VLADO KYSUCKY

Access to Finance in a Cross-Country Context

Access to Finance in a Cross-Country Context

Access to Finance in a Cross-Country Context

Toegang tot financiering in een international context

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Vlado Kysucky
Rotterdam, The Netherlands
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Chapter 1

Introduction

This dissertation examines three crucial mechanisms that can help to reduce financing constraints of companies. The first chapter, based on Kysucky and Norden (2014), focuses on relationship lending as the most important financing technology of SMEs. Close bank-firm relationships can create benefits by reducing information asymmetries between the lenders and borrowers. However, banks might acquire informational monopoly over borrowers and extract rents. Using a meta-analytic methodology, we summarize the overall lending outcomes from relationship lending and explain the cross-country differences in outcomes by the structure of banking markets. We find that relationship lending technology is generally beneficial for companies, but lenders and companies face trade-offs in lending relationships. Long-lasting, exclusive and synergy-creating bank relationships are associated with higher credit volume and lower loan rates. These benefits are more likely in the U.S. and in countries where bank competition is high. They are lower the higher the deposits-to-GDP ratio and the higher the importance of SMEs in an economy, suggesting that a higher prevalence of relationship lending does not necessarily come along with higher benefits for borrowers.

In the second, single-authored chapter, I develop a more complete conceptual framework of credit constraints. The new framework describes the occurrence of credit constraints in sequential, conditional stages. I examine the role of the institutional environment and analyze how bank lending standards affect the likelihood of occurrence of individual stages of credit constraints. I decompose credit constraints into loan application discouragement, rejection, and unfavorable loan terms. I find that credit constraints vary with bank lending environment beyond firm risk. Tighter lending standards lead to higher discouragement and rejection rates, but conditional on approval, tight lending standards make unfavorable loan

terms to borrowers less likely. The results document that the problem of credit constraints is significantly larger than the observed loan rejections. Moreover, the relationship among the key determinants and credit constraints vary across individual stages. This analysis demonstrates that understanding the sequential and stage-specific nature of credit constraints is crucial in developing effective solutions for facilitating access to finance.

In the third chapter, based on Beck et al. (2015), we focus on credit information sharing systems. In a large sample of companies from developing economies, we document the relationship between credit information sharing systems and the occurrence of financing constraints. We analyze in detail the role of credit information sharing scope (information depth) and credit information sharing scale (information coverage). The evidence reveals a dichotomous effect of credit information sharing systems. While information scope is associated with lower financing constraints, information scale is associated with higher financing constraints. Greater credit information scope is more beneficial for small firms. The significance of credit information scope is unaffected by information sharing mechanism and content. Overall, these findings indicate that accurate and deep information, rather than coverage alone, contribute to lower financing constraints.

This dissertation provides new insights on firms' access to finance in a cross-country context. Drawing upon rich datasets from diverse institutional settings, the results show that research and policy interventions need to take into account a more complex system of factors that influence the availability of finance.

Chapters 2, 3, and 4 are based, respectively, on Kysucky and Norden (2014), Kysucky (2014), and Beck et al. (2015). The advisors for this dissertation are Lars Norden and Abe de Jong (until April 2014). The research was conducted at the Department of Finance, Rotterdam School of Management, Erasmus University, and Erasmus Research Institute of Management.

1.1 The dark and the bright side of relationship lending

Bank financing is the single most important source of external financing in most of the economies around the world. Relationships between borrowers and lenders play a key role in the provision of banking services based on multiple interactions between the two parties. As a result, building and maintaining lending relationships over time and across products should help to reduce information asymmetries, decrease financing constraints, and improve resource allocation. However, when lenders obtain information monopoly over borrowers, they may

exploit this position to "lock-in" their customers into existing lending relationships. Alternatively, they may extract additional rents by raising interest rates over time from initial low levels to the levels beyond the equilibrium price. Relationships may also exacerbate moral hazard problems when borrowers have incentives to violate soft budget constraints or take excessive risks, especially in distress situations.

Empirical literature on the outcomes of relationship lending is mixed. Individual studies utilize different data samples, measurements, and methods. Since most empirical evidence is based on data from a single country, it is not clear which country-level determinants drive the differences in relationship lending outcomes across countries. In this chapter, we use meta-analysis to systematically summarize and quantify the results from the empirical literature. We develop a multi-dimensional framework, which combines four dimensions of relationship lending measures (time, distance, exclusivity, and cross-product synergies) with four dimensions of relationship lending outcomes (price of credit, volume, collateral, and maturity).

Meta-analysis is a tool for systematic aggregation and analysis of empirical evidence. This method allows us to estimate the overall effect and to introduce new hypotheses to explain the country-level differences, which cannot be tested in the original studies. Controlling for publication-level characteristics, we can isolate the effect of a potential publication bias and increase the explanatory power by combining the outcomes from multiple studies.

The empirical strategy proceeds in two steps. First, we quantify the overall outcome per each combination of relationship lending strength and outcome. Second, we explain the heterogeneity in the original results with country-level characteristics. Our data sample is based on 2,979 effects from 101 studies. The datasets from the original studies encompass more than 4.1million firm observations from 28 countries.

The findings show that lending relationships are generally beneficial for borrowers, but the outcomes differ across the relationship dimensions. Aggregate meta-analytic results reveal that 35% of all effects are beneficial for borrowers, 21% are not beneficial, and 44% are not significant. Longer, more exclusive, and synergy-creating relationships, are associated with lower loan rates and higher credit volume. However, borrowers with exclusive relationships are likely to post more collateral and those in close physical proximity to their lenders obtain credit at higher price. These results suggest that tradeoffs exist between the strength of relationships and lending terms.

Second, meta-analytic regressions indicate that the likelihood of observing beneficial outcomes for borrowers is driven by the structure of banking markets. We show that more bank

competition monotonically increases the likelihood of beneficial effects for borrowers, which is consistent with the models by Boot and Thakor (2000), Hauswald and Marquez (2006), and the more general view that banks use relationship lending as a strategic response to cope with increased levels of competition. This result becomes even stronger when we account for possible endogeneity of relationship benefits and the structure of banking systems. We also find that the benefits for borrowers from relationship lending are more likely in the United States compared to other countries. This result is not contrary to the widespread view that relationship lending mainly exists in the bank-based financial systems in continental Europe and Japan (e.g., Allen and Gale, 2000). We show that benefits of relationship lending for borrowers do not necessarily arise from the prevalence of relationship lending.

This chapter presents a novel approach to analyze relational financial contracting – an area which has become one of the focal points of modern research in banking and corporate finance. The meta-regressions with time-varying country-level characteristics provide explanations for the heterogeneity in the literature. The main result, the positive relation between bank competition and borrower benefits, is strong and robust and contributes to the ongoing discussion whether or not bank competition is conducive to relationship lending and its beneficial effects. Single country studies find evidence for negative effects of competition (e.g., Petersen and Rajan, 1995) or u-shaped effects of competition on relationship lending benefits for borrowers (e.g., Degryse and Ongena, 2005; Elsas, 2005; Presbitero and Zazzaro, 2011). The model of Boot and Thakor (2000) indicates positive effects of bank competition on relationship lending benefits for borrowers, as does our cross-country meta-analysis. This study provides a foundation for future research, and informs policy makers about the implications of bank market structure for banks and borrowers, especially SMEs.

1.2 A more complete framework of credit constraints

The second chapter focuses on financing constraints that are specific to credit instruments. These constraints arise when companies cannot access external credit financing, such as bank loans or credit lines, to undertake profitable investment projects. Since most SMEs are dependent on bank financing, credit constraints pose a major obstacle to their operations. Academic research and practice focus on credit constraints mainly as a measure of credit rejection rates. However, credit rejections do not represent the full extent of the problem.

There are three stages at which credit constraints can occur. First, borrowers might not apply for credit because they are discouraged. Second, borrowers that apply might be rejected.

Third, approved borrowers might obtain less favorable credit terms than requested. In the sample of Euro-area companies, the proportion of credit constrained firms, accounting for discouragement and unfavorable terms, is four-times larger than the proportion of credit rejections alone. Taking together all three stages, credit constraints affect a substantially larger share of the productive economy. It is not understood how credit constraints occur in a sequential process and what factors contribute to the outcomes at each stage.

Empirical literature documents large cross-country heterogeneity in the occurrence of credit constraints. The differences arise due to the institutional environment (Djankov et al., 2007; La Porta, et al., 1998; Pagano and Jappelli, 1993), the structure of the financial systems (Beck et al., 2004; Beck, Demirgüç-Kunt, and Maksimovic, 2008; Levine, 1998), and the economic activity and monetary policy (Jiménez et al., 2012, 2014). Discouraged and informally rejected firms constitute a significant proportion of credit constrained firms, especially among SMEs (e.g., Brown et al., 2011; Cole, 2008; Popov and Udell, 2011). Little evidence is available about the occurrence of unfavorable terms and the interaction between the stages of credit constraints and the characteristics of the economic environment across the countries.

In this chapter I develop a more complete conceptual framework of credit constraints and investigate a differential impact of firm, bank, and country-level factors on the likelihood of the occurrence of credit constraints. I decompose credit constraints into three stages: discouragement, rejection, and unfavorable terms. Using a large scale dataset on small businesses from Europe, I document the prevalence of credit constraints and investigate how the key determinants affect their likelihood of occurrence.

My findings reveal that credit constraints vary with the bank lending environment beyond firm risk. Tighter lending standards lead to higher discouragement and rejection rates, but conditional on approval, tight lending standards make unfavorable loan terms for borrowers less likely. The effect is mainly due to higher loan volume rather than lower loan rates. Discouragement and rejections are more likely in countries with risky banking sectors. I find evidence that credit constraints occur at the firm level and are consistent across various credit instruments. In addition, I document that the availability of market financing for both banks and firms influences the outcomes at each stage. While firms are less discouraged in the presence of the firm market financing options, banks are more likely to offer larger loans when they have external bank market funding options.

This study develops a new framework for analyzing credit constraints. I document a differential relationship between the key bank lending factors and the occurrence of credit constraints at different stages of a loan granting process. The evidence suggests that the conditional nature and stage-specific differences in the determinants should be considered in economic policies that aim at reducing credit constraints.

1.3 Information sharing and access to finance

In the last chapter, we focus on the role of credit information sharing systems in reducing financing constraints of companies. Credit information sharing is a mechanism that enables multiple finance providers to share information about borrowers. Banking theory makes ambiguous predictions about the effect of credit information sharing on the availability of financing. On the one hand, greater credit information sharing can reduce information asymmetries and lead to greater availability of finance. On the other hand, an increase in credit information sharing can lead to credit rationing if higher quality borrowers attract higher financing volume at the expense of lower quality borrowers.

Credit information sharing mechanisms arise due to a number of benefits for both finance providers and firms. In addition to greater information availability, information sharing systems can reduce adverse selection. By reducing uncertainty about the quality of firms, lower quality firms are not able to pool with higher quality firms (Pagano and Jappelli, 1993). As a result, finance providers can set more accurately the financing terms. Credit information sharing also mitigates potential hold-up problems (Sharpe, 1990; von Thadden, 2004). If information is shared and readily available, firms can more easily switch to competition if financing terms are not favorable. Finally, information sharing motivates firms to fulfill their financial obligations and maintain sustainable debt levels. Since potential lenders can access adverse information about credit behavior, borrowers are motivated to maintain their good credit standing (Klein, 1992; Padilla and Pagano, 1997; Vercammen, 1995). The potential downside of credit information sharing is a credit redistribution effect. If banks exchange more information about borrowers while the quality of borrowers remains the same, the overall increase in lending due to better information may not compensate for the decrease in lending to lower-quality or riskier borrowers (Jappelli and Pagano, 2000).

We investigate the role of credit information sharing scale (credit information coverage) and scope (depth of the information), and examine the components of credit information content. Using micro-data from 45 emerging economies from the period 2006-2012, we present

evidence of a dichotomous effect of credit information sharing. While information scope is associated with lower financing constraints, information scale is associated with higher financing constraints. Greater credit information scope is more beneficial for small firms. The significance of credit information scope is unaffected by information sharing mechanism and content. We find that financing constraints are less likely in countries with lower credit regulation, safer and more competitive banking systems, and in countries with higher economic growth. Overall, these findings indicate that accurate and deep information, rather than coverage alone, contribute to lower financing constraints.

Chapter 2

The Benefits of Relationship Lending*

2.1 Introduction

The theory of financial intermediation suggests that relationship lending has a bright side and a dark side (e.g., Boot 2000). Strong bank-borrower relationships help reduce asymmetric information between lenders and borrowers, the bright side. But, at the same time, these relationships can create hold-up problems whereby the lender captures the borrower to extract rents, the dark side. Hence, the overall effect of strong bank relationships is a trade-off in costs and benefits between lenders and borrowers through interactions across time, space, and financial products. The empirical evidence on the effects of relationship lending is mixed because of substantial differences in data sources, measurement approaches, dimensions of the relationships, and research methods. In particular, research has neither documented nor systematically analyzed cross-country differences in relationship lending yet. It is not clear what underlying country-level factors drive the differences in relationship benefits across economies and in what way these factors affect the outcomes of relationship lending. In this paper, we conduct the first meta-analysis on the benefits of relationship lending to quantify the heterogeneity in the results and provide country-level explanations for differences in relationship lending outcomes.

Relationship lending is one of the most important lending technologies and for many private firms, especially SMEs, it is the key source of external financing (e.g., Beck et al. 2005;

* This chapter is based on Kysucky and Norden (2014).

Berger and Udell 1995; Berger and Udell 2006; Bharath et al. 2011; Petersen and Rajan 1994). Close bank-borrower relationships might create benefits for both sides if informational problems are reduced. The effects of a strong bank-firm relationship are not necessarily a zero-sum game. On the one hand, banks can better assess the risk of default for existing borrowers, while the latter might benefit from improved credit availability and more favorable borrowing terms over time. On the other hand, banks might follow an intertemporal pricing strategy by offering attractive lending terms at the beginning of a relationship to win over a customer and then raising the loan rates and fees on subsequent business. A close bank-borrower relationship might create a lock-in effect (hold up, ex-post information monopoly) if the borrower does not have sufficient alternative banking relationships (e.g., Degryse and Ongena, 2005), or if switching costs are high (e.g., Ioannidou and Ongena, 2010). But, borrowers might have incentives for moral hazard in both strong and weak bank relationships. A large borrower that is in distress has incentives to rely on a "too-big-to-fail" effect if the relationship is strong. Instead of making an effort to improve its financial conditions the borrower might gamble on getting more funds from the bank. Or, a relatively risky borrower has incentives to hide private knowledge about its default risk in a weak bank relationship, as long as the possibility exists to benefit from lending terms that are more favorable compared to the true default risk.

Empirical studies on relationship lending have produced evidence that focuses primarily on the benefits from a banking relationship. However, there is no clear consensus on whether, and under which conditions, relationship lending is beneficial for the borrower, the bank, or both. To investigate this issue we use meta-analysis, which has several advantages over field evidence-based empirical research or qualitative surveys. Meta-analysis provides a set of formal quantitative tools to summarize the results on a common topic and explain differences in study-to-study variation in outcomes. It offers objective perspective and avoids potential biases of individual judgment. This method is especially useful in our setting for several reasons. The data from empirical studies on relationship lending range from country-specific firm surveys to samples of proprietary credit file data from banks. The original single-country studies cannot identify and test country-level determinants of the relationship lending outcomes. Meta-analysis allows us to quantify the overall effect of relationship lending, increase the number of observations from different sources and time periods, reduce the impact of sampling errors within individual studies, and control for the unobserved between-study heterogeneity. We identify the sources of disagreement among the studies and introduce new institutional factors to test hypotheses on the economic drivers that account for the differences in relationship lending outcomes among the economies. One limitation of meta-analysis is the reliance on inputs from the original studies. If the original studies are misspecified in a

systematic way, the resulting biases may carry over to the meta-analysis. To reduce this possibility, we account for the precision of the input, control for observable systematic heterogeneity, and conduct a bootstrapping analysis of our meta-analytic results.

We develop a multidimensional conceptual framework that considers key dimensions of the strength of bank-borrower relationships and key lending relationship outcomes. First, we summarize the overall effect from the perspective of the borrower, decompose the effects into a matrix of relationship dimensions and lending outcomes, and examine the variation of the benefits. Second, we estimate meta-analytic regressions with country characteristics to explain the heterogeneity in the results. Our sample consists of 101 studies that report multivariate empirical results on relationship lending and lending outcomes using 2,979 effects based on 4.1 million firm-year observations from 28 countries.

