design, and Section 4 presents the results. Section 5 offers robustness tests, and section 6 concludes with a discussion, implications, and suggestions for further research.

## **2. Related Literature and Hypotheses**

### *2.1. Relationship Lending*

In conducting their operations, banks do not employ homogeneous ways of lending money – a concept referred as heterogeneous lending technologies in the literature. Berger and Udell (2002) have distinguished two main types of lending technologies, based on the type of information employed by the bank and the type of relationship between the bank and the borrower. Transactional lending relies on hard information – i.e. accounting and historical data on the firm, such as balance-sheet and income statement – and offers limited interaction between the banker and the borrower. On the opposite, relationship lending mostly employs soft information – non recordable information obtained in an informal manner, such as opinions or economic projections – and relies on long-term relationship between the banker and the firm.

An extensive strand of literature emphasizes the importance of relationship lending to resolve information asymmetry issues. For example, several studies investigate the severe

information asymmetries that small and medium-size enterprises (SMEs) face, showing how banks overcome this issue by building long-term relationships with these firms and using soft information (e.g., Petersen and Rajan, 1994, 1995; Degryse and Van Cayseele, 2000).

Stein (2002) and Berger and Udell (2002) demonstrate that large banks tend to act more on hard information, whereas small banks concentrate on the collection and the use of soft information. Berger et al. (2005) show that this difference reflects the use of different lending technology. Compared with small banks, large banks lend at a greater distance, create more impersonal ties with borrowers, and have shorter, less exclusive relationships. Therefore, they primarily invest in transactional lending, which is based on hard information, whereas small banks invest in relationship lending, which is based on the soft information. Subsequent literature has both confirmed and qualified this role division of small and large banks between relationship and transactional lending (e.g., De la Torre et al., 2010; Berger and Black, 2011; Uchida et al., 2012).

The literature emphasises that the benefits associated with relationship lending depend on whether information asymmetries are severe. Bharath et al. (2011) find that relationship lending reduces interest and collateralization rates and increases loan amounts, especially when borrowers suffer from severe information asymmetries. However, they find that relationship lending has no impact when the firms do not exhibit substantial information asymmetries. López-Espinosa et al. (2017) show a decrease in interest rates after two years of relationship, especially for opaque firms suffering from severe information asymmetries.<sup>3</sup> Beck et al. (2018) demonstrate that relationship lending is especially important when the firm suffers from high information asymmetries and when the lending is implemented in an emerging country, which emphasizes the role of the information environment.

However, relationship lending is not only associated with positive outcomes. First, relationship banking can involve using the private information in banks' possession to extract rents from the borrower, commonly referred as the "hold-up" problem (Sharpe, 1990). Second, relationship lending can lead to a soft budget constraint: because banks incur sunk costs when building the relationship, the threat of termination in case of default may not be credible, and the borrower may extort rents from the bank (Dewatripont and Maskin, 1995; Berglof and Roland, 1998).

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<sup>3</sup> A firm is transparent when it is possible for outsiders to find information about it easily. On the other hand, a firm is opaque when it is difficult to find information about it, and it takes time for an outsider to evaluate it properly. Hence, opacity is the antonym of transparency.



## 2.2. *Role of Creditor Information*

Seminal credit market literature emphasizes the primary role of creditor information and shows how asymmetric information can result in adverse selection (e.g., Jaffee and Russell, 1976; Stiglitz and Weiss, 1981) and higher monitoring costs (e.g., Williamson, 1987). Information on borrowers can temper information asymmetries in the credit market. Pagano and Jappelli (1993) demonstrate how information sharing across creditors tempers the adverse selection problem. Their model shows that an increase in creditor information improves the borrower quality and results in a decrease in default risk and interest rate. Empirical literature provides supportive results. For example, Jappelli and Pagano (2002) show that better information sharing at the country level is associated with an increase in lending and a decrease in credit risk. Using a sample of 129 countries, Djankov et al. (2007) find a positive relationship between creditor information and the ratio of private credit to gross domestic product (GDP). At the firm level, a large body of literature confirms the positive effect of creditor information on reducing selection costs and improving borrower default predictions (Barron and Staten, 2003; Kallberg and Udell, 2003; Powell et al., 2004; Luoto et al., 2007; Brown et al., 2009; Dierkes et al., 2013).

By making the credit history available to all creditors, creditor information also exerts a disciplinary effect on borrowers. Padilla and Pagano (2000) predict that to avoid facing high interest rates from any lender in the case of default, investors will invest more effort in their project, resulting in lower default rates, lower interest rates, and more lending. Furthermore, an increase in creditor information is an effective way to reduce the hold-up problem associated with private information retained by the bank (Sharpe, 1990). Such private information rent<sup>4</sup> can lead to excessive interest rates, penalizing the borrower and increasing its incentive to strategically default. Padilla and Pagano (1997) predict that creditor information helps mitigate this issue and results in lower interest rates, lower default rates, and increased lending, and empirical findings overall confirm these predictions. Other studies show that an increase in creditor information is associated with an increase in loan performance and loan repayment and a decrease in the default probability (Brown and Zehnder, 2007; Luoto et al., 2007; De Janvry et al., 2010; Behr and Sonnekalb, 2012; Doblas-Madrid and Minetti, 2013; Bos et al., 2016).

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<sup>4</sup> An informational rent occurs when a bank possesses a private information, which provides a competitive edge and from which an economic value can be extracted.

### 2.3. *Creditor Information and Relationship Lending*

By modifying the extent of information asymmetries between banks and firms, creditor information is likely to have an impact on the use of relationship lending. Building on the literature, we posit that this modification can take two opposite directions.

A first view is that an increase in creditors' information can reduce the use of relationship lending because it increases the availability and quality of hard information. From the bank's perspective, this leaves fewer incentives to invest in relationship lending and obtain additional information (Berger and Udell, 2006). In support of this view, Miller and Rojas (2004) find that creditor information increases the use of credit scoring by banks – a transactional lending technology. Because an increase in creditor information also disciplines the borrower, the monitoring benefit associated with relationship lending for the bank decreases.

Adopting the firm's perspective, reduction in information asymmetries allowed by credit registries reduces the marginal benefits associated with relationship lending, such as a decrease in credit rationing (e.g., Ferri and Murro, 2015).<sup>5</sup> Klapper (2006) notably finds that an increase in creditor information from registries increases the firm's use of factoring – another transactional lending technology. This means that firms would be less incentivized to use relationship lending when credit registries widely disseminate information on borrowers.

Last, because relationship lending also generates a hold-up issue (detrimental for the firm) and a soft budget constraint (detrimental for the bank), both firms and banks may be inclined to use transactional lending when information asymmetries decrease. Overall, a first possible outcome of an increase in creditor information is a decrease in the use of relationship lending.

A second view is that an increase in creditors' information makes the private information associated with relationship lending more profitable for the bank. Consistent with this view, Karapetyan and Stacescu (2014) build a model in which more creditor information increases the relative value of soft information compared with hard information, giving banks an incentive to engage in relationship lending to extract information rent. Hauswald and Marquez (2006) investigate the role of securing private information to obtain a competitive

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<sup>5</sup>Jaffee and Russel (1976, p. 1) define credit rationing as a situation that “occurs when lenders quote an interest rate on loans and then proceed to supply a smaller loan size than that demanded by the borrowers.” Their study contributes to the link between information asymmetries and credit market imperfections, to which the reader can usefully refer for a better grasp of these notions.

edge, finding that banks invest in information acquisition to soften competitive pressures and to extend their market share.

Even in the context of information sharing, Bouckaert and Degryse (2006) show that, while banks might share information on their borrowers with other banks, they do so only strategically: by sharing information on only a portion of their borrowers, they create an adverse selection issue that prevents incumbents from tapping their most profitable clientele, for which they have gathered private information. From that perspective, private information is crucial for banks and the dissemination of hard information through credit bureaus and registries gives them an incentive to further invest in relationship lending. In that case, the expansion of creditor information can reinforce the use of relationship lending.

### **3. Empirical Design**

#### *3.1. EFIGE Database*

Our main source of data is the EU-EFIGE/Bruegel-UniCredit dataset (EFIGE dataset). The data were collected by the EFIGE (European Firms in a Global Economy) project, supported by the European Commission and coordinated by Bruegel. The EFIGE project involved conducting a firm-level survey on nearly 15,000 firms that employed at least 10 people and operated in seven European countries (Austria, France, Germany, Hungary, Italy, Spain, and the United Kingdom). The dataset is based on a representative sample of firms in terms of number, size, sector, and regions. The survey required a minimum response rate of at least 60% and up to 90% on key questions. We use answers to questions referring to 2009.<sup>6</sup> The dataset consists of responses to questions related to six topics: firm structure, workforce, technological information and R&D, internationalization, markets and pricing, and finance. Importantly, it includes precise information on the firm's relationship with its bank.