2.2 Conceptual framework

Our conceptual framework combines lending relationship dimensions with lending outcomes. The key dimensions of the strength of the relationships are: time, distance, exclusivity, and cross-product synergies. The lending outcomes are: loan rates, credit volume, collateral, and maturity. The transmission channel of relationship effects is the information, which affects lending outcomes by the choice of the communication mode, lending technology, and incentive structure (e.g., Agarwal and Ben-David, 2013; Agarwal and Hauswald, 2009). We consider the source of the information (public and private) and the type of information (soft and hard). What matters for relationship lending is private information, both hard and soft. Whereas soft information is conducive to relationship lending that comes at a higher price, the opposite is found for hard information and arm's length lending (Agarwal and Hauswald, 2009). Figure 2.1 summarizes our conceptual framework.

Time represents a dimension that is characterized by repeated interactions between contracting parties, validation of the interactions, potential learning, and collection of public and private information. Time is conducive to the production of both public/private and hard/soft information. The age of the borrower is a proxy for public information about a firm. Older firms are more likely to pay lower interest rates and obtain more credit. The duration of the relationship is a proxy for private information about a firm. Lenders obtain more private information about the borrower the longer the relationship.

Distance between the bank and borrower has important implications for the type and usage of private information produced by banks. We consider physical, organizational, and personal distance. Smaller distance facilitates more intense personal connection and leads to greater soft information production, resulting in a negative (positive) correlation between physical distance and loan rates (loan volume). However, the overall outcome depends on the proximity of competing banks and the availability of soft and hard information (Agarwal and Hauswald 2010; Degryse and Ongena 2005). Moreover, technological change and organizational structure of banks also affect distance and thereby the strength of bank relationships.

Exclusivity denotes the extent to which a firm concentrates its borrowings on a single lender. Information might be more complete, more accurate and easier to interpret the more exclusive a bank relationship is. Relationship exclusivity promotes primarily private information production, both hard and soft. Firms with a relatively large number of lending relationships tend to be riskier in the sense that leverage and the share of unsecured bank debt are higher. More exclusive relationships are associated with beneficial credit terms for borrowers although exclusive banks might be prone to take advantage of their monopoly position.

Cross-product synergies represent the scope of the financial services provided by the bank. Lenders and/or borrowers may benefit from increased information production and shared costs of multiple services. A key source of informational synergies for commercial banks might be the simultaneous provision of lending, payment services, and deposit taking. In the retail context, relationship customers exhibit higher credit utilization, and lower default and attrition rates. Information about customers' other bank products helps to predict borrower credit quality over time (e.g., Agarwal et al. 2009).

2.3 Hypotheses

The empirical literature on relationship lending draws conflicting conclusions, in part, because of different data sources, time periods, methods, or relationship lending measures. In the first step we summarize the evidence and test whether it supports the view that the bright side of relationship lending prevails over its dark side.

HYPOTHESIS 1 (H1). *Strong bank-borrower relationships are associated with beneficial lending outcomes for the borrower.*

In the second step, we investigate several factors that explain the benefits of relationship lending for borrowers in a cross-country context. We expect that more competition in the banking sector creates incentives for banks to use relationship lending as a device to differentiate (and shield) themselves from their competitors (Boot and Thakor, 2000). Single country studies find negative effects of competition (Petersen and Rajan, 1995) or u-shaped effects of competition on relationship lending benefits for borrowers (Degryse and Ongena, 2005; Elsas, 2005; Presbitero and Zazzaro, 2011). In bank-based systems, characterized by a relatively high ratio of bank deposits over GDP, banks can commit more resources to relationship lending and thereby provide more benefits to borrowers (e.g., Allen and Gale, 2000; Krahnen and Schmidt, 2004). We further expect that borrowers benefit from higher bank efficiency and from reduced information asymmetries in SME lending. Legal system, law enforcement, and property rights influence outcomes of financial intermediation (La Porta et al., 1998). On the one hand, countries with strong legal foundations develop efficient and stable financial markets and intermediaries, which improve the financing of the corporate sector. On the other hand, relationship lending may serve as an (informal) mechanism to offset a weak legal system and enforcement, and improve allocative efficiency. We hypothesize that close bank-borrower relationships might be more important in the developing economies and in the environment of weak institutions, high corruption, low transparency, and high inflation.

HYPOTHESIS 2 (H2). *The likelihood of beneficial effects of relationship lending for borrowers is greater in countries with high bank competition (H2a), bank-based financial systems (H2b), high prevalence of relationship lending (H2c), developing countries (H2d), weak legal institutions (H2e), high level of corruption (H2f), high inflation (H2g), and high cost efficiency in the banking sector (H2h).*

2.4 Data

We use two search strategies to collect the results from the original studies. First, we look for the terms "relationship lending" and "relationship banking" in the following six databases: ISI Web of Knowledge, Scopus, ScienceDirect, JSTOR, ABI/Inform, and SSRN.[1] Specifically, we search in the fields "title", "abstract", "keywords", or their equivalents. This strategy results in

[1] These databases comprise journal articles (ISI Web of Knowledge, Scopus, ScienceDirect and JSTOR), working papers (SSRN), or both (ABI/Inform). In the ABI/Inform search, we add Econlit and Banking Information Source.

a total of 850 matches as of May 2012. Second, as common in meta-analyses, we perform a reverse lookup of references in the literature survey articles on relationship lending by Boot (2000), Elyasiani and Goldberg (2004), and Degryse and Ongena (2008). From the reverse lookup we obtain additional 438 matches. After eliminating missing records, both strategies yield a raw sample of 1,258 studies. We search the above databases for more recent or published versions of all unpublished papers and make replacements wherever appropriate.

We then apply several filter rules to arrive at the final sample. We exclude papers with no empirical results and those with no information on relationship lending and lending outcomes. Next, we eliminate studies that are written in language other than English, and historical studies with data prior to the year 1970. Since we focus on corporate borrowers we also remove the studies that deal with consumer lending. In the next step, we analyze the empirical strategy of all remaining papers and keep those that meet criteria for consistent meta-analysis: (i) empirical results contain at least one multivariate regression model with one of the lending terms as the dependent variable and a proxy for the lending relationship's strength as the explanatory variable, (ii) the relationship strength proxies and lending outcomes fall into one of the above categories (as shown in Figure 1), and (iii) information about the effect size (i.e., the regression coefficient that indicates the relation between the dependent and independent variable) and its statistical significance are available, complete, and comparable within each category. Applying these filters yields a final sample of 101 studies, consisting of 75 published and 26 unpublished papers. Table A2.1 of the appendix shows a list of all studies included in our analysis.

We ensure that our selection criteria do not create a systematic bias by checking three potential sources of biases: language selection, time period, and inclusion of published/unpublished studies. We find that studies conducted in languages other than English do not influence our analysis because their number is very low. Before applying content-related filters there are only three non-English studies in our raw sample of 1,258 studies. There are two studies from the period prior to the year 1970, both from the industrialization era. We do not consider these two banking history studies because the socio-economic, legal and regulatory environment has significantly changed afterwards. In addition, consistent with the current practice in meta-analysis (Cooper et al., 2009, pp. 118), we include unpublished studies in our meta-database and in empirical tests we control for observed publication-level variables that might create a systematic bias.

For each study, we manually collect information on the link between relationship lending and loan terms from all of the tables in a study, including the appendices. This data

collection leads to a sample of 2,979 estimation results (hereafter "effects"). The basis of the selected studies is 4.1 million firm-period observations. We collect key characteristics of the selected studies and corresponding country-level variables from publication sources (e.g., ISI Journal Citations Reports, Web of Science, The World Bank Country Indicators, etc.). Table A2.2 of the appendix shows the variables and their definitions. Table 2.1 reports the summary statistics.

The studies in our sample are based on data from Europe (43 studies), the US (35), Asia (18), and Latin America (5), and span the period from 1970 to 2008. Published papers come mainly from journals on banking, finance, economics, and business. The total number of unique firms in the original papers is around 60,000 from the US and 161,000 from other regions.

We obtain country-level data from external sources, primarily the World Bank database. For each sample period of the original study we calculate the average indicator of country-level variables in overlapping periods where the country-level data is available. Across all country-level variables, on average 11% of observations fall into time periods in which country-level series are available but no time overlap exists between the original sample period and the available country indicator. In these cases we use the closest available country-year observation, majority of which fall within two years of the original sample availability. We note that these indicators are persistent and do not have effect on our analysis when we estimate the empirical models without the filled data.

2.5 Empirical analysis

2.5.1 Method

This study employs meta-analysis as a statistical tool to systematically combine individual results and to quantify differences across the studies. This method has been successfully used in medical sciences and finds increasing application in social sciences (e.g., Stanley, 2001). It provides tools to correct for statistical artefacts and to obtain an estimate of the true relationship between the variables of interest that are not directly comparable in the original studies. Furthermore, meta-analysis allows researchers to identify possible determinants of differences and to test new theories by exploiting systematic patterns of heterogeneity. Empirical testing in meta-analysis consists of 4 main steps: 1) literature search and data collection; 2) computation of comparable effect sizes; 3) estimation of the magnitude and the direction of the true relationship; and 4) explanation of systematic heterogeneity (if present). The total variance

in the observed results is comprised of the true variance across the studies and the sampling error. Meta-analytic procedures weight the contribution of each individual result by its sampling error and thereby increase the accuracy of the overall estimate of the true relationship. Our study employs state-of-the art meta-analytic methods (Borenstein et al., 2009; Lipsey, 2001).

The term "effect" in our analysis refers to the measure of significance, direction, and magnitude of a regression coefficient that quantifies the link between one of the relationship strength proxies and one of the lending outcome variables shown in Figure 1. We calculate three measures (one discrete and two continuous) of effect sizes. The first measure is a discrete indicator that classifies reported effects into positive, negative, and nonsignificant ones at the 10% significance level. The second measure is the one-tail *p*-value as a continuous interpretation of the direction and the significance of an effect size. The values range from zero to one where values approaching zero are significantly unfavorable to the borrower, but values approaching one are significantly favorable. We confirm that discrete and continuous measures are consistently closely related (Spearman's rank correlation 0.94). The third measure is the continuous Fisher's *z*-score which is a partial correlation corrected for skewness. This measure reports the degree of association between the relationship dimensions and the lending outcomes, and accounts for the effect of other explanatory variables included in the original regression models. We obtain partial correlations from regression statistics using the procedure by Greene (2003, Ch. 3). To reduce the effect of potential outliers we winsorize extreme observations at the 1 percent and 99 percent quantile. Based on these three measures we obtain the information on the relative significance, the direction of the effects, and the magnitude of the strength of the association. Because these indicators are unit-free, we can meta-analyze the effects in a consistent and comparable way across a heterogeneous set of studies (examples of our selected effect size applications in economics are Card et al. (2010) and Koetse et al. (2009)). In order to increase the precision of the estimates we follow Bijmolt and Pieters (2001) and collect a complete set of effects from all studies in our sample. This means that there are multiple observations from each study that are not independent. We account for this dependence as described below.

To test Hypothesis 1 we estimate the overall effect using the three types of individual effect sizes. First, we report discrete relative frequencies of significantly positive, significantly negative, and nonsignificant effects. Next, estimate the continuous pooled meta-analytic effect size. We calculate the overall one-tail *p*-value (Edgington, 1972), and pooled meta-analytic mean correlations (Borenstein et al., 2009; Hedges and Olkin, 1985; Lipsey and Wilson, 2001).

We employ random effects model, which assumes that the true effect varies between the studies. This is a common approach in social sciences where studies are typically significantly heterogeneous and vary in empirical strategies and samples. Random effects models apply weighting scheme based on heterogeneity of precision and heterogeneity of effect sizes. We confirm the between-study heterogeneity by Cochran's Q-test for all relationship-outcome combinations. The overall continuous result weights effect sizes by their precision. Namely, we weight each input by the inverse of its squared errors and weight the study clusters by between-study variance (Hedges and Olkin, 1985). The statistical power of estimating the pooled effect, and the confidence in interpreting the overall estimate, is positively related to the number of studies and the precision of the individual effect sizes. By combining all of the effects (both significant and insignificant), we reduce the probability of a type-II error and improve the accuracy of the significance estimation for the overall effect.

We test Hypothesis 2 with meta-regressions that allow us to investigate the relationship between country characteristics and the reported results in the original studies. We run four sets of meta-analytic regressions, in which we introduce country-level variables as the main explanatory variables and control for observed differences in study-level characteristics. First, we estimate a pooled binary Logit model with dependent variable indicating whether the effect is significant at 10% level. This regression includes only significant effects. Second, we estimate a random effects Tobit model using all of the results with one-tail *p*-value as the dependent variable. Because multiple observations within a study are not independent, in the pooled regression models we use robust standard errors clustered by studies, and in random effects models we group observations by studies. Third, we estimate a mixed-effects multi-level regression. Using this method, one or more estimated slopes are allowed to vary from study to study. This solution is a less restrictive estimation of the aggregate evidence with an excess between-study variation. The dependent variable is Fisher's z-score as the measure of the strength of the association between relationship lending and lending terms. Fourth, we employ random effects robust variance regressions with estimates of the dependent effect sizes. This method is based on Hedges et al. (2010) and provides a robust method for estimating the meta-analytic regressions where effect sizes are correlated. Because we include in our analysis all reported effects, our methods account for a potential bias arising from correlated estimates within the studies.

To address systematic pattern of publication-level heterogeneity, we follow Koetse et al. (2009) and construct variables for four possible sources of systematic variance, including the sources of potential misspecification in the primary studies: data, model specification,

estimation method, and publication characteristics. We add controls for each category to all meta-regressions.

2.5.2 Direction and significance of the effects

To assess the direction and significance of relationship benefits, we first estimate the overall pooled effect based on all individual effect sizes. Figure 2.2 shows the distribution of the continuous one-tail *p*-values. The effects cluster near zero (adverse effects for the borrower) and one (beneficial effects for the borrower), but the frequency is significantly larger near one, which indicates that benefits for the borrower prevail. Of the significant effects (i.e., leaving the nonsignificant effects aside for a moment), 62% are beneficial for the borrower, while 38% are not beneficial for the borrower. This difference is significant at 1% level, which is consistent with Hypothesis 1.

In the next step we decompose the effects into lending relationship proxies and lending outcome proxies. Panel A of Table 2.2 shows the relative frequencies of the effects. Positive sign (+) denotes positive and significant regression coefficients, (-) denotes negative and significant coefficients. "B" designates cells with significant borrower benefits; "N" is for significant borrower "anti-benefits".

We find that longer, exclusive and synergy-creating bank relationships are likely to result in higher credit volumes and lower loan rates. Moreover, firms pledge less collateral the longer they maintain the relationship. These findings indicate that the benefits of relationship lending are of a more general nature since they exist for multiple combinations of lending outcomes and relationship strength proxies. For comparison, the empirical study of Petersen and Rajan (1994) suggests that strong bank relationships primarily help increase the availability of financing to firms but have little impact on the financing costs. The table shows a potential hold-up problem whereby higher exclusivity is related to more collateral. This problem means that borrowers are either willing to pledge more collateral to an exclusive lender as a signaling device, or lenders accumulate collateral to capture their clients. Close distance is typically associated with more soft information production which enables lenders to more accurately assess the borrowers as well as the collateral. The effects on distance, however, are mixed and based on a relatively small number of studies, which does not allow us to identify a systematic pattern.

Panel B of Table 2.2 reports the pooled effects on the continuous scale. We find results in line with the discrete analysis. The largest likelihood of obtaining lower rates and higher

volume is related to borrower's age and the exclusivity of the relationship (one-tail *p*-values approaching 1). The magnitude of the association ρ reveals a possible trade-off in lending terms in exclusive relationships. We observe that reduction in interest rates is 55% greater relative to the increase in the collateral, although the increase in credit volume is lower by 40%.

Our results suggest that strong bank-borrower relationships are beneficial for the borrowers as suggested by Hypothesis 1 but the effects differ across the relationships' dimensions. The relationship benefits mainly stem from repeated interactions over time and from cross-selling of multiple financial services from the same lender. These benefits are realized mostly through higher credit availability and lower loan rates.