We merged the EFIGE dataset with the Amadeus database, which offers financial and accounting information on European firms. We were interested in the firm's use of relational or transaction lending. To that end, we focused on firms that needed credit in 2008 and used short-, medium-, or long-term bank credit or leasing or factoring, which represented 18% of the firms in EFIGE dataset. We removed firms that did not have enough information and ultimately retained a sample of 2,292 firms.

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<sup>6</sup> Although the EFIGE survey spans from 2007 to 2010, the answers in the Finance section refer to 2009. Altomonte and Aquilante (2012) provide a thorough description of the EFIGE dataset.

We are aware that this sample only represents 18% of the overall EFIGE dataset and might be affected by a potential sample bias. To verify that such a bias is not present in our analysis, we compared the firms in the overall dataset with those in our analysis sample with respect to their main characteristics. Appendix A provides the results of this comparison, showing that firms are roughly the same in terms of size, age, and capital structure in both samples. Thus, we are confident our sample does not suffer from a sample bias.

### 3.2. *Measuring Relationship Lending*

To measure relationship lending, we follow Bartoli et al.'s (2013) methodology, which Ferri et al. (2019) adapted to the EFIGE survey. We capture the firm's lending technology with responses to the question "Which type of information does the bank normally use/ask to assess your firm's creditworthiness?" (EFIGE Survey, question F.16). Figure 1 displays the possible answers and the proportion of responses for each.

We follow Stein (2002) and assimilate the banks' use of hard information as transactional lending, which corresponds to items 1, 2, and 5. We created a *Transactional Lending Index (TLI)*, which takes the value of 1 each time a firm selects one of these items. The greater the value of the *TLI*, the more the banks use transactional lending. We acknowledge that our measure imperfectly covers all the transactional lending technology available to the firm (Berger and Udell, 2006); it does, however, cover the banks' use of hard information, which is the source of the various transactional lending technologies.

To capture the use of relationship lending, we rely on the banks' use of soft information, which corresponds to items 3 and 6. We created a *Relationship Lending Index (RLI)*, which goes from 0 to 2 and takes the value of 1 each time the respondent selects one of these items. Last, we constructed a *Relationship Lending (RL)* dummy, which takes the value of 1 if *RLI* is greater than *TLI* and 0 otherwise (Bertrand and Statnik, 2018).<sup>7</sup> Items 4 and 7 are classified as neither transactional nor relationship because they do not belong to either definition.

Table 1 reports the use of relationship lending across countries. Note that whereas only 19.66% of firms in Spain rely mostly on relationship lending, this share reaches 61.09% in France. On average, 29.01% of the firms in the sample use mostly relationship lending.

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<sup>7</sup> Because *TLI* is based on three items and *RLI* is based on two items, we rescaled *RLI* by 2/3; note, however that our results hold without this rescaling.

### 3.3. *Measuring Creditor Information*

To measure the degree of creditor information, previous studies have mainly used credit bureaus and public credit registers. Jappelli and Pagano (2000) define a credit bureau as a voluntary mechanism, in which an information broker collects the information provided by its members and distributes this information among the group. It consists of a private initiative to gather credit information on firms and borrowers for the profit of its members. Historically, banks and entrepreneurs have set up credit bureaus. Growth of credit bureau coverage over the past decade has been substantial: private bureaus represented 15.7% of the population in the world in 2005, but this figure reached 30.8% in 2017 (World Bank, Doing Business Database<sup>8</sup>).

Another element used to measure the degree of creditor information is the presence of a public credit registry. Public credit registers are credit databases created by governmental bodies and are usually maintained by the banking supervising authority or the central bank. These registers collect information on banks and borrowers on a mandatory basis and make it available to financial institutions. Compared with credit bureaus, public credit registers' coverage tends to be larger, as the information is not restrained to the subset of banks that patronize a credit bureau. However, the information may also be less extensive and restrained to certain types of debt. Public credit registry coverage has increased substantially over the past decade: they accounted for only 3.3% of the population worldwide in 2004, but this share reached 13.6% in 2017 (World Bank, Doing Business Database).

In our study, we use the Depth of Credit Information Index (*Creditor Information*) as our key variable. This index combines the effects of credit registries and private bureaus and is more precise in its components. It was constructed by the World Bank and takes values from 0 to 8: a score of 1 is assigned each time the country offers one of the eight features a credit registry or a credit bureau potentially offers.<sup>9</sup> We then break the Credit Information Index down further into private bureaus and public credit registries. We use the World Bank indicator of public credit registry coverage (*Public Registry*) and private bureau coverage (*Private Bureau*) to assess the role of each component. These indicators “report the coverage of individuals and firms by a private credit bureau/public credit registry with information on

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<sup>8</sup> Data available at <https://www.doingbusiness.org/>

<sup>9</sup> The indicators are data on the firm, both positive and negative credit information, data from retailers, at least two years of historical data, inclusion of small loans, low cost to access the data, online access, and services to assess the creditworthiness of borrowers. The complete definition is available at <http://www.doingbusiness.org/Methodology/Getting-Credit>.

their repayment history, unpaid debts, or credit outstanding from the past 5 years – expressed as a percentage of the adult population.”<sup>10</sup>

Although private credit bureaus and public credit registries both convey information on creditors, they do not contribute in the same way to the informational environment, which is why we break them down in our analysis (Jappelli and Pagano, 2000). Privates bureaus are essentially set up in a network of banks, while credit registries make the information more broadly available to the public. This difference also means that the depth of information provided is likely to vary. Extant research has documented this difference. Whereas some studies show similar effects for private bureaus and credit registries (e.g., Djankov et al., 2007; Brown et al., 2009), others show differences (e.g., Love and Mylenko, 2003; Grajzl and Laptieva, 2016), suggesting that they do not convey the same information and do not deliver the same outcomes (Jappelli and Pagano, 2002).

Table 1 presents the value of *Creditor Information*, *Public Registry*, and *Private Bureau* by country. The value of *Creditor Information* is relatively high, ranging from 4 to 6. Two countries do not offer a public credit registry, and only one country does not offer a private bureau. The coverage of private bureaus varies widely, from 5.9% of the population in Hungary to 93.9% in Germany. The coverage of public credit registries ranges from 0.5% in Germany to 44.9% in Spain.

### 3.4. Empirical Model

To evaluate the impact of creditor information on relationship lending, we estimate the following model:

$$RL = \alpha_0 + \beta_1 \cdot Info + \sum_k \varphi_k \cdot Credit + \sum_g \gamma_g \cdot Firm + \sum_h \theta_h \cdot Macro + \varepsilon, \quad (1)$$

where  $RL$  is the relationship lending variable and  $Info$  is a creditor information variable, measured at the country level. In our main specification, we use *Creditor Information*. We then assess the role of *Credit Registry* and *Private Bureau* using both the percentage of coverage and dummy variables that indicate the presence of a credit registry (*Credit Registry I/O*) and a private bureau (*Private Bureau I/O*) in the country, respectively.  $Credit$  is a vector of variables related to the characteristics of the last credit negotiated and is measured at the firm level. It includes the use of personal collateral (*Personal Collateral*), the use of firm’s collateral (*Asset Collateral*), the increase in the cost of credit ( $\Delta Credit Cost$ ), and the

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<sup>10</sup> World Bank, Doing Business Project (<http://www.doingbusiness.org/ExploreTopics/GettingCredit>). It is noteworthy that the variable is scaled by the adult population but does not represent the coverage of the adult population, as it includes both individuals and firms.

acceptance or refusal of the last credit application (*Denied*). We provide two versions of the model, with and without the *Credit* vector of control variables. Our rationale is that these variables might be influenced by the choice of a lending technology, which could create a potential endogeneity issue. To ensure that this issue does not affect the significance of our results, we present two versions of the model, with and without this set of controls.

Because the bank organization can have an important impact on relationship lending and may be correlated with the informational environment, we also control for *Local*, which is a dummy that equals 1 if the bank of the firm is a local one and 0 otherwise. For *Credit* variables, given a potential endogeneity issue, we test our specification with and without this variable.

*Firm* is a vector of variables that controls firm characteristics. We consider the following variables: the number of employees (*Size*), the age of the firm in years (*Age*), the ratio of total loans to total assets (*Leverage*), the percentage of total turnover invested in R&D (*R&D*), the limited corporation status of the firm (*Limited Corp.*), and the gender of the CEO (*CEO Male*). We also include dummies for sectors.

Last, *Macro* is a vector of variables that controls the country's characteristics. We employ three macroeconomic variables. We use the GDP per capita (*GDP/Capita*) to control for differences in wealth across countries. We include the ratio of stock capitalization to GDP and domestic bank credits to GDP to control for market- and bank-based systems (Aggarwal and Goodell, 2016). In line with extensive research showing the importance of bank competition on information sharing among banks (e.g., Brown and Zehnder, 2010), we use the *Lerner Index* to control for market power.

We estimate Equation 1 using a logistic regression, with standard errors clustered at the country level. Appendix B provides a full description of the variables, along with their sources. Table 2 provides descriptive statistics.

#### **4. Creditor Information and Relationship Lending**

Does a different informational environment, driven by either public credit registries or private credit bureaus, affects the use of relationship lending? In this section, we first estimate the impact of creditor information on relationship lending. Then, we investigate whether this effect leads to credit rationing or to a shift toward transactional lending.

#### 4.1. Main Results

We begin with a univariate analysis to test whether countries that have a public registry of credit or a private bureau exhibit a different level of relationship lending. Table 3 provides difference tests. The degree of relationship lending is similar between countries that offer and do not offer a public credit registry, and the differences are not significant between the two groups. By contrast, countries with private bureaus exhibit a much lower use of relationship lending than countries without private bureaus. The difference is substantial: in countries without a private bureau, 61.1% of the firms in our sample rely mostly on relationship lending, whereas only 23.3% of the firms in countries with a private bureau rely mostly on relationship lending, and this difference is highly significant.

We next turn to the multivariate modelling. Table 4 reports the results. For each measure of creditor information, we present our results with and without controlling for credit conditions. As explained in Section 3, we do so to ensure that our results are not affected by an endogeneity issue. The first two columns show the effect of *Creditor Information* on the use of relationship lending. We control for firms' characteristics and macro variables and then firms' conditions of credit. An increase in the depth of credit information index exerts a substantial decrease in firms' use of relationship lending in both models. The marginal effect associated with an increase of creditor information is a decrease of 20.1% in the use of relationship lending ( $p$ -value < 0.01). We further investigate this effect by breaking down the effect of private bureaus and public credit registries, testing the effect of offering a private bureau or a credit registry per se and then the effect of increasing their coverage.

We next divide the Depth of Credit Information Index into its two main components and find consistent results on the effect of public bureaus. Countries with a private bureau experience a decrease in the use of relationship lending, compared with countries that do not offer such bureaus. This effect is highly significant. We also observe a significant decrease in the use of relationship lending when the coverage of private bureaus increases. On average, an increase of 1% in the private bureaus' coverage leads to a decrease of 1.3% in the probability that banks use relationship lending as the major lending technology.

Turning to the role of credit registries, the dummy variable *Credit Registry (0/1)* is nonsignificant, which indicate no significant impact associated with the introduction of a public credit registry. However, for countries offering a public registry, increasing the coverage of the registry is associated with a reduction of relationship lending. The odds ratio of *Credit Registry* shows that an increase of 1% of the coverage of public credit registries leads to a decrease of 3.5% of the use of relationship lending as the main lending technology.



Overall, our results confirm the hypothesis that an increase in creditor information reduces banks' use of relationship lending. The effect is substantial and significant for the models including different sets of control variables. Including the credit controls substantially increases the R-square, underscoring the importance of these variables in explaining the use of relationship lending. Breaking the components of *Creditor Information* down, we find that both private bureaus and credit registries exert a similar negative effect.

This evidence supports the view that the increase in the availability and quality of public hard information reduces banks' incentives to invest in relationship lending (Berger and Udell, 2006). Creditor information helps banks screen and discipline the borrowers, which achieves similar objectives as relationship lending. Moreover, compared with relationship lending, creditor information does not entail sunk costs for the banks and does not create a soft budget constraint problem for firms. The legal environment, by modifying the informational environment, exerts a direct impact on the use of relationship lending. Our next step is to explore whether these modifications result in adverse outcomes for the borrowers.

#### 4.2. *Credit Rationing and the Use of Transactional Lending*

Our main results lend support to the view that an increase in creditor information is associated with a decrease in relationship lending. In addition, the data indicate that creditor information substitutes for relationship lending, in that it plays a similar role – that is, offering additional information and monitoring the borrower.

We next explore the consequences for the firm. Although a bank can have an interest in reducing its share of relationship lending to reduce the associated costs when creditor information is high, it is unclear whether this shift alleviates or increases the firm's financial constraints. Indeed, considering that relationship lending usually helps reduce credit rationing (Petersen and Rajan, 1994; Cenni et al., 2015), we wonder if strong creditor information has the same effect.

Thus, we next investigate these points and analyse the impact of creditor information on credit rationing and on the use of relationship lending or in a mismatching situation. To measure credit rationing, we construct the variable *Rationing*, which is a dummy that takes the value of 1 if the firm applied for more credit in 2008 and did not obtain it despite being ready to pay a higher interest rate, in line with Stiglitz and Weiss's (1981) definition of rationing. We estimate the effect of relationship lending in the presence of credit information

on credit rationing by computing the interaction between *Creditor Information* and *Relationship Lending*.

Table 5, column 1, provides the results. Overall, we observe no impact of relationship lending associated with creditor information on credit rationing. The effect of the interaction variable, *Creditor Information*  $\times$  *RL*, exerts no significant effect on either *Rationing* or *Creditor Information* and *Relationship Lending* when considered separately. These results are in line with those of Degryse and Van Cayseele (2000), who show that relationship lending can exert opposite effects on credit, depending on the strength or length of the relationship. However, the literature also finds an opposite effect of creditor information on loan size (e.g., González-Uribe and Osorio, 2014; Grajzl and Laptieva, 2016), which could explain why we do not find any significant impact of creditor information on credit rationing.

We next take the analysis a step further. Ferri and Murro (2015) show that a firm issuing soft information to a transactional bank, a so-called mismatching situation, will be more credit constrained. The main idea is that the bank will not be able to process the information issued by the firm and therefore will refuse the credit. However, if creditor information plays the same role as the banking relationship, transactional banks should be able to use the creditor information in lieu of the information obtained through relationship banking. Thus, a company in a mismatching situation should be less constrained in terms of credit in a strong informational environment. As a mismatching variable, we employ *Mismatching*, a dummy variable that takes the value of 1 if a firm issuing soft information is in contact with a transactional bank, using Ferri and Murro's (2015) methodology. Again, we then compute the interaction between *Creditor Information* and *Mismatch*.

Table 5, column 2, displays our results. Note that the interaction term *Creditor Information*  $\times$  *Mismatch* is negative and significant, which means that a firm issuing soft information and having a relationship with a transactional bank (i.e., in a mismatch situation) will be less rationed in a strong informational environment. This result shows that transactional banks, which do not have the capacity to analyse soft information, turn to information bureaus or registries to obtain information and thus grant credit anyway.

Last, if the decrease in relationship lending does not result in an increase of credit constraints, and can even ease credit conditions for firms in a mismatching situation, it would be natural to observe an increase in the use of transactional lending overall. To verify this hypothesis and to confirm our results, we assess the role of creditor information in the use of factoring, a form of transactional lending (Berger and Udell, 2006). Table 5 reports the results. The variable *Factoring* takes the value of 1 if the firm uses factoring and 0 otherwise.

We logically find a negative relationship between the use of relationship lending and the use of factoring. However, the coefficient of *Creditor Information*  $\times$  *RL* is positive and significant, which indicates that firms engaged in relationship lending use more factoring when credit information increases. This finding supports the view that the banks' lending technology shifts in the presence of more creditor information. The legal environment exerts a direct impact on bank behaviours, such that banks and firms reduce the use of relationship lending and increase the use of transactional lending.

## 5. Robustness tests

We performed six robustness tests to confirm our results. First, we use two alternative measures of creditor information. Second, we use four alternative measures of relationship lending. Third, we examine firms with a high degree of opacity and determine whether our results hold for them. Fourth, we control for the legal environment through creditor rights and contract enforcement. Fifth, we consider a potential endogeneity issue in our results. Sixth, we control for a potential selection bias on the credit market.

### 5.1. Alternative Measures of Creditor Information

We reran our main estimation using two measures of creditor information. First, we took the World Bank's Business Extent of Disclosure Index (*Business Disclosure*), which measures the extent of disclosure of ownership and financial information required from companies. It ranges from 0 to 10, with higher values indicating more disclosure. Second, we use Djankov, La Porta et al.'s (2008) index of ex ante disclosure requirements (*Disclosure Ex Ante*), which gathers the disclosure requirements the firm must meet when operating a transaction and thereby provides an alternative measure of the degree of information the bank has access to when dealing with a firm. Table 6 displays the estimations. The findings support our main results. An increase in information, through an increase of either *Business Disclosure* or *Disclosure Ex Ante*, generates a negative impact on *Relationship Lending*. The results are significant at the 0.01 level. On average, an increase of one point of *Business Disclosure* is associated with a decrease of 28.8% in firms' probability of using relationship lending. An increase of 1% in the disclosure requirements leads to a decrease of 4.3% in firms' probability of using relationship lending.