2.5.3 Multivariate analysis of relationship lending benefits for borrowers

We now test Hypothesis 2 which makes predictions about the impact of country characteristics on the likelihood of beneficial effects for the borrower. Countries and regions exhibit substantial variation in the lending environment. Financial systems in continental Europe and Japan are bank-based and concentrated. In the US capital markets dominate and the banking system is more fragmented, which is reflected by a large number of small banks that provide relationship lending to small businesses (Allen and Gale, 2000). We posit that the differences in relationship lending benefits for borrowers across countries can be partially explained by differences in the structural economic variables. In unreported bivariate analyses we find that the borrower benefits are more likely by 33% in countries with competitive banking markets. Specifically, when the competition is high, 76% of all effects are beneficial for the borrower. For comparison, when the competition is low only, 43% of effects are beneficial. This finding is consistent across all relationship dimensions. Figure 2.3 illustrates the link between the extent of banking competition and the average relationship benefits per country. We find a significantly positive and robust linear relationship between the two variables. A simple bivariate cross-sectional OLS regression has a slope coefficient of 0.59 (*p*-value<0.01 based on robust standard errors) and an R^2 of 41%. The largest benefits accrue to borrowers in the US, Argentina, and Taiwan where the bank competition is highest. The smallest borrower benefits are observed in Europe, especially in countries with low levels of bank competition.

We proceed with multivariate meta-regressions in Table 2.3. Model (1) reports results with simple region effects. The purpose of this analysis is to capture the aggregate unobserved heterogeneity across the regions. We find that the relationship lending benefits for borrowers are stronger in the US compared to Europe, Asia and Latin America. The contrast is largest for

Japan. This result does not indicate that relationship lending is less prevalent in these regions, but that the benefits for borrowers are, ceteris paribus, lower in these regions. As illustrated in Figure 3, this is likely due to higher bank competition in the US, especially for small businesses. Moreover, lending to small businesses in the US comes from a large number of community banks, relatively small commercial banks, and credit unions with the mandate to serve local businesses and/or their members.

In Models (2) – (5) we explain the results of the studies with country-level variables (Hypothesis 2). The meta-regressions confirm the strong positive relation between bank competition and benefits (consistent with Hypothesis 2a). The coefficient is strongest both in magnitude and significance across all specifications. This finding is in line with the argument that banks use relationships to retain customers in the face of competition from other banks (e.g., Boot and Thakor, 2000; Degryse and Ongena, 2005). Banks exert effort in borrower-specific and/or industry-specific information production and reward their relationship borrowers with more credit and/or better lending terms to prevent them from switching to competitors. Our result is also consistent with the evidence provided by Black and Strahan (2002) who document the impact of policy changes fostering competition in the US banking sector on new incorporations and entrepreneurial activity. At a first glance, this finding seems to contradict studies that show that borrowers can benefit from limited competition by having exclusive bank relationships (e.g., Petersen and Rajan, 1994). However, we believe that there is no contradiction since we measure competition at the level of a country's banking system in cross-country context (and we later show that this effect remains robust if we use alternative measures) but not at the individual firm level. In our test of Hypothesis 1 we have already shown that more exclusive bank relationships exhibit lower loan rates and a higher credit volume. We argue that a firm can maintain a value-creating exclusive relationship with a lender in a country with high bank competition. The meta-regression results on competition indicate a monotonic positive relationship, while single-country studies have found u-shaped effects of local or national competition on relationship lending (e.g., Elsas, 2005; Degryse and Ongena, 2008; Presbitero and Zazzaro, 2011). We believe that both effects may coexist and can be reconciled – but at different levels of aggregation.

We also find that the borrowers in bank-based economies are less likely to obtain relationship benefits (not consistent with Hypothesis 2b). The magnitude of the effect is approximately half the size of the bank competition. This suggests that banks' advantages from deposit funding liquidity do not necessarily translate into borrower benefits as hypothesized. This finding hints at the possibility that larger capital markets (lower bank orientation) exert

competitive pressure on the banks to maintain relatively larger borrower benefits. A related hypothesis concerns the importance of SMEs in the economy, considered as lower bound proxy for the prevalence of relationship lending in the country (Hypothesis 2c). We do not find a significant relationship between the SME employment and the benefits. The two findings lead to a surprising implication that both the bank orientation of the economy and the prevalence of relationship lending do not come along with relationship lending benefits for borrowers.

The rest of the lending environment characteristics are not significantly related to the relationship benefits. Specifically, we do not find evidence that relationship benefits for borrowers consistently differ in developing countries (Hypothesis 2d), in countries with more developed legal systems, higher level of corruption, or in inflationary environment (Hypotheses 2e, 2f, 2g). Furthermore, we do not find that a higher level of aggregate bank cost-efficiency is related to relationship lending benefits for borrowers (Hypothesis 2h).

While Models (1) and (2) of Table 2.3 are based on Logit analysis that considers only the significant effects, we include both significant and insignificant effects in the subsequent analyses. Considering all effects increases the number of observations in meta-regressions and allows us to meta-analyze the effects with continuous measures. The results remain robust when we repeat the analysis using a Tobit estimator with random effects (Model 3), mixed-effects meta-regression (Model 4), and robust variance meta-regression (Model 5).

All of the models include controls to capture publication-level heterogeneity. The coefficient of the indicator variable for published studies is negative across all models. Taking into account the between-study variance in the random effects and mixed-effects model, the coefficient becomes significant. This finding implies that published studies are less likely to report beneficial relationship lending effects. We recognize that loan terms might be determined simultaneously but evidence on this issue is mixed and difficult to interpret economically (e.g., Brick and Palia, 2007; Dennis et al., 2000). However, some studies show that in banking practice the loan terms are determined sequentially (Bharath et al., 2011; Kirschenmann and Norden, 2012; Standard & Poor's, 2011). The loan purpose determines the amount and maturity, then bank and borrower agree on the collateral to be pledged, and finally the loan spread is set, considering the borrower risk and all other loan terms. We take possible interaction and the endogeneity of the loan terms into account by categorizing and controlling for the estimation methods used in the original studies to address the potential endogeneity problem.

A potential concern is that our dependent variable, the relationship lending benefits for borrowers, and two explanatory variables, bank deposits / GDP as well as bank competition, are determined endogenously. First, bank deposits / GDP might be endogenous because banks exploit funding and/or informational synergies between deposit taking and lending (e.g., Berlin and Mester, 1999; Norden and Weber 2010). This occurs because banks can use inelasticity in deposit taking and provide relationship borrowers with loan rate-smoothing. The endogeneity of this measure, however, is not warranted because the use of particular lending technologies is not necessarily related to the volume of deposit taking (e.g., Acharya et al., 2006). Second, bank competition and relationship benefits may be driven by the same unobserved underlying information and market frictions. Third, there might be a reverse causality between relationship benefits and bank competition. Banks invest in acquisition of proprietary information with expectations of internalizing the relationship benefits. Greater benefits captured by the bank thus attract more competition. In the presence of more competition it is easier for borrowers to switch lenders, which in turn leads to declining incentive for lenders to collect costly proprietary information.

We address this potential endogeneity by estimating instrumental variable regressions in which we use as instruments country's legal origin and latitude. Legal origin shapes the structure of financial markets and exerts long-term influence on the real economy, including the degree of competition in financial markets (e.g., Beck et al., 2005; La Porta et al., 1998). Since legal origin is a historical heritage, it is exogenous relative to the outcomes of modern relationship lending. The second instrument is country's absolute latitude as a proxy for geographic location. Several studies show that geographical endowments affect the structure and the development of economies and their institutions (La Porta et al., 1999). Legal origin and latitude provide countries with legal framework and resource endowments that determine the economic, financial, and institutional development, but affect the outcomes of the relationship lending only indirectly. Table 2.4 presents the results.

We find that the positive effect of bank competition holds robustly across all three specifications. The estimated coefficient of bank deposits / GDP is negative but not significant. Although in this case we cannot reject the null hypothesis in the IV setting, this finding supports the previous result that the bank-based systems (and higher SME lending) is not associated with outright benefits. In sum, the IV models confirm that more competitive banking markets are *ceteris paribus* associated with higher likelihood of beneficial relationship lending outcomes for borrowers after accounting for the potential endogeneity of bank competition.

2.5.4 Further empirical analyses

The following analysis differentiates the lending outcomes by lending terms (except for loan maturity due to a relatively low number of observations for this term). Table 2.5 reports the results.

As shown in Models (1) – (3), borrowers in the US generally reap higher benefits across the loan terms compared to the other regions. While relationship borrowers in Europe tend to pay higher interest rates, borrowers in Japan pledge more collateral. In both regions, the borrowers are likely to obtain less credit relative to the US. Models (4) – (6) show that relationship lenders in competitive banking markets are more likely to compete on lower interest rates and higher credit volume. We do not find evidence that relationship lenders require less collateral when the bank competition is high or in countries with more soft information production in SME lending. Conversely, more collateral is required in bank-based and developed economies.

In another test we examine a possible ambiguity in the overall direction of the relationship benefits. The overall beneficial effect might be due to the straight benefits for the borrower, or due to the absence of "anti-benefits" that have adverse effect on the borrower. To investigate this issue, we follow the studies by Card et al. (2010) and Koetse et al. (2009) and estimate multinomial Logit with three-outcome variable as the dependent variable: one (the relationship effect is significant and beneficial for the borrower), zero (the relationship effect is nonsignificant), and minus one (the relationship effect is significant and unfavorable for the borrower). The results are reported in Table 2.6. Bank competition is directly related to beneficial outcomes of lending relationships. There is no evidence of adverse effects of bank competition. In contrast, bank orientation is positively related to unfavorable outcomes for the borrower. This analysis confirms our earlier findings and supports the interpretation that the effect of bank competition is driven by its direct association with positive borrower benefits, as shown in Figure 2.3.

To examine the robustness of our results we run a random sample analysis and derive bootstrapped estimates from our meta-analysis. We generate a random-draw sample with replacement of size N equal to the sample size, stratified at the study level. We repeat the resampling 200 times and estimate the coefficients and significance for each random sample with the pooled Logit model. We plot the distribution of the resulting coefficients and the *p*-values in Figure 2.4. The results of the bootstrapping analysis confirm our original findings and document robustness of the effect of bank competition and bank system development, both

in terms of the size of the coefficient and its significance. In line with the earlier results, the other coefficients cluster around zero with wide significance intervals.

We conduct several additional tests to further study the robustness of our results and their sensitivity to variable definitions, methods, underlying structural forms, sample selection and time variance. The results of these additional tests are reported in the online appendix.

2.6 Conclusion

In this paper, we conduct a meta-analysis to summarize and explain the heterogeneity of the results in the literature on relationship lending in a cross-country context. We find that strong relationships are generally beneficial for the borrowers, but the lending outcomes differ across the relationship dimensions. The dimensions time, exclusivity, and cross-product synergies are associated with lower loan rates and higher credit volume. However, borrowers with exclusive relationships are likely to post more collateral and those in close physical proximity to their lenders pay higher rates. Our results indicate that the beneficial effects of relationship lending go beyond an improvement in credit availability to firms as suggested by Petersen and Rajan (1994), and that banks trade-off the costs and benefits across different relationship dimensions and lending terms.

The meta-regressions show that the likelihood of borrower benefits has a significant relation to the structure of the banking markets. The benefits of relationship lending for the borrowers are more likely when bank competition is high. We document a strong and positive monotonic link between bank competition and relationship lending benefits for borrowers. We further find that the benefits for the borrowers are more likely in the US compared to the other regions. The prevalence of relationship lending, as found in the bank-based financial systems in Europe and Japan with a large fraction of SME borrowers, does not necessarily come along with benefits for these borrowers.

We note that the inferences of the meta-analysis depend on the inputs from the original studies. Systematic heterogeneity in the original studies might create biases in the overall meta-analytic estimates and meta-regressions. We address this point in three ways. First, we weight individual effects by precision in order to reduce the impact of misspecified studies. Second, in all models we account for possible sources of observed systematic heterogeneity. These sources are related to data, methods, model specifications, and publication characteristics.

Third, we perform a random sample analysis using bootstrapping technique, which confirms the robustness of our original estimates.

Our meta-analysis represents the first attempt to provide a systematic and quantitative assessment of the evidence on relationship lending in a cross-country context. Our findings also point at several interesting avenues for future research. For example, we do not yet fully understand the role of supply and demand, including the impact of bargaining power on outcomes of bank-firm relationships. Therefore, to assess the overall value of relationship lending, it is important to understand the conditions under which relationship lending emerges along with the benefits for the lenders and/or the borrowers. Moreover, the occurrence of financial crises gives rise to the question whether and how relationship lending amplifies or alleviates the transmission of shocks to banks on individual firms (and vice versa) and how this mechanism varies between countries.

2. 7 Appendix

Table A2.1 Studies included in the meta-analysis

Id	Author(s)	Title	Year	Publication	# effects	# obs.
1	Agarwal, R., and J. A. Elston	Bank–firm relationships, financing and firm performance in Germany	2001	Economics Letters	5	NA
2	Agarwal, S., and R. Hauswald	The Choice between Arm's-Length and Inside Debt	2009		39	33,855
3	Agarwal, S., and R. Hauswald	Distance and private information in lending	2010	Review of Financial Studies	84	25,487
4	Alem, M.	Insurance motives in lending relationships: Evidence from Argentina	2003		9	649
5	Alessandrini, P., A. F. Presbitero, and A. Zazzaro	Banks, distances and firms' financing constraints	2009	Review of Finance	120	7,844
6	Alessandrini, P., A. F. Presbitero, and A. Zazzaro	Global banking and local markets: A national perspective	2009	Cambridge Journal of Regions, Economy and Society	6	7,844
7	Angelini, P., R. Di Salvo, and G. Ferri	Availability and cost of credit for small businesses: Customer relationships and credit cooperatives	1998	Journal of Banking and Finance	50	2,232
8	Bebczuk, R. N.	What determines the access to credit by SMEs in Argentina?	2004		6	139
9	Becchetti, L., and M. M. Garcia	Informal collateral and default risk: do Grameen-like banks work in high-income countries?	2011	Applied Financial Economics	3	1,009
10	Berger, A. N., R. J. Rosen, and G. F. Udell	Does market size structure affect competition? The case of small business lending	2007	Journal of Banking and Finance	3	520
11	Berger, A. N., and G. F. Udell	Relationship lending and lines of credit in small firm finance	1995	Journal of Business	18	863
12	Berger, A. N., N. N. Miller, M. A. Petersen, R. M. Rajan, and J. C. Stein	Does function follow organizational form? Evidence from the lending practices of large and small banks	2005	Journal of Financial Economics	6	546
13	Berger, A. N., S. W. Frame, and V. Ioannidou	Tests of ex ante versus ex post theories of collateral using private and public information	2011	Journal of Financial Economics	6	32,286
14	Bharath, S., S. Dahiya, A. Saunders, and A. Srinivasan	Lending relationships and loan contract terms	2011	Review of Financial Studies	63	15,636
15	Blackwell, D. W., and D. B. Winters	Banking relationships and the effect of monitoring on loan pricing	1997	Journal of Financial Research	10	174
16	Bonfim, D., and Q. Dai	The number of bank relationships, borrowing costs and bank competition	2009		83	38,764
17	Bongini, P., M. L. Di Battista, and E. Zavarrone	The value of relationship lending: Small banks in an era of consolidation	2007	Economic Notes	5	195
18	Bopaiah, C.	Availability of credit to family businesses	1998	Small Business Economics	7	1,500
19	Brick, I. E., and D. Palia	Evidence of jointness in the terms of relationship lending	2007	Journal of Financial Intermediation	39	766
20	Calomiris, C., and T. Pornrojnangkool	Relationship Banking and the pricing of financial services	2009	Journal of Financial Services Research	96	14,439
21	Castelli, A., Gerald P. D. Jr., and I. Hasan	Bank relationships and small firms' financial performance	2006		12	9,996
22	Cavalluzzo, K. S., L. C. Cavalluzzo, and J. D. Wolken	Competition, small business financing, and discrimination: Evidence from a new survey	2002	Journal of Business	16	2,609
23	Cerqueiro, G., H. Degryse, and S. Ongena	Rules versus discretion in loan rate setting	2011	Journal of Financial Intermediation	22	3,901
24	Chakraborty, A., and C. X. Hu	Lending relationships in line-of-credit and nonline-of-credit loans: Evidence from collateral use in small business	2006	Journal of Financial Intermediation	28	1,632
25	Chakraborty, A., and R. Mallick	Credit gap in small businesses: Some new evidence	2012	International Journal of Business	11	4,348

Table A2.1 (continued)