## 5.2. *Alternative Measures of Relationship Lending*

Our measure of relationship lending is built on the answers to the EFIGE survey, which has two shortcomings. On the one hand, it is based on the qualitative answers a firm provides, which may only approximate the true relationship with the bank and reflect the firm's own perception. On the other hand, even if the answers refer to 2009, they may embed the impact of the financial crisis. To address these two issues, we follow the literature and use four alternative ways of measuring relationship lending. First, we use the length of the relationship, assuming that firms that have a long-lasting relationship with their bank are more likely to use relationship lending (Degryse and Van Cayseele, 2000). We construct two variables: one is the natural logarithm of the length of relationship ( $\text{Log}(\text{Length})$ ), and for the other, we follow López-Espinosa et al. (2017) and generate a dummy variable  $\text{Length} (1/0)$  that equals 1 if the length of the relationship between the firm and its bank is less than or equal to two years and 0 otherwise. For the second alternative measure, we use the number of institutions a firm deals with, assuming that firms are more likely to engage in relationship lending if they do not have multiple bank relations. We construct the variable  $\text{No.Banks}$ , which corresponds to the number of banks the firm uses. For the third alternative measure, we follow Presbitero and Zazzaro (2011) and compute a dummy variable that takes the value of 1 if the firm has more than 33% of its credit from its main bank ( $\text{Main Bank}$ ). Fourth, the increase in relationship lending might simply be related to an increase in the information produced by the firm in general. Bartoli et al. (2013) demonstrate that relationship lending and transactional lending are complementary (the correlation between RLI and TRI is equal to 0.23 in our database). Thus, to verify that we are measuring an actual increase in the use of relationship lending, we create a ratio equal to  $\text{RLI} / \text{TRI}$ .

Columns 3–7 of Table 6 report the results. The impact of *Creditor Information* on all our alternative variables confirms our main results. An increase in creditor information results in a reduction of the length of the relationship between the bank and the firm, an increase in the number of institutions the firm deals with, a decrease in the probability that the firm has more than 33% of credit from one bank, and a decrease in the proportion of relationship lending compared with transactional lending. All results are economically and statistically significant, in support of the view that an increase in creditor information reduces the use of relationship lending.

### 5.3. Firm's Opacity

For extremely opaque firms, the information rent associated with soft information in the presence of high creditor information is likely to be higher. Karapetyan and Stacescu (2014) develop a model in which the bank has an interest in investing in relationship lending when creditor information increases. The rationale is that when hard, verifiable information becomes available to all competitors, soft information remains the exclusive property of the incumbent bank and the only source of information rent. Although our main results do not support this view, it is possible that it holds for extremely opaque firms. Banks may not invest in relationship lending in general but may still have incentives to invest in relationship lending for firms that offer valuable information rent. This speculation is also in line with the literature on relationship lending that argues that relationship lending primarily matters for firms with a high degree of information asymmetries (e.g., Bharath et al., 2011; López-Espinosa et al., 2017; Beck et al., 2018).

To estimate the role of firms' opacity, we use three proxies commonly employed in the literature (e.g., Petersen and Rajan, 1995): a dummy variable equal to 1 when the firm belongs to the first size quartile (*Small Firm*), a dummy variable equal to 1 when the age of the firm is less than two years (*Young Firm*), and a dummy variable equal to 1 when the firm belongs to the first bank debt quartile (*Low Debt*).

Table 7 reports the results. First, the coefficient of *Creditor Information* remains negative and significant in all the specifications, confirming our main result. However, adding the interaction with the opacity variables substantially reduces the effect. An increase of one point of the information index leads to a decrease of only 25% of relationship lending on average, compared with 69% in the main specification. By contrast, an increase in creditor information leads to an increase in the use of relationship lending for firms that are the most opaque in terms of size, age, or share of bank debt. This effect climbs to an increase of 7.3% of relationship lending for firms with few bank debts.<sup>11</sup>

Our results confirm the view that the effect of creditor information on the use of relationship lending is subject to the degree of information asymmetries. In general, an

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<sup>11</sup> The positive correlation between both relationship lending and firm size and relationship lending and small firms might seem surprising; however, this result is consistent with the literature that shows that the relationship between size and lending technology evolves nonlinearly with firm size: small firms favour soft information because they have little hard information. Medium-size firms favour hard information because they are able to transmit it easily and at low cost, while soft information is more expensive to transmit. Finally, large companies, which are often older, have established longer relationships with their banks, which explains their more intensive use of relationship lending. Berger and Udell (2014) further explore this nonlinear relationship between relationship lending and size.

environment with a higher level of creditor information is associated with a decrease in the use of relationship lending, and the effect is the opposite for opaque firms. For those firms, banks seem to prefer relationship lending as information increases. In line with Karapetyan and Stacescu's (2014) model, this preference can be attributed to the information rents that banks extract from proprietary information. Private information is especially valuable for opaque firms when hard information is widely available. Banks then invest in relationship lending to benefit from information rent in a niche market.

#### *5.4. Controlling for Legal Environment*

Our analysis focuses on creditor information; however, the literature has widely demonstrated the role of legal environment in the use of bank debt. For example, Djankov et al. (2007) show that better protection of creditors is associated with more extensive use of bank debt, and Djankov, Hart, et al. (2008) emphasize the role of debt contract enforcement. Furthermore, some studies show that the role of legal environment supplants the role of information in the credit market (e.g., Cho et al., 2014). More recently, employing the same database and the same sample of countries, Bertrand and Statnik (2018) demonstrate that countries with greater creditor rights make less use of relationship lending. Therefore, we explore the possible effect of creditor rights and debt contracts enforcement on our results. To do so, we add the two indices constructed in Djankov and colleagues (Djankov, Hart, et al. 2008; Djankov, La Porta, et al. 2008) on creditor rights and debt contract enforcement. Columns 1 and 2 in Table 8 present the results. We find that *Creditor Rights* and *Enforcement* affect the use of relationship lending. While an increase in creditor rights is associated with an increase in the use of relationship lending, better contract enforcement is associated with a decrease in the use of relationship lending. Controlling for these effects does not affect our results: we still observe that creditor information plays a major role in the use of relationship lending, with a reduction of relationship lending when creditor information increases.

#### *5.5. Potential Endogeneity Issue*

This study focuses on the role of creditor information in relationship lending, using the level of information in the economy as an exogenous variable. We postulate that banks' choice of lending technology is unlikely to affect the informational environment in general. This approach is credible for public credit registries, for example, which are set up by governments for regulatory purposes. The alternative measures we use to assess the role of

information are also likely to be exogenous. Both *Business Disclosure* and *Information Ex Ante* stem from the legal environment, which can be considered exogenous (Kysucky and Norden, 2015). By contrast, the effect of *Credit Bureau* is unlikely to be exogenous. Private credit registries are set up by financial institutions – including banks – in response to the current informational environment the banks are facing and their need for information. The need for information is likely to be determined by the use of relationship lending. Thus, relationship lending would partly determine the use of private bureaus, which generates an endogeneity issue.

To address this issue, we perform an IV regression. A large number of economics and law studies suggest that the legal origins of a country can be a good instrument in this situation (La Porta et al., 1998); however, as Bradford et al. (2020, p. 1) show, the legal origins “may be an important predictor of legal substance in well-established legal regimes, but do little to explain substantive variation in more recent areas of law,” such as creditor information law. Refraining from using legal origins as IVs, we offer an alternative strategy.<sup>12</sup>

We instrument the level of creditor information in a country by its participation in two historical initiatives intended to expand creditor information worldwide. The first is membership in the Association of Consumer Credit Information Suppliers (ACCIS), a group of countries working to develop the presence of Credit Information Bureaus, created in 1990. Historical membership in this association is likely to instrument the level of creditor information today. In our sample, all countries but France are members of ACCIS. Second, we identify countries that have signed the Memorandum of Understanding on the Exchange of Information among National Central Credit Registers for the Purpose of Passing it on to Reporting Institutions (20 February 2003) (MOU), which has influenced several countries to pass laws to comply with common standards (Jentzsch, 2007). In our sample, all countries but Hungary and the United Kingdom have signed the MOU.

Historical membership in the association and signature of the memorandum provides us with two instruments: *ACCIS*, which takes the value of 1 if the country is a member of this association, and *MOU*, which takes the value of 1 if the country signed the memorandum. These two variables are likely to explain the value of *Creditor Information* but cannot be influenced by the lending technology banks use today.

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<sup>12</sup> Employing legal origins as instruments provides similar results to those of the methods that follow.

Columns 3 and 4 of Table 8 report the two stages of the IV regression. Both variables exert a significant impact on *Creditor Information*: both coefficients are positive and significant. The second-stage regression confirms our main result: the instrumented variable of *Creditor Information* exerts a negative and significant impact on relationship lending.

### 5.6. Controlling for Selection Bias on the Credit Market

We acknowledge the risk that some firms may be excluded from the credit market depending on the level of creditor information. Because an increase in the level of creditor information is associated with a decrease in relationship lending, firms that would have only used relationship lending to access credit may refrain from using bank debt. Although our findings show that opaque firms still engage in relationship lending when the information is high, they indicate nothing about potentially even more opaque firms that did not even enter the credit market.

To consider firms that do not access the credit market and to eliminate selection bias issues, we perform a two-stage Heckman regression. In the first stage, we obtain the residuals of a credit access regression. We follow Bertrand and Statnik (2018) and employ *Bank Credit*, which takes the value of 1 if the firm has used short-, medium-, or long-term bank credit or leasing or factoring and 0 if the firm has used another means to satisfy its financial needs. We perform the regression on the control variables and *Creditor Rights*. We use all the firms in the EFIGE survey with available data from Amadeus Database. Using the residuals, we compute the Heckman ratio and add it in the second regression that explains *Relationship Lending*. Columns 5 and 6 of Table 8 report the results, which confirm our hypotheses. Heckman's lambda is nonsignificant, which tempers the risk of a selection bias. We conclude that the role of creditor information in relationship lending is stable, with a negative and significant coefficient.

## 6. Conclusion

This paper appraises the impact of creditor information provided by credit registries on relationship lending – a way of lending that aims at collecting soft (private) information. Public credit registries, instituted by the law, and private credit bureaus, established by banks, can modify the informational environment that banks and borrowers face. We investigated whether such a modification means that banks would modify their behaviours and shift the lending technologies they employ. We can provide a conclusive answer: an increase in creditor information is negatively associated with the use of relationship lending, a result



robust to a large variety of controls and tests. Our findings are in line with a substituting effect. Because relationship lending and creditor information achieve similar objectives – screening and monitoring of borrowers – but creditor information does not generate similar constraints, an increase in creditor information is associated with a decrease in relationship lending.

However, we also find that the relationship between relationship lending and creditor information is positive for extremely opaque firms – for which the role of soft information is instrumental –, in support of Karapetyan and Stacescu's (2014) view on informational rents. From this perspective, because creditor information gives access to hard information, the relative value of proprietary soft information increases, and relationship lending becomes the only way for banks to secure informational rent.

This study contributes to the literature on relationship lending and creditor information. It emphasises the role of the legal environment and regulation in explaining the use of different lending technologies and how they can modify the type of lending technology banks use. Our findings pave the way for further research that could open the “black box” on banks and SME behaviours and how they are related to the general legal and economic framework in which agents are operating.

Our results also provide some guidance for regulators. Setting public credit registries, facilitating the use of private bureaus, and enhancing the informational environment substitute for relationship lending and provide similar outcomes for firms. This result is important: while it is difficult for policy makers to induce a shift in bank lending technologies and favour, for example, relationship lending that helps SMEs gain access to credit, setting up credit registries is a much more straightforward policy that will achieve a similar outcome. Further research could investigate whether access to information also contributes to another outcome of relationship banking: facilitating access to credit over the business cycle.

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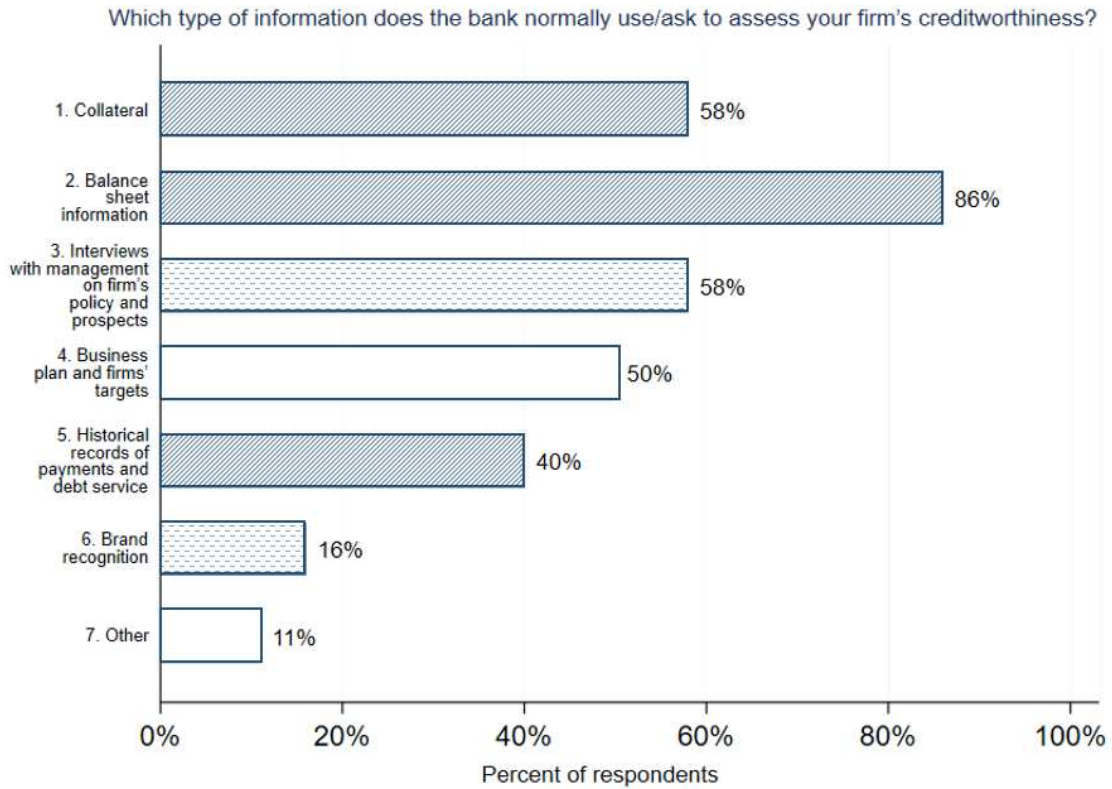
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**Figure 1**  
**Lending Technology Indices**



This figure represents the seven possible answers to the question “Which type of information does the bank normally use/ask to assess your firm’s creditworthiness?” This graph represents the percentage of respondents who chose the item (on the left). Respondents could choose several items. Each item is classified between transactional lending (with hatches), relationship lending (with dashes) or other (blank).

**Table 1**  
**List of Countries**

Country	No.	Creditor Information	Credit Registry	Private Bureau	Relationship Lending (%)
Austria	57	5	1.2	39.9	43.9
France	347	4	12.3	0	61.1
Germany	250	5	0.5	93.9	36.8
Hungary	58	5	0	5.9	25.9
Italy	686	5	9.9	67.8	20.3
Spain	758	5	44.9	7.4	19.7
United Kingdom	136	6	0	86.1	24.3
<i>Total</i>	<i>2,292</i>	<i>4.9</i>	<i>19.8</i>	<i>39.2</i>	<i>29.0</i>

This table provides the list of countries included in the study. It provides the corresponding value of *Creditor Information*, *Credit Registry*, *Private Bureau* and *Relationship Lending* (mean). See Appendix B for definitions of the variables.



**Table 2**  
**Descriptive Statistics**

	Mean	Median	Std. Dev.	Min.	Max.
<b><i>Dependent variables</i></b>					
RL (in %)	29%	0%	0.5	0%	100%
Length (0/1) (in %)	98%	100%	0.1	0%	100%
Log(Length)	2.6	2.9	0.8	0.7	4.6
No.Banks	4.1	4.0	2.6	1.0	15.0
Main Bank (in %)	75%	100%	0.4	0%	100%
RLI / TRI	0.6	0.5	0.7	0.0	3.0
<b><i>Independent variables</i></b>					
<b><i>Variable of Interest</i></b>					
Creditor Information	4.9	5.0	0.5	4.0	6.0
Credit Bureau	39.2	7.4	36.1	0.0	93.9
Credit Bureau (0/1) (in %)	85%	100%	0.4	0%	100%
Credit Registry	19.8	9.9	18.1	0.0	44.9
Credit Registry (0/1) (in %)	91%	100%	0.3	0%	100%
<b><i>Control variables</i></b>					
<b><i>Country-level variables</i></b>					
GDP / Capita	28.5	26.4	7.7	9.4	47.8
Financial Structure	0.6	0.6	0.2	0.2	1.2
Lerner	0.2	0.2	0.1	0.04	0.3
Business Disclosure	6.3	7.0	1.6	2.0	10.0
Disclosure Ex Ante	35.9	33.0	19.8	0.0	100.0
LLSV	1.9	2.0	1.0	0.0	4.0
Legal Efficiency	63.7	57.0	17.1	45.3	92.3
ACCIS (in %)	85%	100%	0.4	0%	100%
MOU (in %)	91%	100%	0.3	0%	100%
<b><i>Credit-level variables</i></b>					
Personal Collateral (in %)	36%	0%	0.5	0%	100%
Asset Collateral (in %)	37%	0%	0.5	0%	100%
ΔCost Credit (in %)	59%	100%	0.5	0%	100%
Rationing (in %)	5%	0%	0.2	0%	100%
Factoring (in %)	4%	0%	0.2	0%	100%
Local Bank (in %)	65%	100%	0.5	0%	100%
<b><i>Firm-level variables</i></b>					
Size	75.4	30.0	351.3	10.0	15,000.0
Firm Age	22.4	19.0	16.9	1.0	113.0
Leverage	0.2	0.2	0.2	0.0	1.0
R&D (in %)	48%	15%	46.7	0%	100%
Limited Corp. (in %)	74%	100%	0.4	0%	100%
CEO Male (in %)	92%	100%	0.3	0%	100%
Manufacturing (in %)	88%	100%	0.3	0%	100%
Energy Production (in %)	1%	0%	0.1	0%	100%
Water Production (in %)	8%	0%	0.3	0%	100%
Observations	2,292				

This table provides descriptive statistics for the variables used in the study. See Appendix B for definitions of the variables.