Id	Author(s)	Title	Year	Publication	# effects	# obs.
26	Cole, R. A.	The importance of relationships to the availability of credit	1998	Journal of Banking and Finance	50	2,007
27	Cole, R. A., L. G. Goldberg, and L. J. White	Cookie cutter vs. character: The micro structure of small business lending by large and small banks	2004	Journal of Financial and Quantitative Analysis	48	1,102
28	Coleman, A. D.F., N. Esho, and I. G. Sharpe	Does bank monitoring influence loan contract terms?	2006	Journal of Financial and Quantitative Analysis	8	3,694
29	Cosci, S., and V. Meliciani	Multiple banking relationships: Evidence from the Italian experience	2002	Manchester School Supplement	3	393
30	Cowling, M.	The incidence of loan collateralization in small business lending contracts: Evidence from the UK	1999	Applied Economics Letters	2	272
31	D'Auria, C., A. Foglia, and P. M. Reedtz	Bank interest rates and credit relationships in Italy	1999	Journal of Banking and Finance	4	120,000
32	De Bodt, E., F. Lobez, and J. Statnik	Credit rationing, customer relationship and the number of banks: An empirical analysis	2005	European Financial Management	33	296
33	Degryse, H., and S. Ongena	Distance, lending relationships, and competition	2005	Journal of Finance	71	15,044
34	Degryse, H. and P. Van Cayseele	Relationship lending within a bank-based system: Evidence from European small business data	2000	Journal of Financial Intermediation	24	17,429
35	Deng, Y., M. Hu, and A. Srinivasan	Hold-up versus benefits in relationship banking: A natural experiment using REIT organizational form	2011		32	1,404
36	Dennis, S., D. Nandy, and I. G. Sharpe	The determinants of contract terms in bank revolving credit agreements	2000	Journal of Financial and Quantitative Analysis	6	2,634
37	Elsas, R., and J. P. Krahnen	Is relationship lending special? Evidence from credit-file data in Germany	1998	Journal of Banking and Finance	12	1,079
38	Ewert, R., G. Schenk, and A. Szczesny	Determinants of bank lending performance in Germany	2000	Schmalenbach Business Review	10	682
39	Fernando, C., and A. Chakraborty	The importance of being known: Relationship banking and credit limits	2010	Quarterly Journal of Finance and Accounting	21	226
40	Ferri, G., and M. Messori	Bank-firm relationships and allocative efficiency in northeastern and central Italy and in the south	2000	Journal of Banking and Finance	18	33,808
41	Ferri, G., T. S. Kang, and I.-J. Kim	The value of relationship banking during financial crises: Evidence from the Republic of Korea	2001		6	6,936
42	Fraser, D. R., S. Ghon Rhee, and G. Hwan Shin	The impact of capital market competition on relationship banking: Evidence from the Japanese experience	2012	Journal of Empirical Finance	13	11,780
43	Fredriksson, A.	The effect of relationship intensity on loan pricing	2007		9	599
44	Gama, A. P. M., and F. Duarte	The role of collateral and relationship lending in loan pricing: evidence from United Kingdom SMEs	2011		18	326
45	Gloy, B. A., M. A. Gunderson, and E. L. LaDue	The costs and returns of agricultural credit delivery	2005	Journal of Agricultural Economics	3	901
46	Guiso, L.	Small business finance in Italy	2003		10	3,236
47	Hao, L.	Bank effects and the determinants of loan yield spreads	2003		8	1,140
48	Harhoff, D., and T. Körting	Lending relationships in Germany - Empirical evidence from survey data	1998	Journal of Banking and Finance	30	994
49	Hernández-Cánovas, G., and J. Koëter-Kant	Debt maturity and relationship lending: An analysis of European SMEs	2008	International Small Business Journal	9	1,912
50	Hernández-Cánovas, G., and P. Martínez-Solano	Banking relationships: Effects on debt terms for small Spanish firms	2006	Journal of Small Business Management	40	184

Table A2.1 (continued)

Id	Author(s)	Title	Year	Publication	# effects	# obs.
51	Hernández-Cánovas, G., and P. Martínez-Solano	Effect of the number of banking relationships on credit availability: Evidence from panel data of Spanish small firms	2007	Small Business Economics	30	2,115
52	Hernández-Cánovas, G., and P. Martínez-Solano	Relationship lending and SME financing in the continental European bank-based system	2010	Small Business Economics	24	182
53	Howorth, C., and A. Moro	Trustworthiness and interest rates: An empirical study of Italian SMEs	2012	Small Business Economics	10	362
54	Hübler, O., L. Menkhoff, and C. Suwanaporn	Financial liberalisation in emerging markets: How does bank lending change?	2008	World Economy	28	NA
55	Jiangli, W., H. Unal, and C. Yom	Relationship lending, accounting disclosure, and credit availability during the Asian financial crisis	2008	Journal of Money, Credit and Banking	40	1,147
56	Jiménez, G., V. Salas, and J. Saurina	Determinants of collateral	2006	Journal of Financial Economics	18	426,112
57	Jiménez, G., V. Salas, and J. Saurina	Organizational distance and use of collateral for business loans	2009	Journal of Banking and Finance	19	449,931
58	Jiménez, G., J. A. Lopez, and J. Saurina	Empirical analysis of corporate credit lines	2009	Review of Financial Studies	28	2,078,434
59	Kano, M., H. Uchida, G. F. Udell, and W. Watanabe	Information verifiability, bank organization, bank competition and bank–borrower relationships	2011	Journal of Banking and Finance	55	1,775
60	Kim, M.., and G. Lee	Effect of relationship banking on financing cost and performance of SMEs: Evidence from panel data of Korean small firms	2011		40	NA
61	Kirschenmann, K., and L. Norden	The relation between borrower risk and loan maturity in small business lending	2012	Journal of Business Finance and Accounting	30	668
62	Lehmann, E., and D. Neuberger	Do lending relationships matter? Evidence from bank survey data in Germany	2001	Journal of Economic Behavior and Organization	45	389
63	Lehmann, E., D. Neuberger, and S. Räthke	Lending to small and medium-sized firms: Is there an East-West gap in Germany?	2004	Small Business Economics	48	334
64	Li, Y., and A. Srinivasan	Relationship bank behavior during borrower distress and bankruptcy	2011		20	13,144
65	Machauer, A., and M. Weber	Bank behavior based on internal credit ratings of borrowers	1998	Journal of Banking and Finance	9	200
66	Menkhoff, L., D. Neuberger, and C. Suwanaporn	Collateral-based lending in emerging markets: Evidence from Thailand	2006	Journal of Banking and Finance	36	416
67	Menkhoff, L., and C. Suwanaporn	On the rationale of bank lending in pre-crisis Thailand	2007	Applied Economics	35	416
68	Miarka, T.	The recent economic role of bank-firm relationships in Japan	1999		4	1,288
69	Mitchell, K., and D. K. Pearce	Lending technologies, lending specialization, and minority access to small-business loans	2011	Small Business Economics	34	863
70	Montoriol-Garriga, J.	Relationship lending and small business finance: Empirical analysis of cost of capital, credit rationing, and firm performance	2006		110	510,840
71	Neuberger, D., and S. Räthke-Döpplich	Microenterprises and multiple bank relationships: The case of professionals	2009	Small Business Economics	12	208
72	Niskanen, J., and M. Niskanen	Does relationship banking have value for small firms?	2000	Liiketaloudellinen Aikakauskirja	18	919
73	Norden, L., and M. Weber	Credit line usage, checking account activity, and default risk of bank borrowers	2010	Review of Financial Studies	4	643
74	Ogawa, K., E. Sterken, and I. Tokutsu	Multiple bank relationships and the main bank system: Evidence from a matched sample of Japanese small firms and main banks	2009	Contributions to Economics (book)	8	4,888
75	Ogura, Y.	Interbank competition and information production: Evidence from the interest rate difference	2010	Journal of Financial Intermediation	46	889

Table A2.1 (continued)

Id	Author(s)	Title	Year	Publication	# effects	# obs.
76	Ono, A., and I. Uesugi	Role of collateral and personal guarantees in relationship lending: Evidence from Japan's SME loan market	2009	Journal of Money, Credit and Banking	32	1,702
77	Ortiz-Molina, H., and M. F. Penas	Lending to small businesses: The role of loan maturity in addressing information problems	2007	Small Business Economics	20	995
78	Park, Y.	Parsimonious lenders: Bank concentration and credit availability to small businesses	2008		16	1,453
79	Peltoniemi, J.	The value of relationship banking: Empirical evidence on small business financing in Finnish credit markets	2004		46	976
80	Peltoniemi, J.	The benefits of relationship banking: Evidence from small business financing in Finland	2007	Journal of Financial Services Research	105	625
81	Petersen, M. A., and R. G. Rajan	Does distance still matter? The information revolution in small business lending	2002	Journal of Finance	48	4,548
82	Petersen, M. A., and R. G. Rajan	The benefits of lending relationships: Evidence from small business data	1994	Journal of Finance	74	1,500
83	Petersen, M. A., and R. G. Rajan	The effect of credit market competition on lending relationships	1995	Quarterly Journal of Economics	19	1,459
84	Pozzolo, A. F.	The role of guarantees in bank lending	2004		7	67,829
85	Repetto, A., S. Rodríguez, and R. O. Valdes	Bank lending and relationship banking: Evidence from Chilean firms	2002		54	21,000
86	Santikian, L.	The ties that bind: Bank relationships and small business lending	2011		131	2,981
87	Schenone, C.	Lending relationships and information rents: Do banks exploit their information advantages?	2009	Review of Financial Studies	109	878
88	Scott, J. A., and William C. D.	Bank mergers and small firm financing	2003	Journal of Money, Credit and Banking	12	1,474
89	Scott, J. A.	Loan officer turnover and credit availability for small firms	2006	Journal of Small Business Management	60	2,330
90	Shikimi, M.	Do firms benefit from multiple banking relationships? Evidence from small and medium-sized firms in Japan	2005		12	78,695
91	Shin, B., G. F. Udell, and S. Park	Lending relationships, credit availability, firm value and banking crises	2008		20	1,337
92	Sohn, W., and H. Choi	Banks' lending decisions after loan acquisitions: Do banks favour pre-existing relationships?	2011	Applied Economics	28	181
93	Stein, I.	The price impact of lending relationships	2011		29	14,826
94	Streb, J. M., J. Bolzico, P. Druck, A. Henke, J. Rutman, and W. Sosa Escudero	Bank relationships: Effect on the availability and marginal cost of credit for firms in Argentina	2002		56	15,822
95	Uchida, H., G. F. Udell, and N. Yamori	Loan officers and relationship lending to SMEs	2012	Journal of Financial Intermediation	18	1,020
96	Uzzi, B.	Embeddedness in the making of financial capital: How social relations and networks benefit firms seeking financing	1999	American sociological review	5	2,226
97	Voordeckers, W., and T. Steijvers	Business collateral and personal commitments in SME lending	2006	Journal of Banking and Finance	15	234
98	Weinstein, D. E., and Y. Yafeh	On the costs of a bank-centered financial System: Evidence from the changing main bank relations in Japan	1998	Journal of Finance	24	6,836
99	Wen, S., and C. Tseng	Collateral, relationship banking, and corporate credit risk	2006		3	NA
100	Yao, J., and H. Ouyang	Dark-side evidence on bank–firm relationship in Japan	2007	Japan and the World Economy	2	NA
101	Ziane, Y.	Number of banks and credit relationships: Empirical results from French small business data	2003	European Review of Economics and Finance	48	244

Table A2.2 Definitions of variables

Meta-analytic effect sizes
Discrete measure of significance: This variable classifies reported effects from the studies into positive, negative, and non significant ones at the 10% significance level. Alternatively, the variable classifies effects into significant positive and significant negative at the 10% significance level. Significance is derived directly from the reported regression statistics. Source: sample studies
One-tail p-value: A continuous direction and the significance of all of the effect size. Values range from zero to one where values approaching zero are significantly unfavorable to the borrower, but values approaching one are significantly favorable. One-tail p-value is derived from the significance statistics derived from significance statistics reported in a study. If only limited information is provided, such as star indication of the level of significance, we collect the most conservative significance measure (e.g. for significance at >10% confidence level we code the effect as significant at 10% confidence level). If the effect is in the direction of the hypothesis that the relationship is beneficial to the borrower (i.e., the relationship's strength has an association with lower rates, greater credit availability, lower collateral requirements, or longer maturity, then the one-tail p-value is defined as p1=(p2/2). If the effect is in the opposite direction, then p1=1-(p2/2). In this calculation p1 is the one-tail p-value and p2 is the two-tail p-value reported in papers or derived from significance statistics. For the overall effect size we apply Edgington's (1972) method to calculate a one-tail p-value that indicates the pooled estimate of the significance and the direction of the overall true effect. Source: sample studies
Fisher's z-score: Partial correlation corrected for skewness. Partial correlations are obtained directly from sample studies from regression statistics following Greene (2008, Ch. 3): $r_{yz}^2 = \frac{t_z^2}{t_z^2 + df}$ where r_{yz}^2 is the partial correlation between variables y (dependent variable) and z (independent variable), t is the t-statistic associated with the z coefficient, and df is the degrees of freedom. Correction for skewness follows from Borenstein et al. (2009). Positive Fisher's z-scores indicate a positive relation between the strength of the relationship and benefits for the borrowers, negative Fisher's z-scores indicate a negative relation. Source: sample studies
Relationship strength proxies
TIME – DURATION: Time dimension of the relationship's strength measured by the duration of the lending relationship. Source: own dataset
TIME – AGE: Time dimension of the relationship's strength measured by the age of the borrower. Source: own dataset
TIME – OTHER: Time dimension of the relationship's strength measured by other time-related variables, such as number of repeated interactions over time, loan officer turnover, or frequency of interactions. Source: own dataset
EXCLUSIVITY: Exclusivity dimension of the relationship's strength measured by the degree of exclusive lending relationship between lenders and borrowers, e.g. number of lending relationships, concentration of lending, or main bank status. Source: own dataset
CROSSPRODUCT-PRODUCT SYNERGIES: Cross-product synergies dimension of the relationship's strength, e.g. number of services provided by the lender, existence of deposit taking services, and scope of financial services provision. Source: own dataset
DISTANCE – PHYSICAL: Distance dimension of the relationship's strength measured by physical distance between lender and borrower. Source: own dataset
DISTANCE – ORGANIZATIONAL: Distance dimension of the relationship's strength measured by organizational distance between lender and borrower, e.g. membership in lending institutions, cooperative membership, board linkages, or distance between bank branch and bank headquarters. Source: own dataset
DISTANCE – PERSONAL: Distance dimension of the relationship's strength measured by personal distance between lender and borrower, e.g. degree of personal interactions, or a dummy variable indicating banking in person. Source: own dataset
Lending outcome proxies
RATE: Price of credit. Source: own dataset
VOL: Credit availability. Source: own dataset
COLL: Collateral requirements. Source: own dataset
MAT: Loan maturity. Source: own dataset

Table A2.2 (continued)

Country-level lending environment
We calculate country-level variables for each study, country, and sampling window as equally weighted averages of those country-year observations that are available in our datasets within the sample period of the study. If study observations fall into time periods in which country-level series are available but no time overlap exists between the original sample period and the available country indicator, we use the closest available country-year observation.
Bank competition: negative value of the assets of three largest banks as a share of assets of all commercial banks. Source: Beck, T., Demirgüç-Kunt, A., 2010. Financial institutions and markets across countries and over time: data and analysis. World Bank policy
Bank deposits / GDP: Demand, time and saving deposits in deposit money banks as a share of GDP. Source: Beck, T., Demirgüç-Kunt, A., 2010. Financial institutions and markets across countries and over time: data and analysis. World Bank policy
SME employment: Percentage of total employment by micro, small, and medium enterprises. Source: Kozak, M., 2007. Micro, small, and medium enterprises: a collection of published data. International Finance Corporation (IFC). Washington, D. C.
Developed status: Equals 1 if the study dataset is from a high income group as defined by the World Bank country classification system, 0 otherwise. The development status is determined in the median year of the sampling window. Source: World Bank
Legal system and security of property rights: Index of protection of persons and their rightfully acquired property. The index consists of 7 components: judicial independence, impartial courts, protection of property rights, military interference in rule of law and the political process, integrity of the legal system, legal enforcements of contracts, and regulatory restrictions on the sale of real property. The index ranges from 0 (weak legal system) to 10 (strong legal system). Source: Economic Freedom of the World, Fraser Institute
Corruption index: Control of corruption index. The index measures the perceived corruption. Values range from -2.5 to 2.5, with higher values corresponding to lower corruption. Source: World Bank, World Governance Indicators
Bank cost-income ratio: Total costs as a share of total income of all commercial banks. Source: Beck, T., Demirgüç-Kunt, A., 2010. Financial institutions and markets across countries and over time: data and analysis. World Bank policy
Inflation: Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. Source: World Bank
Legal origin: A set of 5 dummies that identifies the legal origin of the Company law or Commercial Code of each country. The five origins are English, French, German, Scandinavian, and Socialist. The reference dummy is English. Source: Djankov, S., McLiesh, C., Shleifer, A., 2007. Private credit in 129 countries. Journal of Financial Economics, 84, 299-329.
Latitude: Absolute latitude of the country. Source: La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1999. The quality of government. Journal of Law, Economics and Organization 15, 222-279.
Publication variables
Ln no. of observations: Number of observations for each regression specification. Source: own dataset
Method strength: Equals 1 if the original estimator uses instrumental variable or structural estimation, 0 otherwise. Source: own dataset
Published: Equals 1 if the study appears in a refereed journal, 0 otherwise. Source: own dataset
Author affiliation ranking: Author affiliation ranking is a 5-year moving average of the Arizona State University Finance Rankings. The value is calculated for each author's affiliation and for each year of publication. For those authors, whose institution is not available in the ranking, we impute the value as the maximum of all rankings in our dataset of selected publications + 1. If the author is affiliated with more than one ranked institutions we use the one that is listed first. Source: Arizona State University Finance Rankings
Primary: Equals 1 if the relationship lending is the main focus of the paper; =0 if relationship lending is not the main focus of the paper and serves in regressions as a control variable. Source: own dataset
Firm survey: Equals 1 if the original sample is a survey where the respondents are representatives of borrowers. Source: own dataset
Subsample: Equals 1 if the effect size is derived from a subsample in the original study. Source: own dataset
Publication year: The year of the publication. If the paper is available online first, the year of the online publication is used. Source: own dataset
No. of citations: Number of citations is obtained from Web of Science for each published paper. The value is set to zero for publications that are not available in the Web of Science database. Source: Web of Science by Thomson Reuters

2.8 Figures

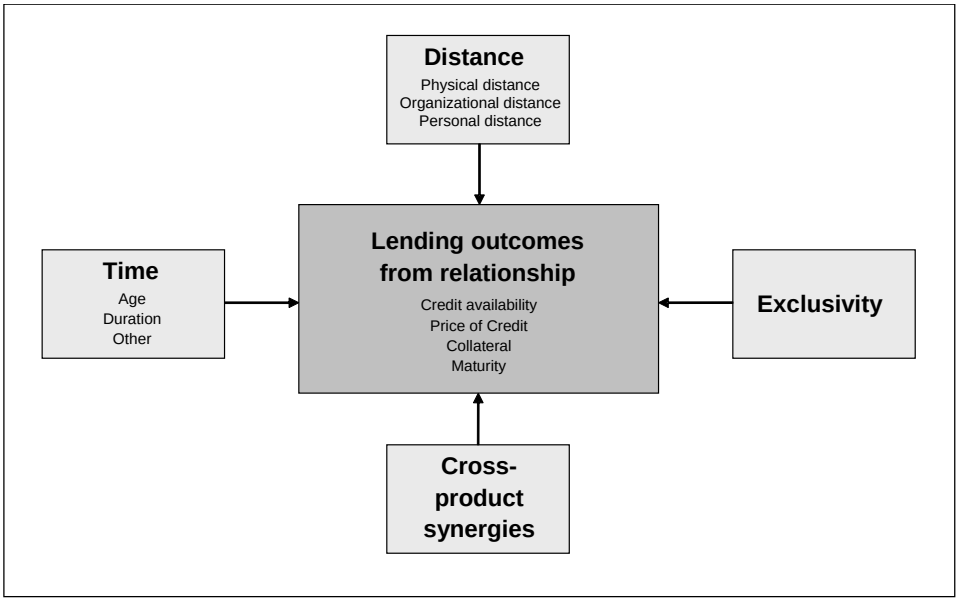


Figure 2.1 Dimensions of the strength of lending relationships and their lending outcomes
This figure displays the multi-dimensional conceptual framework. The effects of relationship lending are represented by the impact of the four dimensions of the strength of bank-borrower relationships on their lending outcomes shown in the center of the figure.

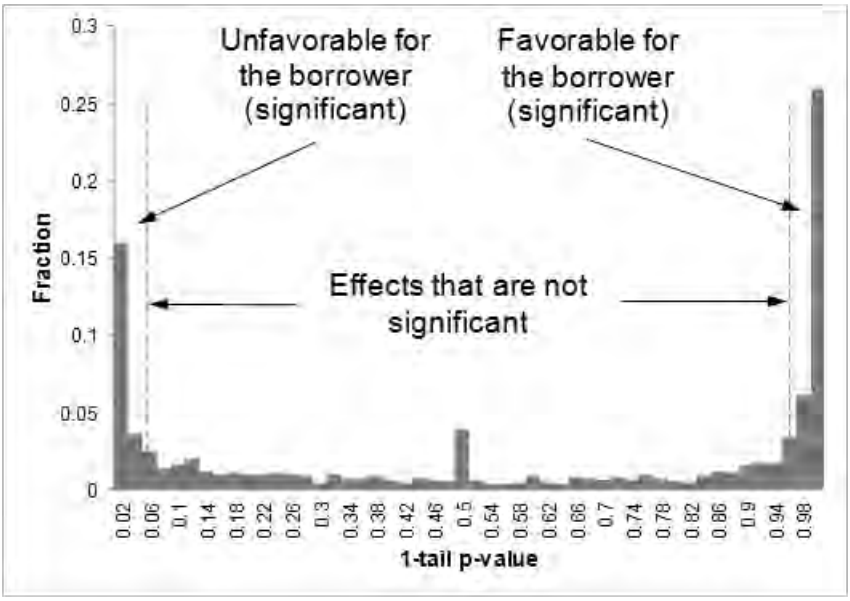


Figure 2.2 Distribution of the one-tail *p*-values

This figure shows the frequency distribution of one-tail *p*-values from all selected studies. Values approaching zero represent results with significantly adverse effects for borrowers at the 10% level; values approaching one represent results with significantly beneficial effects for borrowers at the 10% level. Values in the range of 0.05-0.95 indicate results for the borrower benefits that are not significant at the 10% level. The distribution is based on the total number of 2,979 observations.

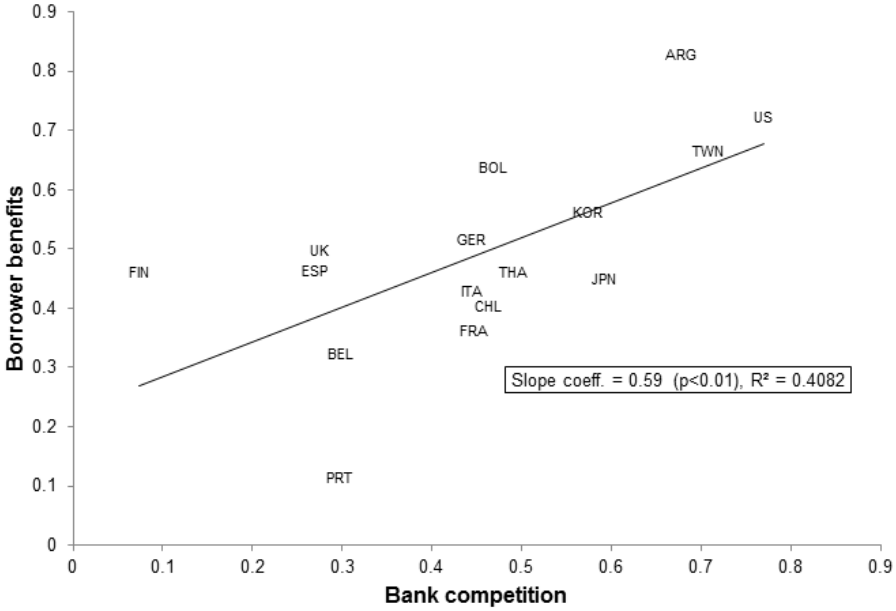
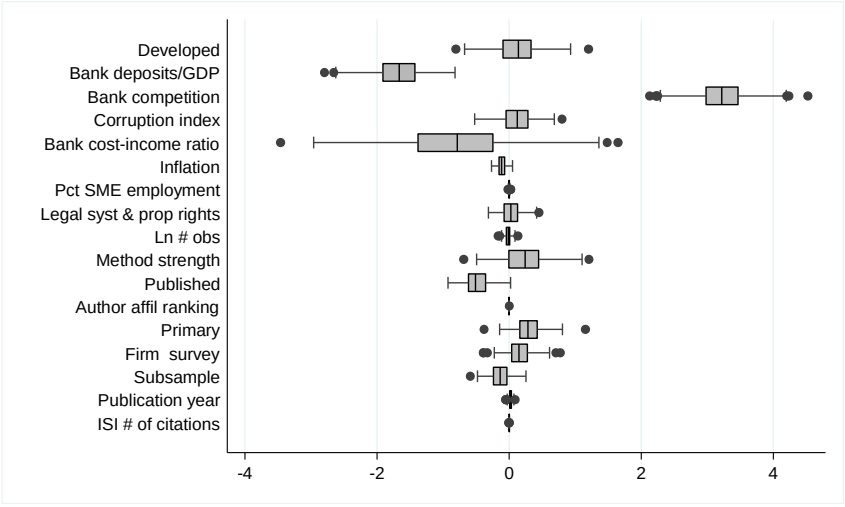


Figure 2.3 Relationship lending benefits and bank competition

This figure shows the means of bank competition (0=perfect monopoly; 1=perfect competition) and borrower benefits measured by one-tail *p*-values (0=significant adverse effect for the borrower; 1=significant beneficial effect for the borrower). The means are calculated as equal-weighted averages of observations per country over the sample period within each study. Effect sizes from multi-country studies are excluded. Countries: ARG=Argentina, BEL=Belgium, BOL=Bolivia, CHL=Chile, GER=Germany, ESP=Spain, FIN=Finland, FRA=France, ITA=Italy, JPN=Japan, KOR=South Korea, PRT=Portugal, THA=Thailand, TWN=Taiwan, UK=United Kingdom, US=United States.

Bootstrapped coefficients



Bootstrapped *p*-values

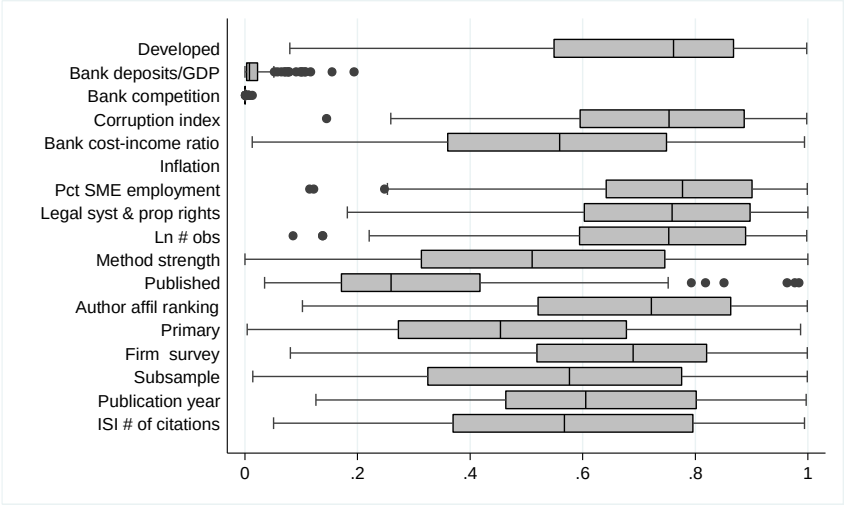


Figure 2.4 Box plots of bootstrapped coefficients and *p*-values

This figure reports bootstrapped coefficients and corresponding *p*-values using pooled Logit model where the dependent variable is a binary indicator of significance, which takes value of 1 if the effect is significant and beneficial for the borrower, and value of 0 if the effect is significant and unfavorable for the borrower. The bootstrapping is based on a random sample generation with replacement using the full sample of all effect sizes (2,979) and 200 repetitions.

2.9 Tables

Table 2.1 Summary statistics of studies in the sample

This table summarizes the characteristics of the selected studies. A study is denoted as published if it appears in a refereed journal. The region relates to the geography of the data sample in each paper. The development status of countries is based on the World Bank development classification in the median sampling year. The data source represents the primary source of a study's information. The focus on relationship lending denotes whether a study uses relationship strength proxies as the primary explanatory variables in the empirical design. If relationship strength proxies serve as control variables, then a paper is designated as secondary. Banking journals in the selected set of publications include the Journal of Banking and Finance; Journal of Money, Credit and Banking; and the Journal of Financial Intermediation. The author's affiliation ranking is calculated as a five-year moving average of the Arizona State University (ASU) Finance Rankings of each author's affiliation in the year of the publication. The values for this variable comprise only those institutions that are available in the ASU data set. The journal's impact factor is from the Journal Citation Report by Thomson ISI (ISI) for the year of the publication. The number of citations is obtained from Web of Science for each published paper. The journal's impact factor and the number of citations are reported only for published studies. The firm count is the total number of unique firms included in each study. The observation count is the number of unique firm-year observations approximated as the maximum number of observations in any regression specification within each study.

Panel A. Sample composition (number of studies)

Publication status		Region		Development status		Data source		Focus on relationship lending	
Published studies	75	US	35	Developed	87	Firm survey	46	Primary	62
of which		Europe	43	Emerging	14	Proprietary bank data	23	Secondary	39
Banking journals	21	Asia	18			Other	32		
Other journals	54	Latin America	5						
Unpublished studies	26								
Total	101		101		101		101		101

Panel B. Sample characteristics

	Mean	Median	Min	Max	St. dev.
Publication year	2005.3	2006	1994	2012	4.62
Sample period mid-year	1996.6	1997	1978	2008	5.23
Author affiliation ranking	119	139	5	246	62
Journal impact factor	1.263	0.807	0.146	4.602	1.032
No. of citations	49.79	8	0	563	104.81
Firm count	9,994	1,800	100	368,977	41,802
Observation count	44,176	1,500	139	2,078,434	227,522

Table 2.2 Pooled effect sizes – discrete and continuous effects

Panel A shows the number and the direction of the effect sizes. In each combination of the relationship's strength and lending outcome, (+) denotes positive and significant regression coefficients, (-) denotes negative and significant coefficients, and (ns) denotes coefficients that are not statistically significant in the original studies at the 10% level. *, **, *** indicate significance according to a two-tail binomial sign test at the 10%, 5%, and 1% levels, respectively. The sign test is estimated for pairs of relationship lending strength-outcome where the number of observations is greater than 30, otherwise we fill the significance cell with '---'. Indicator "B" denotes significant pooled effects that are beneficial to the borrower; "N" denotes significant pooled effects that are not beneficial to the borrower, both at 10% level. Panel B reports the estimates of the overall continuous effects per combination of relationship lending dimension and the lending outcome. The pooled estimate of the overall one-tail *p*-value (p) is calculated using Edgington's normal curve method, based on the contrast of the *p*-value average (Edgington, 1972). Values range from 0 (adverse effect for the borrower) to 1 (beneficial effect for the borrower). One-tail *p*-value is a significance indicator by design, stars next to the one-tail *p*-value are added for visual purposes. The overall correlations (ρ) are meta-analytic pooled estimates of random-effects mean correlations (Borenstein et al. 2009, Lipsey and Wilson 2001). The ρ estimate is based on partial correlations, which are obtained from the *t*-values of the regression coefficients according to Greene (2003, Chapter 3). "#" is the total number of studies that contain at least one effect size for the combination of the relationship lending dimension and a lending outcome. The overall one-tail *p*-values and ρ are derived from the first occurrences of an effect size per each relationship-outcome combination per each study (no interdependent effect sizes within a study). Star indicators next to ρ correspond to the null test that the true pooled effect ρ is zero, where the number of studies is greater than 2, otherwise we fill the significance cell with '---'. In Panel B, we report indicator "B" or "N" if either the overall pooled one-tail *p*-value or pooled ρ are significant at 10% level. Cochran's Q value is significant at 1% for all combinations of the relationship lending dimension and a lending outcome (where the number of studies is at least 5). Variables are defined in Table A2.2 of the appendix.