**Table 3**  
**Mean Differences**

	N	Mean	Std. dev.	Mean Diff.
<i>Relationship Lending</i>				
Credit Registry = 0	194	0.25	0.4	-0.047
Credit Registry = 1	2,098	0.29	0.5	(-1.4)
<i>Relationship Lending</i>				
Credit Bureau = 0	347	0.6	0.5	0.4***
Credit Bureau = 1	1,945	0.2	0.4	(15.0)

This table provides a test of difference in the mean of *Relationship Lending*, depending on the value of *Credit Registry* and *Credit Bureau*. We test the mean difference with a student t-test. Statistics are reported in parentheses. \*, \*\*, and \*\*\* denote a difference significantly different from 0 at the 10%, 5%, and 1% levels, respectively. See Appendix B for definitions of the variables.

**Table 4**  
**Creditor Information and Relationship Lending**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	RL	RL	RL	RL	RL	RL	RL	RL	RL	RL
Creditor Information	0.3*** (-16.5)	0.3*** (-12.7)								
Credit Bureau (0/1)			0.2*** (-20.2)	0.2*** (-13.3)						
Credit Bureau					0.9*** (-14.1)	0.9*** (-10.1)				
Credit Registry (0/1)							4.2 (0.5)	2.0 (0.3)		
Credit Registry									0.9*** (-2.7)	0.9*** (-4.4)
Personal Collateral		0.5*** (-3.1)		0.5*** (-3.1)		0.5*** (-2.9)		0.5*** (-2.9)		0.5*** (-2.8)
Asset Collateral		0.6*** (-2.9)		0.6*** (-3.0)		0.6*** (-2.9)		0.6*** (-4.2)		0.5*** (-4.2)
ΔCost Credit		0.7 (-1.4)		0.7 (-1.4)		0.7 (-1.4)		0.8 (-1.2)		0.8 (-1.2)
Denied		0.9 (-0.5)		0.9 (-0.5)		0.9 (-0.5)		0.9 (-0.4)		0.9 (-0.2)
Log(Length)		1.1 (1.1)		1.1 (1.1)		1.1 (1.1)		1.1 (1.4)		1.1 (1.5)
Local Bank		1.2 (1.6)		1.2* (1.7)		1.2* (1.9)		1.5*** (4.9)		1.6*** (3.5)
Log(Size)	1.5*** (4.7)	1.5*** (4.4)	1.4*** (4.7)	1.4*** (4.4)	1.5*** (4.9)	1.4*** (4.6)	1.4*** (4.5)	1.3*** (4.4)	1.3*** (3.6)	1.3*** (3.9)
Log(Firm Age)	1.1* (1.9)	1.0 (0.9)	1.1** (2.1)	1.0 (0.9)	1.1** (1.9)	1.0 (0.9)	1.0 (0.8)	1.0 (-0.1)	1.1 (1.5)	1.0 (0.6)
Leverage	0.9 (-0.2)	1.2 (1.1)	1.1 (0.2)	1.3 (1.5)	1.2 (1.1)	1.4** (2.0)	0.7** (-2.6)	0.9 (-0.4)	0.8 (-1.2)	1.1 (0.5)
R&D	0.9*** (-2.6)	0.9*** (-3.3)	0.9*** (-2.7)	0.9*** (-3.5)	0.9*** (-2.6)	0.9*** (-3.3)	0.9*** (-1.8)	0.9*** (-2.3)	0.9*** (-2.1)	0.9*** (-3.1)

Limited Corp.	0.9 (-0.4)	0.9 (-0.1)	0.9 (-0.5)	0.9 (-0.05)	0.9 (-0.7)	0.9 (-0.3)	0.6* (-1.7)	0.6 (-1.6)	0.4*** (-3.4)	0.6*** (-3.9)
CEO Male	0.9 (-1.1)	0.9 (-0.8)	0.9 (-1.1)	0.9 (-0.8)	0.9 (-1.0)	0.9 (-0.8)	0.9 (-1.1)	0.9 (-0.6)	0.9 (-1.4)	0.9 (-0.6)
GDP / Capita	1.1*** (5.6)	1.1*** (4.2)	1.0*** (4.2)	1.1*** (3.0)	1.1*** (10.2)	1.1*** (6.8)	1.1 (1.2)	1.1 (1.4)	1.0 (0.6)	1.0 (0.8)
Financial Structure	2.8*** (5.3)	2.5*** (5.1)	0.6*** (-4.3)	0.6*** (-3.0)	2.7*** (5.6)	2.4*** (3.7)	7.6 (0.6)	3.5 (0.4)	0.8 (-0.2)	0.7 (-0.4)
Lerner	1.3 (0.5)	2.3 (1.2)	1.6 (1.1)	2.8* (1.7)	0.01*** (-13.6)	0.01*** (-6.9)	0.5 (-0.6)	1.1 (0.1)	10.8* (1.8)	69.2*** (2.9)
Sectorial Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	7.9*** (5.1)	5.6*** (2.7)	0.3*** (-3.3)	0.3** (-2.4)	0.04*** (-6.8)	0.05*** (-5.4)	0.01 (-0.9)	0.02 (-0.7)	0.3 (-1.1)	0.3* (-1.9)
No.	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292
Pseudo-R <sup>2</sup>	0.11	0.14	0.11	0.14	0.11	0.14	0.07	0.11	0.08	0.12

All models are logit regressions at the firm level. We report the odds ratios. The dependent variable is *Relationship Lending (RL)*. Columns 1, 3, 5, 7, and 9 are models without credit control variables; columns 2, 4, 6, 8, and 10 include credit controls. All models have variance clustered at the country level. \*, \*\*, and \*\*\* denote an estimate significantly different from 0 at the 10%, 5%, and 1% levels, respectively. See Appendix B for the definitions of the variables. *Sectorial Dummies* is a set of dummies, one for each sector we control for (Manufacturing, Energy Production, and Water Production).

**Table 5**  
**Credit Rationing, Relationship lending and Mismatching**

	(1)	(2)	(3)
	Rationing	Rationing	Factoring
RL	0.01 (0.2)		-0.2* (-2.3)
Creditor Information	0.004 (0.5)	0.01 (1.2)	-0.004 (-0.5)
Credit Information × RL	-0.004 (-0.4)		0.03* (2.2)
Mismatch		0.05 (0.6)	
Creditor Information × Mismatch		-0.1** (-2.8)	
Log(Size)	0.02** (3.1)	0.02** (3.1)	-0.01 (-1.7)
Log(Firm Age)	-0.01 (-1.2)	-0.01 (-1.2)	-0.01 (-1.3)
Leverage	-0.02 (-0.6)	-0.02 (-0.7)	-0.03** (-2.5)
R&D	0.0 (0.8)	0.0 (0.9)	0.0 (1.3)
Limited Corp.	0.01*** (4.2)	0.02*** (4.1)	0.01 (1.4)
CEO Male	0.01 (0.6)	0.01 (0.6)	-0.01 (-0.3)
Personal Collateral	0.02*** (6.9)	0.02*** (6.9)	-0.02*** (-9.1)
Asset Collateral	0.03 (1.6)	0.03 (1.7)	0.004 (0.5)
ΔCost Credit	0.1*** (4.5)	0.1*** (4.6)	-0.01 (-1.1)
Log(Length)	-0.01** (-2.8)	-0.01* (-2.2)	-0.01 (-1.5)
Local Bank	0.01 (0.5)	0.01 (0.5)	-0.02 (-1.2)
GDP / Capita	-0.02** (-3.3)	-0.02** (-3.6)	0.02*** (4.4)
Financial Structure	-0.1*** (-5.4)	-0.1*** (-6.0)	0.1*** (10.9)
Lerner	-0.004 (-0.1)	-0.01 (-0.2)	-0.02* (-2.0)
Sectorial Dummies	Yes	Yes	Yes
Constant	0.01 (0.2)	-0.02 (-0.3)	0.1 (0.9)
No.	2,292	2,292	2,292
R <sup>2</sup>	0.04	0.04	0.03
Adjusted R <sup>2</sup>	0.03	0.03	0.02

All models are ordinary least squares regressions at the firm level. In columns 1 and 2, the dependent variable is *Rationing*, and in column 3 the dependent variable is *Factoring*. All models have variance clustered at the country level. \*, \*\*, and \*\*\* denote an estimate significantly different from 0 at the 10%, 5%, and 1% levels, respectively. See Appendix B for definitions of the variables. *Sectorial Dummies* is a set of dummies, one for each sector we control for (Manufacturing, Energy Production, and Water Production).