Panel A: Discrete effects

			Relationship lending outcomes											
Strength of relationship lending		Coeff sign	RATE			VOL			COLL			MAT		
TIME	TIME - DURATION	+	67		B	76		B	17		B	2		
		-	101	**		27	***		33	**		11	---	
		ns	114			56			58			10		
	TIME - AGE	+	17		B	74		B	17					
		-	48	***		20	***		21				---	
		ns	135			93			37			13		
	TIME - OTHER	+	7			31						7		
		-	14			20			6	---				
		ns	39			36			3			1		
EXCL	EXCLUSIVITY	+	137		B	132		B	46		N			
		-	225	***		99	**		22	***		2	---	
		ns	188			177			49			9		
CROSS PROD	CROSS-PRODUCT SYNERGIES	+	4		B	74		B	9			4		
		-	114	***		15	***		12				---	
		ns	86			61			17			11		
DISTANCE	DISTANCE - PHYSICAL	+	5		N	29								
		-	29	***		21				---			---	
		ns	27			44						5		
	DISTANCE - ORGANIZATIONAL	+	1			31		N	2					
		-	1	---		14	**		9	---				
		ns	4			22			1					
	DISTANCE - PERSONAL	+				7								
		-	4	---			---			---				
		ns	1			2								

Panel B: Continuous effects

			Relationship lending outcomes															
Strength of relationship lending			RATE				VOL				COLL				MAT			
TIME	TIME - DURATION	p	0.20				0.98	**	B		0.45				0.18			
		ρ	0.007				0.024	***			0.000				0.026			
		#	43				31				27				3			
	TIME - AGE	p	1.00	***	B		0.99	***	B		1.00	***	B		0.77			
		ρ	-0.020				0.019	***			-0.018	**			0.020			
		#	29				31				18				2			
	TIME - OTHER	p	0.87				0.85				0.99	***	B		0.95			
		ρ	-0.020				0.055				-0.082	*			0.031	---		
		#	3				4				2				1			
EXCL	EXCLUSIVITY	p	1.00	***	B		1.00	***	B		0.02	**	N		0.12			
		ρ	-0.031	***			0.012				0.020	**			-0.022			
		#	46				40				24				2			
CROSS PROD	CROSS-PRODUCT SYNERGIES	p	0.91	*	B		0.88				0.57				0.59			
		ρ	-0.024	**			0.009				-0.015				0.041			
		#	18				15				6				2			
DISTANCE	DISTANCE - PHYSICAL	p	0.42				0.94	*	B						0.72			
		ρ	-0.007				-0.107								-0.014	---		
		#	7				11								1			
	DISTANCE - ORGANIZATIONAL	p	0.50				0.96	**	B		0.00							
		ρ	0.031				-0.073	*			-0.031							
		#	4				6				4							
	DISTANCE - PERSONAL	p	0.01	***	N		0.01	***	N									
		ρ	-0.045	***			0.043	***										
		#	3				2											

Table 2.3 Relationship lending and country characteristics

This table reports the meta-analytic regressions to explain the heterogeneity of relationship lending benefits for borrowers. The beneficial effect for the borrower is one of the following: lower price of credit, higher credit availability, lower collateral requirements, or longer loan maturity. Models (1) and (2) report pooled Logit estimations where the dependent variable is a discrete binary indicator, which takes the value of 1 if the effect is significantly beneficial for the borrower and the value of 0 if the effect is significantly unfavorable for the borrower. Standard errors are clustered at the publication level. Model (3) reports panel Tobit with random effects grouped by publications where the dependent variable is a one-tail *p*-value. Model (4) reports meta-regression with mixed effects multi-level model using the maximum restricted likelihood estimation. Model (5) reports random-effects robust variance meta-regression with dependent effect sizes. The dependent variable in Models (4) and (5) is Fisher's *z*-score. The Tau2 is the residual maximum likelihood estimation of the between-study variance. The omitted reference region is "US". Variables are defined in Table A2.2 of the appendix. The *, **, *** indicate the coefficients that are significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Method:	Logit, pooled			Logit, pooled			Tobit, random effects			Meta-regression, mixed effects			Robust meta-regression		
	(1)			(2)			(3)			(4)			(5)		
Dep. var.:	Discrete / Binary borrower benefits			Discrete / Binary borrower benefits (1=yes, 0=no)			Continuous / One-tail *p*-value borrower benefits			Continuous / Fisher's *z*-score			Continuous / Fisher's *z*-score		
	Coeff.	z	sig.	Coeff.	z	sig.	Coeff.	z	sig.	Coeff.	z	sig.	Coeff.	t	sig.
Lending environment															
Bank competition				3.12	4.11	***	0.43	3.36	***	0.07	2.64	***	0.06	2.41	**
Bank deposits / GDP				-1.62	-2.90	***	-0.13	-1.67	*	-0.03	-2.03	**	-0.03	-2.37	**
Pct SME employment				0.00	0.08		-0.001	-0.75		0.00	-0.21		0.00	-0.21	
Developed status				0.19	0.28		0.04	0.39		0.03	1.42		0.02	0.54	
Legal system and prop.				0.03	0.10		-0.029	-0.61		0.00	-0.30		-0.01	-0.60	
Corruption index				0.10	0.18		0.03	0.42		-0.01	-0.39		0.001	0.08	
Inflation				-0.10	-0.96		-0.02	-1.10		0.00	-1.06		0.00	-1.03	
Bank cost-income ratio				-0.95	-0.71		-0.14	-0.60		-0.03	-0.62		-0.02	-0.36	
Regions															
Region = Europe	-1.97	-4.58	***												
Region = Asia ex Japan	-1.31	-2.78	***												
Region = Japan	-2.40	-5.08	***												
Region = Latin America	-1.54	-2.04	**												
Publication controls															
Ln no. of observations	-0.06	-0.96		-0.02	-0.21		0.001	0.14		0.00	-0.46		0.00	0.09	
Method strength	0.47	1.29		0.23	0.63		0.02	0.52		0.01	0.86		-0.02	-1.83	*
Published	-0.33	-0.85		-0.50	-1.19		-0.12	-2.18	**	-0.03	-2.32	**	-0.03	-2.37	**
Author affiliation ranking	0.00	0.00		0.00	-0.25		0.00	-0.33		0.00	-0.08		0.00	0.17	
Primary	0.13	0.37		0.23	0.66		-0.01	-0.30		-0.01	-0.49		-0.01	-0.77	
Firm survey	-0.04	-0.13		0.14	0.35		0.02	0.46		0.01	0.44		0.01	0.79	
Subsample	-0.12	-0.54		-0.14	-0.65		-0.03	-1.31		0.00	-0.13		-0.01	-1.55	
Publication year	-0.04	-0.94		0.02	0.47		0.00	-0.13		0.00	0.65		0.00	0.22	
No. of citations	0.00	-0.53		0.00	0.51		0.00	0.36		0.00	0.75		0.00	1.31	
Constant	87.28	0.97		-41.18	-0.42		3.10	0.24		-1.70	-0.59		-0.44	-0.17	
Rel. lending outcomes	Yes			Yes			Yes			Yes			Yes		
Rel. lending dimensions	Yes			Yes			Yes			Yes			Yes		
Number of studies	94			92			93			93			93		
Number of observations	1,599			1,582			2,821			2,821			2,821		
Pseudo R2	0.19			0.19											
Tau2													0.009		

Table 2.4 Instrumental variable regressions

This table contains estimates for the probability of observing relationship lending benefits for borrowers using the instrumental variable regressions. Instrumented variables are Bank deposits / GDP and Bank competition; instruments are legal origin and latitude. Model (1) reports two-step IV probit with bootstrapped standard errors clustered by studies. The dependent variable is a discrete binary indicator, which takes the value of 1 if the effect is significantly beneficial for the borrower and the value of 0 if the effect is significantly unfavorable for the borrower. . Model (2) reports two-step IV Tobit with bootstrapped standard errors clustered by studies. The dependent variable is a one-tail *p*-value. Model (3) reports two-step IV GMM with bootstrapped standard errors clustered by studies. The dependent variable is Fisher's *z*-score. Test of exogeneity in Models (1) and (2) is Wald χ^2 test of exogeneity, in Model (3) the test is GMM C (difference-in-Sargan) statistic. Variables are defined in Table A2.2 of the appendix. The *, **, *** indicate the coefficients that are significantly different from zero at the 10%, 5%, and 1% levels, respectively.

Method:	IV Probit			IV Tobit			IV GMM		
	(1)			(2)			(3)		
Dep. var.:	Discrete / Binary borrower benefits (1=yes, 0=no)			Continuous / One-tail *p*-value borrower benefits			Continuous / Fisher's *z*-score		
Instrumented	Bank competition, Bank deposits / GDP			Bank competition, Bank deposits / GDP			Bank competition, Bank deposits / GDP		
Instruments	Legal origin, latitude			Legal origin, latitude			Legal origin, latitude		
	Coeff.	z	sig.	Coeff.	z	sig.	Coeff.	z	sig.
Lending environment									
Bank competition	2.29	3.20	***	0.64	3.33	***	0.10	3.26	**
Bank deposits / GDP	-0.77	-0.93		-0.07	-0.29		-0.02	-0.53	
Pct SME employment	0.00	-0.10		0.00	-0.88		0.00	-0.95	
Developed status	0.19	0.26		0.02	0.10		0.0393	0.77	
Legal system and property rights	0.02	0.07		-0.04	-0.59		0.00	0.00	
Corruption index	0.10	0.18		0.06	0.44		-0.01	-0.34	
Inflation	-0.03	-0.23		-0.01	-0.35		0.00	-0.21	
Bank cost-income ratio	-0.36	-0.30		-0.16	-0.38		-0.06	-0.75	
Publication controls									
Ln no. of observations	-0.01	-0.26		-0.01	-0.76		0.00	-0.60	
Method strength	0.13	0.37		0.01	0.07		-0.01	-0.82	
Published	-0.30	-0.95		-0.09	-1.04		-0.03	-1.71	*
Author affiliation ranking	0.00	0.02		0.00	-0.17		0.00	-0.12	
Primary	0.17	0.53		0.03	0.63		0.01	0.42	
Firm survey	-0.01	-0.02		-0.03	-0.39		0.00	-0.13	
Subsample	-0.07	-0.54		-0.05	-1.47		-0.01	-1.02	
Publication year	0.00	0.05		0.00	-0.29		0.00	0.29	
No. of citations	0.00	0.08		0.00	-0.10		0.00	0.05	
Constant	-1.54	-0.02		7.71	0.37		-1.04	-0.24	
Rel. lending outcomes	Yes			Yes	Yes		Yes		
Rel. lending dimensions	Yes			Yes	Yes		Yes		
Number of studies	92			93			93		
Number of observations	1,582			2,821			2,821		
χ^2 test of exogeneity	7.68	**		17.48	***		2.94		

Table 2.5 Decomposition of relationship lending benefits by loan terms

This table decomposes lending outcomes into: loan rates (Models (1) and (4)), credit availability (Models (2) and (5)), and collateral requirements (Models (3) and (6)). The table reports the meta-analytic regressions that explain the heterogeneity of relationship lending benefits for the borrowers by region effects and country-level characteristics. The estimation is panel Tobit with random effects grouped by publications. The dependent variable is a one-tail *p*-value. The omitted reference for regions is "US". Variables are defined in Table A2.2 of the appendix. The *, **, *** indicate the coefficients that are significantly different from zero at the 10%, 5%, and 1% levels respectively.

Method:	Tobit, random effects			Tobit, random effects			Tobit, random effects			Tobit, random effects			Tobit, random effects			Tobit, random effects		
	(1)			(2)			(3)			(4)			(5)			(6)		
Dep. var.:	Continuous / One-tail *p*-value			Continuous / One-tail *p*-value			Continuous / One-tail *p*-value			Continuous / One-tail *p*-value			Continuous / One-tail *p*-value			Continuous / One-tail *p*-value		
	Rate			Volume			Collateral			Rate			Volume			Collateral		
	Coeff.	t	sig.	Coeff.	t	sig.	Coeff.	t	sig.	Coeff.	t	sig.	Coeff.	t	sig.	Coeff.	t	sig.
Lending environment																		
Bank competition										0.75	4.41	***	0.52	2.31	**	-0.13	-0.51	
Bank deposits / GDP										-0.06	-0.51		-0.18	-1.29		-0.43	-3.68	***
Pct SME employment										0.00	-1.25		0.00	0.09		0.00	-1.38	
Developed status										-0.16	-0.75		0.05	0.31		-0.66	-2.08	**
Legal system and prop. rights										-0.04	-0.62		-0.01	-0.11		-0.05	-0.66	
Corruption index										0.06	0.60		0.02	0.17		0.11	0.79	
Inflation										-0.05	-1.79	*	-0.01	-0.37		-0.05	-1.61	
Bank cost-income ratio										-0.37	-0.85		0.24	0.69		0.02	0.04	
Regions																		
Region = Europe	-0.37	-4.22	***	-0.24	-2.37	**	0.02	0.20										
Region = Asia ex Japan	-0.26	-1.14		-0.15	-1.16		0.24	1.87	*									
Region = Japan	-0.14	-1.22		-0.30	-2.23	**	-0.37	-4.40	***									
Region = Latin America	0.10	0.53		-0.17	-1.11		2.09	0.04										
Publication controls																		
Ln no. of observations	0.00	0.33		0.00	-0.26		0.02	1.38		0.01	0.91		0.00	0.03		0.02	1.17	
Method strength	-0.04	-0.72		0.15	2.41	**	-0.07	-0.53		-0.03	-0.61		0.14	2.30	**	0.05	0.32	
Published	-0.13	-1.73	*	-0.02	-0.18		-0.13	-1.54		-0.17	-2.46	*	0.02	0.21		-0.17	-1.62	
Author affiliation ranking	0.00	0.53		0.00	-0.16		0.00	-2.82	***	0.00	0.66		0.00	-0.69		0.00	-2.47	**
Primary	-0.02	-0.23		0.01	0.18		0.03	0.47		0.01	0.11		0.03	0.36		-0.08	-0.94	
Firm survey	0.02	0.31		-0.03	-0.40		0.27	3.99	***	0.08	1.15		0.01	0.06		0.35	4.06	***
Subsample	0.00	0.14		-0.09	-2.37	**	0.03	0.66		0.01	0.32		-0.09	-2.25	**	0.01	0.27	
Publication year	0.00	-0.48		-0.01	-0.96		0.02	1.54		-0.01	-0.81		0.00	-0.40		0.03	2.44	**
No. of citations	0.00	0.18		0.00	-0.50		0.00	0.47		0.00	-0.10		0.00	-0.21		0.00	1.08	
Constant	8.07	0.54		20.37	1.00		-34.69	-1.51		14.34	0.92		9.50	0.45		-61.39	-2.33	**
Rel. lending outcomes	Yes			Yes			Yes			Yes			Yes			Yes		
Rel. lending dimensions	Yes			Yes			Yes			Yes			Yes			Yes		
Number of studies	59			51			29			59			50			29		
Number of observations	1,310			1,148			337			1,310			1,108			337		

Table 2.6 Three-outcome multinomial Logit model and monotonicity of the effects

This table reports the results from the multinomial logistic models with the three categorical variables: -1 denotes the effect sizes that are significant and unfavorable for the borrower; 0 denotes the effect sizes that are not significant; and 1 denotes the effect sizes that are significant and beneficial for the borrower. Columns (1) and (3) show the estimation for the outcome -1, the effects sizes that are significant and unfavorable for the borrower, relative to the non-significant results. Columns (2) and (4) show the estimation for the outcome 1, the effect sizes that are significant and beneficial for the borrower, relative to the non-significant results. The omitted reference for regions is "US". Models take into account the clustering of observations at the publication level. Variables are defined in Table A2.2 of the appendix. The *, **, *** indicate the coefficients that are significantly different from zero at the 10%, 5%, and 1% levels respectively.

Method: Multinomial Logit	(1)			(2)			(3)			(4)		
Dep. var.:	Adverse effect for the borrower			Benefit for the borrower			Adverse effect for the borrower			Benefit for the borrower		
	Coeff.	z-stat	sig.	Coeff.	z-stat	sig.	Coeff.	z-stat	sig.	Coeff.	z-stat	sig.
Lending environment												
Bank competition	-0.12	-0.17		3.28	4.62	***						
Bank deposits / GDP	0.94	2.64	***	-0.57	-1.17							
Pct SME employment	-0.01	-1.15		-0.02	-1.44							
Developed status	-0.39	-0.61		0.14	0.20							
Legal system and property rights	-0.01	-0.03		-0.17	-0.55							
Corruption index	0.12	0.29		0.38	0.78							
Inflation	0.12	1.66	*	0.02	0.17							
Bank cost-income ratio	1.11	0.90		-0.52	-0.45							
Region												
Region = Europe							0.53	1.44		-1.36	-3.21	***
Region = Asia ex Japan							0.31	0.67		-1.66	-4.40	***
Region = Japan							0.88	2.19	**	-1.52	-3.75	***
Region = Latin America							1.64	2.82	***	-0.05	-0.07	
Publication controls												
Ln no. of observations	0.32	5.60	***	0.25	3.33	***	0.33	6.05	***	0.24	3.52	***
Method strength	-0.12	-0.56		-0.20	-0.47		-0.34	-1.54		-0.06	-0.17	
Published	0.70	2.35	**	0.05	0.15		0.61	2.11	**	0.18	0.52	
Author affiliation ranking	0.00	-0.24		0.00	-0.39		0.00	-0.59		0.00	-0.45	
Primary	0.31	1.29		0.55	2.23	**	0.30	1.19		0.49	2.01	**
Firm survey	-0.70	-2.45	**	-0.75	-1.83	*	-0.58	-2.36	**	-0.80	-2.06	**
Subsample	-0.05	-0.33		-0.19	-0.87		-0.05	-0.34		-0.10	-0.45	
Publication year	-0.03	-0.85		-0.01	-0.15		0.01	0.35		-0.01	-0.25	
No. of citations	0.00	-0.23		0.00	-0.01		0.00	0.88		0.00	0.04	
Constant	59.14	0.77		13.30	0.17		-30.83	-0.41		17.40	0.23	
Rel. lending outcomes	Yes						Yes					
Rel. lending dimensions	Yes						Yes					
Number of studies	93						95					
Number of observations	2820						2869					
Pseudo R2	0.16						0.15					

Chapter 3

The Conditional Nature of Credit Constraints*

3.1 Introduction

Credit constraints continue to pose significant obstacles to small and medium-sized enterprises. Firms that cannot access financing forego profitable investments, reduce employment, and restrict innovation (Campello et al., 2009). The total funding gap of SMEs worldwide represents over 30% of all SME credit outstanding, or around 5% of worldwide GDP (IFC, 2011). Notwithstanding the severity of the problem, it is not clear how large is the extent of credit constraints and what underlying factors drive their occurrence. While policy interventions and research focus mainly on credit rejections, a substantially larger portion of credit constraints remains unaccounted for. First, borrowers might not apply for a loan in anticipation of rejection. Second, borrowers that apply might be rejected or, third, they may obtain unfavorable credit terms. Hence, credit constraints occur in stages and the outcome at each stage is affected by firm, bank, and country characteristics. In this paper I decompose credit constraints into the three conditional stages and investigate large cross-country heterogeneity in the prevalence of credit constraints by differential impacts of firm- and bank-level factors.

Large cross-country variation in credit constraints arises due to differences in legal and information environments (Djankov et al., 2007; La Porta et al., 1998; Pagano and Jappelli, 1993), financial and banking systems (Beck et al., 2004; Beck, Demirgüç-Kunt, and

* This chapter is based on Kysucky (2014).

Maksimovic, 2008; Levine, 1998), economic activity and monetary policy (Jiménez et al., 2012, 2014). Across firms, smaller and informationally more opaque borrowers face higher barriers to operations and access to finance (Beck, Demirgüç-Kunt, and Levine, 2005a). Empirical studies focus largely on formally rejected firms, but discouraged or informally rejected firms constitute an important group of constrained firms (e.g., Brown et al., 2011; Cole, 2008; Popov and Udell, 2011). There is little evidence about credit constraints that occur due to the unsatisfied loan demand of approved borrowers. Further, it is not known how the individual stages of credit constraints depend on banking markets, and how bank lending standards affect lending outcomes at each stage.

To provide a more complete picture of credit constraints, I classify constrained borrowers into three conditional stages: discouragement, rejection, and unfavorable terms. The three stages of credit constraints consist of non-overlapping sets of outcomes, but they are conditional because each outcome depends on the result of the previous stage. The discouragement and unfavorable terms occur at the firm level because the decision to proceed or to drop out from the application process rests with a firm. Rejection occurs at the bank level, since lenders decide about the outcomes of the formal loan application and propose lending terms. Firms and banks have different incentives with respect to the provision and repayment of credit. While firms have an incentive to minimize the cost of obtaining and servicing a loan, banks have an incentive to minimize risk and maximize income from providing a loan. In the presence of market frictions and information asymmetries, the occurrence of credit constraints depends on the lending stage and the lending party, which makes the choice about the outcome at the given stage. Due to these differences it is likely that the key firm and bank determinants have a differential impact on the loan provision in each stage.

Using a dataset with over 58,000 firm-level observations from 14 Euro-area countries in the period 2009-2013, I explain the variation in credit constraints with three sets of factors: firm, bank, and country characteristics. I document how credit constraints relate to firm risk and bank lending standards and investigate strategic behavior of borrowers and banks. To understand the boundaries of credit constraints, I examine whether their occurrence is specific to a credit instrument, or whether credit constraints exist at the firm level regardless of credit instrument requested. I check the consistency of credit constraints across different instruments and estimate the probability of loan application timing in response to the expectations of credit availability. At the bank level, I analyze the spillover effect of bank lending standards on different credit instruments and investigate the transmission channels through which banks implement their bank lending policies. In the last step, I study the effect of non-bank

competition and the availability of market financing to firms and banks. In all analyses I control for the structure of the economic environment and banking markets. The empirical methods take into account the conditionality of credit constraints and correct for a sample selection bias.

My key findings are as follows. Stages of credit constraints vary with bank lending environment beyond firm risk. I show that the stages of credit constraints have differential relationships with the key determinants and document a more complex effect of bank lending standards on lending outcomes. While tight bank lending standards are associated with more discouraged borrowers and higher rejection rates, approved borrowers are likely to obtain more favorable credit terms in spite of tight standards. The effect is mainly due to a larger loan volume, rather than lower interest rates. Loan covenants are associated with increased constraints at all three stages, but the requirements on collateral have an opposite effect. I find that discouragement and rejections are more likely in countries with higher risk in a banking system.

Second, I provide evidence that the boundaries of credit constraints encompass the whole firm. Credit constraints exist at the firm level and are consistent across the credit instruments. Individual stages of credit constraints are strongly related to the stages of credit constraints reported for other credit instruments, and bank lending standards applied for bank loans tend to spill over to other credit instruments

Third, I show that borrowers are not likely to time their bank loan applications strategically according to their expectations of the availability of external finance. However, I find evidence that borrowers trade-off bank loans and trade credit applications in the expectation of changes in their availability in the future. The availability of market financing serves as a moderating factor that further influences the lending outcomes. On the demand side, if the availability of market finance to firms is high, borrowers are less likely to be discouraged and rejected in spite of higher lending standards. On the supply side, the availability of market finance to banks facilitates higher loan volumes for approved borrowers.

Overall, this paper documents more completely the extent of credit constraints and provides a differential explanation of large heterogeneity in the occurrence of credit constraints in a conditional framework. The results suggest that lending standards may induce inefficient lending. Banks with high lending standards excessively reject (and discourage) borrowers, but approved borrowers obtain higher loan volume. This implies a possibility of a distorted loan allocation whereas banks substitute higher rejection rates at the application stage with higher loan volume for approved borrowers.

The rest of the paper is organized as follows. Section 3.2 provides an overview of related literature. Section 3.3 describes data and empirical strategy. Section 3.4 presents the results and robustness checks, and section 3.5 concludes.

3.2 Related literature

Access to finance is an important factor related to the economic activity and growth of companies (e.g., Demirgüç-Kunt and Maksimovic, 1998). In many countries, SMEs account for a large share of the economy and significantly contribute to the employment and economic growth (Ayyagari et al., 2003; Beck, Demirgüç-Kunt, and Levine, 2005b). At the same time, SMEs consistently face higher barriers to operations and access to finance (Beck, Demirgüç-Kunt, and Levine 2005; Berger and Udell, 1998). The main firm-level factors responsible for greater difficulties of SMEs in accessing finance include higher information asymmetries, less favorable economies of scale, and higher entry costs (Beck, Demirgüç-Kunt, and Levine, 2005b; Beck, Demirgüç-Kunt, and Maksimovic, 2008; Klapper et al., 2006). Literature on financing constraints analyzes a wide array of factors that impose barriers for companies to access external funding. Among various financing technologies, bank lending represents a key instrument for SMEs (Beck, Demirgüç-Kunt, and Maksimovic, 2005). Bank lending to SMEs is specific in resolving information asymmetries through lending relationships, but it can also lead to negative externalities in the form of hold-up problems and moral hazard (Berger and Udell, 1995a; Boot, 2000; Petersen and Rajan, 1994). Credit rationing of SMEs is further related to information and incentive problems (Kirschenmann, 2014). This paper focuses on credit constraints specifically related to bank lending of SMEs in the Euro-area countries. I document the prevalence of the individual stages of credit constraints and offer new evidence on the differential impact of factors that influence the outcome at each stage.

Firm characteristics alone do not fully explain the cross-country variation in financing constraints (Djankov et al., 2007). At the country level, the key explanatory factors are related to the strength of the institutions (e.g., Beck and Demirgüç-Kunt, 2006; Demirgüç-Kunt and Maksimovic, 1998; La Porta et al., 1998; Rajan and Zingales, 1998). Legal environment affects the enforceability of financial contracts and influences the provision of credit, whereas regulatory environment affects the availability of finance by imposing restrictions on financing activities and potentially distorting capital allocation in favor of specific stakeholders or financing instruments (Altman, 2005; Berger, 2006). Countries with weak legal environment and low protection of property rights are less likely to experience SME growth and new

business creation (Beck, Demirgüç-Kunt et al., 2005a; Demirgüç-Kunt et al., 2006). The efficiency of the legal environment determines the availability of tools that banks can deploy to provide and secure credit, such as collateral, covenants, or the use of personal recourse (Berkowitz and White, 2004; Sharpe, 1990). More efficient bankruptcy laws and higher debt enforcement improve the availability of credit and facilitate the development of credit markets (Djankov et al., 2008). Another important factor is the information environment. Sound accounting standards and credit information sharing systems reduce the cost of resolving information asymmetries (Kallberg and Udell, 2003; Miller, 2003). Empirical evidence confirms that credit information depth helps to increase the access to finance by reducing the adverse selection problem, facilitating more accurate pricing of financial instruments, and improving the alignment of incentives between lenders and borrowers (Jappelli and Pagano, 2000, 2002; Love and Mylenko, 2003). Overall, the cross-country evidence confirms the importance of the institutional environment for SME finance availability. Many of the above studies are concerned with the finance-growth nexus, especially in the developing economies. However, the problems of SMEs to access finance remain acute in the developed countries, where many of the SMEs rely on bank financing. I extend this strand of literature by analyzing the role of the institutional environment in the context of the conditional stages of credit constraints. My empirical analysis is set in the post-crisis period 2009-2013, which is marked by dislocations in credit markets and provides a testing ground for analyzing credit constraints and the strength of the institutions in the times of distress.

Access to SME finance is further affected by the structure of a banking sector (Berger and Udell, 2006). There is conflicting evidence about the role of bank competition and the availability of credit (Berger et al., 2004). Studies find positive (Boot and Thakor, 2000), negative (Petersen and Rajan, 1995), or U-shaped relationship (Degryse and Ongena, 2005; Elsas, 2005; Presbitero and Zazzaro, 2011) between the availability of credit and bank competition. Recent studies describe the implications of a complex oligopoly and its differential impact on loan terms (Heffernan, 2006; Voordeckers and Steijvers, 2006). The effects of bank competition also depend on institutional development (Beck et al., 2003). Regarding the bank regulation, most studies report overall positive effects of imposing fewer restrictions. For instance, Berger and Udell (1995b) and Ramirez (1995, 2002) show that fewer restrictions are associated with lower cost of capital and lower cash-flow constraints. Barriers to banking services are higher in countries with more restrictions (Beck et al., 2008), whereas credit constraints decrease after a credit market liberalization takes place (Gelos and Werner, 2002; Laeven, 2003). Low efficiency of a banking system may signal unwarranted managerial perquisites and market power. Barth et al. (2008) find that private monitoring is associated with

greater bank efficiency. In this paper I study the effects of bank lending standards and the transmission mechanism through which bank lending standards relate to the stages of credit constraints. High level of bank lending standards may signal a prudent bank lending policy at the loan approval stage, but it is not known whether and how these policies translate into discouraged lending or unfavorable loan terms.

Availability of non-bank finance influences the financing choice of borrowers. While larger participation in the market finance leads to smaller banking sectors (Diamond, 1997), banks and stock markets tend to develop together (Demirgüç-Kunt and Levine, 1996). Rajan and Zingales (2003) suggest that more market-oriented financing system should be beneficial in Europe. Smaller firms are more likely to obtain larger share of alternative informal finance (Beck, Demirgüç-Kunt, and Maksimovic, 2008). It is unclear how the stages of credit constraints depend on the availability of non-bank competition and market finance. I conduct analyses to estimate the moderating effect of alternative finance on the occurrence of credit constraints.

Literature on credit constraints is based mainly on the analysis of credit rejections. However, this measure underestimates the full extent of credit constraints (Brown et al., 2011; Cavalluzzo and Wolken, 2005; Cole, 2008; Cox and Jappelli, 1993; Léon, 2014; Popov and Udell, 2012). Observed loan applicants may consist of a systematically truncated subsample of all firms, which results into biased estimates. In other words, in a full sample, a discouraged borrower and a borrower that does not need a loan are observationally identical. Empirical evidence shows that discouragement represents a sizeable component of credit constraints, but the level of discouragement varies across economies (Brown et al., 2011; Ongena et al., 2013; Popov and Udell, 2012; Popov, 2013). While the literature establishes discouragement as the first stage of credit constraints and rejection as the second stage, there is little evidence about loan terms. I introduce the third stage of credit constraints, which corresponds to the occurrence of unfavorable terms. Borrowers whose application is approved, but who receive unfavorable terms are effectively credit constrained. With an unsatisfied loan demand these borrowers cannot fully undertake their intended investment projects. Without accounting for the third stage of credit constraints, borrowers with unfavorable terms are observationally identical to approved borrowers.

3.3 Data and empirical strategy

3.3.1 Data sources

The empirical strategy is based on a sample of 58,845 semi-annual observations of firms located in 14 Euro area countries in the period 2009-2013. The data comes from two main sources.

First, ECB SAFE (Survey on the access to finance of enterprises) contains firm-level micro-data on SME access to finance. The survey covers mainly micro, small, and medium-sized enterprises, but also includes large firms to facilitate comparison among the size groups. The firms are selected randomly from Dun & Bradstreet database. The selection is stratified by firm size, economic activity, and country. Data is collected at semi-annual frequency (ECB, 2014a).

Second, ECB BLS (Bank lending survey) contains country-level data on Euro area bank lending standards, factors that affect the bank lending standards, and supply and demand conditions in the credit markets. The survey is addressed to senior loan officers and covers a representative sample of approximately 90-140 banks from all Euro area countries (ECB, 2014b). Data from the survey is available as diffusion indices collected at a quarterly frequency. The diffusion index values are aggregated across the banks per each country. The following Euro area countries are not available in the dataset: Belgium, Greece, and Finland. I merge the firm level data from ECB SAFE dataset with the ECB BLS. Further data on country-level banking sector and economic environment come from the World Bank Global Financial Development Database and other sources as indicated in the Appendix, Table A3.1.

3.3.2 Main variables

This study focuses on credit constraints related to bank loans (both new loans and renewals). It does not include credit lines or overdrafts. The main dependent variable consists of the three conditional stages of credit constraints. Each stage is represented by a binary variable, which takes the value of 1 if a firm is constrained, 0 otherwise.

The first stage of credit constraints represents discouraged lending. A firm is discouraged if it needs a loan, but does not apply because of a possible rejection. For a firm that has to forego a profitable investment, the discouraged lending corresponds to an effective credit constraint. A firm is considered to be in need of a loan if it does not belong to a group of firms that do not apply because of sufficient internal funds or for other reasons. The survey

does not provide further information about the latter group of firms (0.9% of all observation) and the reasons why these firms do not apply. Using a consistency check of credit constraints across various credit instruments, I confirm that these firms are not likely to be constrained. Unlike credit constrained firms, there is no significant relationship with the stages of credit constraints of other credit instruments.

The second stage, loan rejection, occurs if a firm needs a loan, submits a loan application, and a bank declines the application.

Finally, the third stage represents unfavorable terms of an approved loan application. There are two possible outcomes from the loan approval: a) a firm obtains favorable terms (a firm obtains 75% or more of the requested amount and accepts the loan terms and conditions); b) a firm obtains unfavorable terms. In the latter case, the survey provides information on two possible outcomes. Either a firm obtains only a limited part of the loan amount requested (up to 74% of the requested amount), or a firm refuses the loan because of unacceptable cost or terms. There is a slight semantic nuance in these two outcomes. According to the survey design, it is implied that a firm with insufficient loan amount accepts the loan, whereas a firm with high cost refuses the loan. In both cases these firms are considered credit constrained in the third stage. There are two situations that do not fall into this category. First, a firm that accepts the loan in spite of the unfavorable terms is not considered credit constrained because the acceptance of the terms implies a rational decision of a firm that the terms are acceptable. Second, a firm that refuses the loan due to an insufficient loan amount is not observed, however, it may belong to a small group of non-applicable responses that represent less than 1% of observations in the third stage. These two cases are not expected to have an influence on the overall outcome. All three stages document firms' bank loan experience within the past 6 months. I exclude observations where the outcome from the lending stage is not applicable or is invalid. Figure 3.1 depicts the conditional stages of credit constraints.