**Table 6**  
**Robustness Tests: Alternative Measures**

	Alternative measures of creditor information		Alternative measures of relationship lending				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	RL	RL	Length (0/1)	Log(Length)	No.Banks	Main Bank	RLI / TRI
Business Disclosure	0.7*** (-6.3)						
Disclosure Ex Ante		0.9*** (-4.9)					
Creditor Information			0.6** (-2.5)	0.9*** (-5.8)	2.8*** (9.3)	0.7*** (-3.8)	0.7*** (-15.4)
Log(Size)	1.3*** (3.6)	1.3*** (3.7)	1.2 (0.8)	0.9 (-0.8)	2.4*** (4.3)	0.7*** (-3.9)	1.1** (3.2)
Log(Firm Age)	1.1 (1.3)	1.1 (1.3)	1.5*** (3.6)	1.5*** (12.2)	1.3* (1.9)	0.9 (-0.9)	1.1 (1.9)
Leverage	1.2 (0.7)	1.3 (1.1)	0.5 (-1.5)	0.9 (-0.4)	0.5 (-1.9)	2.3*** (3.2)	1.1 (0.9)
R&D	1.0*** (-4.0)	1.0*** (-3.9)	1.0*** (-3.4)	1.0 (0.2)	1.0*** (-3.2)	1.0*** (3.3)	1.0*** (-6.9)
Limited Corp.	0.9 (-0.6)	0.9 (-0.7)	1.6 (1.5)	1.1 (0.3)	0.7 (-1.4)	1.3 (1.4)	1.0 (-0.6)
CEO Male	0.9 (-0.8)	0.9 (-0.8)	0.3 (-1.5)	0.9 (-1.6)	1.2** (3.1)	1.1* (1.7)	0.9 (-0.6)
Personal Collateral	0.5*** (-2.9)	0.5*** (-2.9)	1.8 (1.2)	1.0 (0.5)	1.2 (1.4)	1.0 (0.6)	0.9*** (-7.2)
Asset Collateral	0.6*** (-3.9)	0.6*** (-3.9)	0.9 (-0.2)	1.0 (1.0)	0.7 (-1.3)	1.2 (1.4)	0.9** (-3.5)
ΔCost Credit	0.7 (-1.4)	0.7 (-1.4)	1.5 (1.1)	1.0 (0.5)	1.1 (0.4)	1.0 (-0.1)	0.9 (-1.3)
Denied	1.0 (-0.3)	1.0 (-0.3)	1.2 (0.7)	0.9** (-3.0)	1.2* (2.1)	0.8** (-2.4)	1.1 (0.7)
Log(Length)	1.1 (1.3)	1.1 (1.3)			0.9* (-2.1)	0.9 (-1.3)	1.0 (-0.9)
GDP / Capita	1.1*** (13.7)	1.1*** (8.5)	1.0 (0.7)	1.0*** (6.9)	0.9** (-2.5)	1.1*** (2.6)	1.0*** (4.9)
Financial Structure	2.2* (1.9)	111.9*** (3.7)	0.1*** (-4.1)	0.6*** (-9.6)	0.05*** (-5.0)	1.5 (1.1)	1.3*** (4.0)
Lerner	0.2*** (-3.1)	2.8* (1.8)	3.5* (1.7)	1.1 (1.1)	2.3 (0.7)	4.6*** (3.4)	1.6* (2.2)
Local Bank	1.3*** (5.7)	1.3*** (6.4)	1.1 (0.5)	1.0 (0.7)	2.5*** (3.9)	0.7*** (-2.9)	1.1** (2.6)
Sectorial Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0*** (-15.0)	13,560.7 (0.9)	1,082.3*** (5.5)	6.4*** (12.6)	0.6 (-0.3)	7.6*** (2.6)	3.9*** (7.9)
No.	2,292	2,292	2,292	2,292	2,292	2,292	2,292
Adjusted R <sup>2</sup>				0.15	0.25		0.17
Pseudo-R <sup>2</sup>	0.15	0.15	0.08			0.06	

Columns 1, 2, 3, and 5 are logit regressions at the firm level; we report the odds ratios. Columns 4, 5, and 7 are ordinary least squares regressions. Columns 1 and 2 report results for alternative measures of creditor information; columns 3–7 for alternative measures of

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relationship lending All models have variance clustered at the country level. \*, \*\*, and \*\*\* denote an estimate significantly different from 0 at the 10%, 5%, and 1% levels, respectively. See Appendix B for definitions of the variables. *Sectorial Dummies* is a set of dummies, one for each sector we control for (Manufacturing, Energy Production, and Water Production).

**Table 7**  
**Opacity of the Borrower**

	(1)	(2)	(3)
	RL	RL	RL
Creditor Information	0.8*** (-18.8)	0.8*** (-20.6)	0.8*** (-18.4)
Small Firm	0.7*** (-7.1)		
Small Firm × Creditor Information	1.1*** (4.4)		
Young Firm		0.8*** (-4.9)	
Young Firm × Creditor Information		1.1*** (4.8)	
Low Debt			0.7*** (-8.4)
Low Debt × Creditor Information			1.1*** (6.9)
Log(Size)		1.1*** (5.1)	1.1*** (4.9)
Log(Firm Age)	1.0 (0.3)		1.0 (0.7)
Leverage	1.1 (1.5)	1.0 (1.2)	1.0 (1.2)
R&D	1.0*** (-4.8)	1.0*** (-3.9)	1.0*** (-4.1)
Limited Corp.	1.0 (-0.5)	1.0 (-0.2)	1.0 (-0.1)
CEO Male	1.0 (-0.8)	1.0 (-0.9)	1.0 (-0.9)
Personal Collateral	0.9*** (-5.7)	0.9*** (-5.1)	0.9*** (-5.0)
Asset Collateral	0.9** (-3.0)	0.9** (-3.5)	0.9** (-3.5)
ΔCost Credit	0.9 (-1.7)	0.9 (-1.5)	0.9 (-1.6)
Denied	1.0 (-0.3)	1.0 (-0.5)	1.0 (-0.5)
Log(Length)	1.0 (1.1)	1.0 (1.0)	1.0 (1.0)
GDP / Capita	1.0*** (3.7)	1.0*** (4.4)	1.0*** (4.2)
Stock/Bank	1.2*** (4.7)	1.2*** (5.2)	1.2*** (5.3)
Lerner Index	1.2 (1.1)	1.1 (1.1)	1.1 (1.1)
Sectorial Dummies	Yes	Yes	Yes
Constant	4.0*** (10.1)	2.9*** (12.1)	2.9*** (13.0)
No.	2,292	2,292	2,292
Pseudo-R <sup>2</sup>	0.15	0.16	0.16

All models are logit regressions at the firm level. We report the odds ratios. The dependent variable is *Relationship Lending (RL)*. All models have variance clustered at the country level. \*, \*\*, and \*\*\* denote an estimate significantly different from 0 at the 10%, 5%, and 1% levels, respectively. See Appendix B for definitions of the variables. *Sectorial Dummies* is a set of dummies, one for each sector we control for (Manufacturing, Energy Production, and Water Production).



**Table 8**  
**Robustness Tests: Legal Environment, IVs, and Selection Bias**

	Legal Environment		IV Regression		Selection Model	
	(1)	(2)	(3)	(4)	(5)	(6)
	RL	RL	First-Stage: Creditor Info.	Second-Stage: RL	Bank Credit	RL
Creditor Information	0.3*** (-14.7)	0.6** (-2.5)		0.5*** (-12.9)	3.7 (0.9)	0.4* (-1.9)
Creditor Rights	5.4*** (14.0)				0.6 (-0.64)	
Legal Efficiency		0.9*** (-12.6)				
ACCIS			3.5*** (156.5)			
MOU			0.8*** (7.9)			
$\lambda_1$						3.7 (0.58)
Log(Size)	1.3*** (3.7)	1.3*** (3.6)	1.0* (-1.7)	1.2*** (4.7)	0.9*** (-4.9)	1.3** (1.9)
Log(Firm Age)	1.1 (1.2)	1.1 (1.2)	1.0 (-1.2)	1.0 (0.6)	1.1*** (2.8)	1.1 (0.8)
Leverage	1.1 (0.6)	1.1 (0.3)	1.0* (-1.9)	1.1 (1.3)	0.8 (-1.6)	1.0 (-0.1)
R&D	1.0*** (-3.9)	1.0*** (-4.0)	1.0 (-0.9)	1.0*** (-3.6)	1.0*** (2.7)	1.0 (-1.5)
Limited Corp.	0.9 (-0.2)	1.0 (-0.2)	1.0 (1.3)	1.0 (-0.1)	1.0 (-0.04)	1.0 (-0.03)
CEO Male	0.9 (-0.8)	0.9 (-0.8)	1.0 (-1.0)	0.9 (-0.9)	1.0 (0.2)	0.9 (-0.7)
Personal Collateral	0.5*** (-3.1)	0.5*** (-3.1)	1.0 (-1.4)	0.7*** (-3.4)	1.1 (1.1)	0.5*** (-3.2)
Asset Collateral	0.6*** (-3.8)	0.6*** (-3.8)	1.0 (-1.4)	0.8*** (-2.9)	0.9 (-1.3)	0.6*** (-3.3)
$\Delta$ Cost Credit	0.7 (-1.4)	0.7 (-1.4)	1.0 (-1.2)	0.8 (-1.4)	0.9 (-1.6)	0.7 (-1.4)
Denied	0.9 (-0.4)	0.9 (-0.4)	1.0 (1.4)	0.9 (-0.6)	0.8** (-2.)	0.8 (-0.8)
Log(Length)	1.1 (1.2)	1.1 (1.2)	1.0 (0.8)	1.0 (1.1)	1.1 (0.2)	1.1 (1.3)
GDP / Capita	1.1*** (21.1)	1.1*** (17.1)	1.0*** (12.0)	1.0*** (3.7)	1.0 (-0.7)	1.0 (0.6)
Financial Structure	2.5*** (7.9)	54.5*** (9.6)	2.7*** (15.7)	1.7*** (4.3)	0.4 (-1.3)	1.7 (0.9)
Lerner	2.5*** (2.9)	3.4*** (12.7)	0.9** (-2.5)	1.6 (1.1)	0.4* (-1.9)	1.0 (0.0)
Local Bank	1.3*** (3.8)	1.3*** (3.6)	1.0 (-1.0)	1.1 (1.3)	0.9*** (-2.7)	1.1 (0.28)
Sectorial Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.8*** (3.1)	2.4*** (5.5)	22.7*** (72.5)	3.1*** (2.8)	0.02 (-0.6)	2.3 (0.7)
No.	2,292	2,292	2,292	2,292	2,510	2,292
Pseudo-R <sup>2</sup>	0.15	0.15			0.07	0.14

All models are logit regressions at the firm level. We report the odds ratios. Columns 1 and 2 control for legal environment. Columns 3 and 4 report the result of the two stages of an IV regression where the legal origin is used as an instrument for *Creditor Information*. Columns 5 and 6 report the result of a credit selection model. All models have variance clustered at the country level. \*, \*\*, and \*\*\* denote an estimate significantly different from 0 at the 10%, 5%, and 1% levels, respectively. See Appendix B for definitions of the variables. *Sectorial Dummies* is a set of dummies, one for each sector we control for (Manufacturing, Energy Production, and Water Production).

## Appendix A

### Statistics of Full EFIGE Sample

This table provides descriptive statistics for the firm-level variables used in the study, in both the full EFIGE sample “Full EFIGE Sample” and in the analysis sample, “Analysis Sample.” As explained in Section 3.1, the analysis sample includes only firms that needed credit in 2008 and either use short-, medium-, or long-term bank credit; leasing; or factoring. These firms should also display enough information in the Amadeus database. This represents 18% of the firms in EFIGE dataset.

	Full EFIGE Sample		Analysis Sample	
	Mean	Std. Dev.	Mean	Std. Dev.
<i>Firm-level variables</i>				
Local Bank	0.6	0.5	0.6	0.5
Size	77.4	501.5	75.3	351.2
Firm Age	24.1	20.0	22.3	16.9
Leverage*	0.2	0.2	0.2	0.2
R&D	49.5	46.9	47.7	46.6
Limited Corp.	0.7	0.4	0.7	0.4
CEO Male	0.9	0.3	0.9	0.3
Manufacturing	0.9	0.3	0.9	0.3
Energy Production	0.01	0.1	0.01	0.1
Water Production	0.1	0.3	0.1	0.3
Observations	14,655 (*12,745)		2,292	

## Appendix B

### Definition of the Variables

Variable	Description	Source
<i>Dependent variables</i>		
RL	Takes 1 if the bank mainly uses the soft information to allocate credit; 0 otherwise. Constructed from the answers to the question F.16 in the EFIGE survey.	EFIGE dataset
Length (0/1)	Takes 1 if the length of the relationship between the firm and its bank is less than or equal to two years and 0 if longer.	EFIGE dataset
Log(Length)	Natural logarithm of the length of the relationship between the firm and the bank, in years	EFIGE dataset
No.Banks	The number of credit institutions the firm deals with.	EFIGE dataset
Main Bank	Takes 1 if the firm obtains more than 33% of banking credit from its main bank and has credit lines with no more than four banks.	EFIGE dataset, following Presbitero and Zazzaro (2011)
RLI / TRI	Ratio of RLI to TRI.	EFIGE dataset
<i>Independent variables</i>		
<i>Variable of interest</i>		
Creditor Information	The depth of Credit Information Index. Takes values from 0 to 8. A score of 1 is assigned each time the country offers one of the eight features potentially offer by a credit registry or a credit bureau.	World Bank
Credit Bureau	Report the coverage of individuals and firms by a private credit bureau with information on their repayment history, unpaid debts, or credit outstanding from the past five years—expressed as a percentage of the adult population	World Bank
Credit Bureau (0/1)	Takes 1 if the country offers a credit bureau, 0 otherwise.	World Bank
Credit Registry	Report the coverage of individuals and firms by a public credit registry with information on their repayment history, unpaid debts, or credit outstanding from the past five years—expressed as a percentage of the adult population	World Bank
Credit Registry (0/1)	Takes 1 if the country offers a credit registry, 0 otherwise.	World Bank
Business Disclosure	Measures the extent of disclosure of ownership and financial information. The index ranges from 0 to 10, with higher values indicating more disclosure.	World Bank
Disclosure Ex Ante	Average of disclosure indices on transaction approvals that are required for a firm. Regressions use the percentage.	Djankov, La Porta, et al. (2008)
<i>Control variables</i>		
<i>Country-level variables</i>		
GDP / Capita	Gross national income per capita per country in 2008.	World Bank
Financial Structure	The ratio of stock capitalization to banks' domestic assets.	Aggarwal and Goodell (2016)
Lerner	Difference between output prices and marginal costs (relative to prices). Higher values of the Lerner index indicate less bank competition.	Global Financial Development Database
LLSV	Index aggregating creditor rights following a bankruptcy. The index ranges from 0 to 4, with 4 indicating higher rights.	Djankov, McLiesh, and Shleifer (2007)
Legal Efficiency	Measure the efficiency of the debt enforcement procedure for each country, defined as the present value of the terminal value of the firm after bankruptcy costs. Higher scores indicate more efficient debt enforcement processes.	Djankov, Hart, et al. (2008)
ACCIS	Takes 1 if the country is a member of the Association of Consumer Credit Information Suppliers, 0 otherwise	

MOU	Takes 1 if the country signed the Memorandum of Understanding on the Exchange of Information among National Central Credit Registers for the Purpose of Passing it on to Reporting Institutions (20 February 2003), 0 otherwise	
<i>Credit-level variables</i>		
Personal Collateral	Takes 1 if the firm had to provide personal guarantees from the person who manages or owns the firm to obtain credit, 0 otherwise.	EFIGE dataset
Asset Collateral	Takes 1 if the firm had to provide assets belonging to the firm to obtain credit, 0 otherwise.	EFIGE dataset
$\Delta$ Cost Credit	Takes 1 if the firm experienced an increase in the cost of debt in 2008, 0 otherwise.	EFIGE dataset
Rationing	Takes 1 if the firm applied for more credit in 2008 and did not obtain it but was ready to pay a higher rate of interest, 0 otherwise.	EFIGE dataset
Factoring	Takes 1 if the firm uses factoring, 0 otherwise.	EFIGE dataset
Local Bank	Takes 1 if the bank is a local bank; 0 if it is a national or international bank.	EFIGE dataset
<i>Firm-level variables</i>		
Log(Size)	Natural logarithm of the number of employees in the firm.	Amadeus Database
Log(Firm Age)	Natural logarithm of the firm age in years.	Amadeus Database
Leverage	The ratio of firm's total loans to total assets at the end of 2008.	Amadeus Database
R&D	Percentage of total turnover the firm has invested in R&D on average in the past three years.	Amadeus Database
Limited Corp.	Takes 1 if the firm is a limited corporation; 0 otherwise.	Amadeus Database
CEO Male	Takes 1 if the CEO is a male; 0 otherwise.	Amadeus Database
Sectorial Dummies	Set of dummies, one for each sector: <ul style="list-style-type: none"> <li>- Manufacturing: takes 1 if the firm sector is manufacturing; 0 otherwise</li> <li>- Energy Production: takes 1 if the firm sector is energy production; 0 otherwise</li> <li>- Water Production: takes 1 if the firm sector is water production; 0 otherwise</li> </ul>	Amadeus Database
<i>Other</i>		
Small Firm	Takes 1 when the firm belongs to the first size quartile and 0 otherwise.	Amadeus Database
Young Firm	Takes 1 when the age of the firm is less than two years, 0 otherwise.	Amadeus Database
Bank Credit	Takes 1 if the firm has used short, medium, or long-term bank credit or leasing or factoring and 0 if the firm has used another mean to satisfy its financial needs.	EFIGE dataset