To explain the variation of the stages of credit constraints across countries, I use three sets of explanatory variables: firm, bank, and country-characteristics. The firm-level data allows me to observe indicators that reflect the extent of the information asymmetries, firm risk, economic activity of firms, and their credit demand. I separate the firm-level credit demand factors from the bank loan supply factors.

The firm-level explanatory variables include the number of employees, age, annual turnover, industry, ownership, gender of the owner/director, and individual firm outlook. Firm size is related to the information asymmetries and higher obstacles in accessing credit. Although the sample consists mainly of SMEs with up to 250 employees, there are marked

differences within this size classification. I control for firm age as a proxy for the information asymmetries and the availability of public information about a firm. Annual turnover is a proxy for the current activity of a firm, whereas ownership status reflects the differences in the legal forms and their implications for financial contracting. Limited liability protection, or the absence of it, influences the implicit collateralization of bank financing, which affects credit access. Gender of the owner or director controls for the unobserved firm heterogeneity related to the gender gap in SME financing. Overall credit risk of a firm is measured by the change in credit history over the past 6 months. All firm characteristics are measured as categorical variables.

The bank-level supply-side factors are represented by bank lending standards. ECB (2014b) defines bank lending standards as "the internal guidelines or criteria which reflect a bank's loan policy". Bank lending standards encompass lending terms and conditions, as well as written and unwritten practices and criteria for granting a loan. In the empirical analyses I implement three sets of bank lending standards. First, I examine the overall indicator of bank lending standards as a measure of change in the tightness of bank policies for granting loans. Second, I decompose bank lending standards by loan terms into interest margins, loan size, maturity, collateral, covenants, and non-interest margins. Third, I check the variation in bank lending standards due to the availability and accessibility of non-bank finance for firms and banks. Bank lending standards are set by banks and are measured as diffusion indices at the country-level. Diffusion indices are derived from the survey questions that use a 5-point scale to estimate the extent of a change in the standards from "tightened considerably" to "eased considerably". Each observation covers the period over the past 6 months (I aggregate the observations over the two quarters).

A limitation in using diffusion indices is that there is no reference level. This limitation affects the interpretation of results. Instead of estimating the effect of different levels of bank lending standards, I can estimate the marginal effect of the relative differences in changes in bank lending standards (e.g. an increase in lending standards in Germany vs. a decrease in France). In my empirical analyses I interpret bank lending standards in their literal sense. Van der Veer and Hoeberichts (2013) propose a solution to estimate the level of lending standards, but the solution is de-based to a unitless scale within a country. This means that it is less applicable in a cross-country context. Another concern is raised by Del Giovane et al. (2011) who note that questions in the survey collect data about a change in a degree of tightness to some (undefined) benchmark in a preceding period, but not specifically about a change in lending standards relative to a specific point in time or benchmark in the previous period. This

might influence longitudinal analyses, but in my empirical setting I do not analyze the time dimension and, instead, exploit the cross-sectional variation in the relative changes in lending standards.

Finally, I use the country-level variables to control for the heterogeneity of banking sectors and economic environments across countries. Bank concentration is used as a proxy of the competitiveness of a banking sector. I measure bank concentration by assets of the three largest commercial banks relative to total commercial banking assets. I test alternative proxies for bank competition and market power in the robustness checks. Bank z-score and bank returns on assets approximate the strength of a banking sector in an economy. I measure the efficiency of a banking segment by net interest margin (efficiency of financial intermediation) and by bank overhead costs over total assets (efficiency of bank operations).

I model the differences in economic environments by the development of the financial system (share of private credit to GDP, stock market capitalization), expected aggregate credit demand (expected economic activity), legal system and property rights (overall property rights index), information environment (credit information depth index), regulation (composite business regulation index), and macro-economic environment (level of GDP, inflation).

3.3.3 Empirical strategy

The aim of the empirical strategy is to investigate the occurrence of the conditional stages of credit constraints. My empirical analysis proceeds in two steps. First, I quantify the prevalence of the stages of credit constraints across countries. Next, I explain their occurrence in a multivariate setting. I focus on the role of bank lending standards and investigate the transmission mechanisms through which bank lending standards affect the occurrence of credit constraints in each conditional stage.

In the empirical setup I address two econometric issues. First, the process of loan granting consists of sequential selection steps. In each stage, the sample is a non-random sub-sample from the previous step (e.g. the sample of firms that need a loan is a non-random sub-sample of all firms; the sample of firms that apply for a loan is a non-random sub-sample of those firms that need a loan, etc.). This is the case of an incidental truncation (Greene, 2003), which may lead to a bias due to some underlying systematic factors that drive the sample selection at each stage. To address this issue, I implement the Heckman procedure (Heckman, 1979). A good identification requires at least one exclusion restriction at each stage. At the first stage (discouraged lending), the exclusion restriction should affect the need for a loan directly,

but only indirectly affect the decision of a firm to apply. As the exclusion restriction I use the firm's changes in the *need for fixed investment*. I assume that firms base their need for fixed investments primarily by their business operations. It is not likely that the firm's loan application would drive the need for fixed investment. At the second stage (rejection), the exclusion restriction should directly affect the firm's decision to apply, but only indirectly affect the bank's decision to approve a loan. For the identification I use *regulation index*. Higher obstacles to business operations in the form of more burdensome regulation might negatively influence the decision of a firm to apply for a loan. However, a bank is not likely to base its decision to approve the loan directly on the level of regulation. Finally, at the third stage (unfavorable terms), the exclusion restriction should directly affect the bank's loan terms, but only indirectly affect the firm's decision to accept unfavorable terms or refuse a loan. At this stage the exclusion restriction is *bank overhead costs / total assets*. The level of bank efficiency is likely to influence the loan terms or the quality of the bank services, but this information does not seem to be the primary reason for firms to accept the loan terms.

A related concern is that the changes in bank lending standards may be endogenously determined with the credit demand. For example, given a limited funding liquidity of a bank, an increase in lending standards might be determined by an increase in the existing or expected credit demand. Although this pattern is not present in the sample, I assert that there is a causal link between lending standards and credit constraints. In fact, the purpose of lending standards is to define the terms, conditions, and rules that directly affect the decision of a bank to approve a loan. Accordingly, the relationship is causal. Alternatively, it is possible that there is a feedback effect between lending standards and lending outcomes. If lending standards are not effective in achieving their goals (as observed by lending outcomes), banks may respond to this situation by changing their lending standards. Even though such relationship is sequential, in this case the bank lending standards are not fully independent from the lending outcomes within a given time period. The solution lies in isolating the endogenous component of the credit demand effect. Since the credit demand overlaps with the need for a loan, the common underlying problem is the same as in the sample selection bias in the first step and the endogeneity of the relationship is rooted in the same latent variables that drive the sample selection.

The second econometric issue relates to the distinction between the credit supply effect, credit demand effect, and the repricing of credit risk. The composition of borrowers and the demand for various financing instruments varies with the business cycle. Further, in economic downturns, agency costs of firms and banks increase at the same time (Gertler and Gilchrist,

1994; Popov, 2013), leading to time-varying risk premia. To address this issue I include in the model separate firm-level factors of credit demand and credit supply composition, bank lending standards, as well as country-level indicators of the economic activity.

The dataset does not allow for matching banks with firms. This means that I cannot analyze separately the effect of bank relationships and bank characteristics that are specific to the bank-firm relationships. Taking this limitation into account, the empirical findings can be interpreted at the aggregate country level.

I estimate the results with probit models where the dependent variable is the stage of credit constraint. All models are estimated with the industry and year-fixed effects. I report the results using robust standard errors. The findings are consistent when I use standard errors clustered at the country level. However, because the number of clusters is low and the observations within the clusters are unbalanced, these estimates are likely to be less efficient.

3.4 Empirical results

3.4.1 Cross-country evidence on credit constraints

In the first step of the empirical analysis I estimate the prevalence and the composition of credit constraints. Figure 3.2 provides an overview of the absolute and relative levels across countries. The figure shows a large variation in the 14 Euro area economies. While in Malta and Austria, around 5% of all firms are credit constrained, in Ireland and Spain the figure reaches, respectively, 19% and 16% of all firms in the sample. In most countries, discouragement is the most important component of the overall credit constraints. On average, the discouragement proportion is about twice as large as rejections and unfavorable terms combined.

The sample period 2009-2013 spans the financial crisis and the European sovereign debt crisis. The developments in credit markets in this period are marked by policy measures aimed at the economic recovery and the mobilization of credit. Figure 3.3 shows the development of the stages of credit constraints over time. It also shows the changes in bank lending standards and the demand for loans. Throughout the whole period, banks constantly tightened their bank lending standards, whereas the demand for loans declined on average. The contrast is particularly apparent in the crisis year 2009. These developments are likely related to the macro-economic conditions and the policy measures, which motivated banks to decrease their risk exposure amidst the declining credit demand (Wehinger, 2013). The composition of credit constraints remained relatively stable over time with the exception of year 2009, when

rejection rates increased and unfavorable terms decreased. The overall level of credit constraints remained at around 10%. The figure documents the importance of separating credit demand and supply factors. For example, high level of rejections may be a manifestation of low credit supply, or high demand. In 2009, the effect is likely to be supply-driven. The figure also shows that the changes in bank lending standards are not positively correlated with the changes in the credit demand.

Figures 3.2 and 3.3 raise a number of questions, which I address in the subsequent analyses. What drives the large cross-country variance? How do the credit demand and supply factors influence the outcome, and how do the institutions and the structure of the financial markets affect the occurrence of credit constraints?

Table 3.1 presents the summary statistics of the main variables. Firms included in the survey are mainly SMEs. 90% of all firms have less than 250 employees, and 70% report up to €10 million in annual turnover. A stylized typical company in the sample is a private, family-owned small firm with around 30 employees, and older than 10 years. During the sample period, most firms reported neutral or negative economic outlook, but at the same time, their credit history improved or remained unchanged.

The country-level summary statistics, reported in Table 3.1, Panel B, show that the average level of credit constraints is 11%, but a large variation exists (standard deviation of 32%). On an unconditional basis, the overall constraints consist of 5.9% discouragement, 2.8% rejections, and 2.7% unfavorable terms. Bank lending standards increased on average during the sample period, especially for long-term loans. For this asset class, the bank lending standards increased by 76% more compared to short-term loans. Banks tightened all components of the lending standards, with the most tightening occurring (in the order of magnitude) in the interest margins, collateral, and maturity. Lowest increase is reported for the non-interest margins and covenants. While the changes in bank capital positions contributed most to the increase in the lending standards, bank competition was the only supply-side factor that helped to loosen the overall lending standards. Regarding the landscape of the banking sector, the three largest commercial banks accounted for 70% of all bank assets across the countries (ranging from 30% in Luxembourg to 99.64% in Estonia). The banks made a small loss of -0.02% ROA throughout the period, but held a moderately optimistic outlook on the expected economic activity. On average, the banks charged net interest margin of 1.34% and maintained bank z-score at 14.48.

Table 3.2 breaks down the aggregate level and the composition of credit constraints by countries. The table distinguishes between the unconditional and conditional relative

frequencies. The former measure reports the ratio of constrained firms relative to all firms, the latter one takes into account the conditionality of the stages of credit constraints. Highest levels of discouragement are reported in Ireland and the Netherlands where, respectively, 46% and 40% of firms needing a loan are discouraged from applying. There is a large variation across the countries in the prevalence of rejections and unfavorable terms. The relative outcome depends on the conditionality of the measurement. 26% of firms that apply are rejected in Estonia and 22% in the Netherlands, compared to only 1.5% in Luxembourg and 2% in Malta. Of all approved firms, 22% receive unfavorable terms on average, but the figure is significantly lower in France where only 6% of approved firms obtain unfavorable terms. Clearly, there is a considerable heterogeneity across countries in terms of the firm risk, the structure and the development of the economic environments and banking sectors. In addition, there are regional differences in the propensity of firms to apply for loans and the conditional likelihood of banks to approve the applications or to offer favorable loan terms. Hence, taking into account the conditionality of credit constraints in all three stages increases the accuracy of the estimated true credit constraints.

To gain further insights on the firm-level relationship between the firm risk and the stages of the credit constraints, I sort firms into 4 groups by annual turnover and plot the distribution of firms against the stages of credit constraints (Figure 3.4). The distribution represents a relative proportion of credit constraints by country. I select the annual turnover because it contains information about the firm size, risk, and the economic activity. The figure shows that the stages of credit constraints are related to the firm turnover, but the relationship depends on the stage of credit constraints. There is an inverse relationship between the firm turnover and the relative level of discouragement. Smaller and more risky borrowers are more likely to be discouraged. On the other hand, the relationship is opposite in the third stage, as larger borrowers are more likely to obtain less favorable terms, mainly lower loan amount than requested. Rejection rates are relatively constant across the levels of annual turnover, but in some countries larger companies experience more rejections. The figure documents that firm characteristics are important in explaining the cross-sectional variation in credit constraints, but the analyses need to distinguish among the individual stages in order to estimate more precisely the direction and the size of the effect.

3.4.2 Differential determinants of the stages of credit constraints

In this section I explain the occurrence of the stages of credit constraints in a multivariate setting. The main goal of the following analyses is to disentangle the differential effect of the key determinants on the individual stages. Table 3.3 reports the baseline results. In models (1-3) the dependent variable is a binary indicator corresponding to each stage. In models (4-5) I break down the third stage, unfavorable terms, into two outcomes: either the amount of a loan is insufficient, or the cost of a loan is too high. All of the model specifications correct for the sample selection bias. The first stage function of the sample selection correction estimates the loan demand. In the subsequent stages the procedure uses recursively the inverse Mills ratios from the previous steps.

I find that credit constraints vary with the firm, bank, and country characteristics, but the direction and the magnitude of the effect depends on the stage of credit constraints. Firm characteristics explain a large portion of the overall variation. Firms with negative changes in credit history over the past 6 months are more likely to be discouraged or rejected. This implies that banks screen applicants using the information in credit history records and that borrowers anticipate this screening. Another significant factor is the individual firm outlook. This variable is a joint proxy for the firm risk and business prospects. As the firm outlook deteriorates, a firm is more discouraged or rejected. Interestingly, firms with negative changes in both, credit history and firm outlook, are less likely to obtain unfavorable terms. It is possible that this effect arises due to the role of lending relationships (or the banks' expertise in borrower screening) if banks collect more private information in the presence of more hard information that is available through credit history records. Relationship lenders may further support borrowers throughout the business cycle by inter-temporal smoothing of the loan terms. Another possibility is that discouragement in the first stage eliminates some borrowers that would otherwise qualify for favorable terms in the third stage. Conversely, lower discouragement may induce adverse selection in the second stage as low quality borrowers attempt to pool with high quality borrowers. Smaller firms, measured both by the number of employees and by the annual turnover, are more likely to be discouraged or rejected, but high turnover firms tend to obtain an insufficient amount if they are approved. This is likely because these firms also request larger loan amounts whereas banks might not have sufficient funding capacity or are not willing to provide sufficiently large loans. The results also indicate a potential existence of the hold-up problem. Assuming that the firm age correlates with the length of a lending relationship, young firms are less discouraged or rejected, but older firms obtain less favorable terms. The relationship appears to follow an upward sloping concave

curve. The contrast is greatest between the group of the youngest firms (up to 2 year old) and medium-aged firms (2-5 years), but less pronounced for the older group of firms relative to the medium-aged firms. Firm ownership is not significant, but there is an indication that female owners/directors tend to be more discouraged.

On the supply side, I find that an increase in bank lending standards is related to more discouraged borrowers and higher rejection rates. However, approved borrowers are less likely to obtain unfavorable terms. This effect is mainly due to a larger loan volume, rather than a lower cost of loans or more favorable other terms and conditions. Lower credit constraints in the second and the third stage are observed in countries with less risky banking systems (higher bank z-score), and in countries with an optimistic economic outlook and lower interest margins. Firms are more likely to be discouraged when the stock market capitalization is high, suggesting that there might be a substitution effect between the bank and the market finance. Further analyses below reveal that this relationship is more complex and depends on the source and the uses of market finance. Regarding the information environment, the results indicate that greater scope of information in credit registries is associated with higher discouragement and higher cost of loans. This finding raises two conjectures. On the one hand, deep credit information reduces the adverse selection in the first stage since lower quality borrowers do not apply if they are aware of their poor credit record. On the other hand, the existence of detailed credit information may lead to banks' over-reliance on hard information, resulting in relatively more costly loans in countries where credit information is deep and available, as opposed to countries where banks rely more on their private information. As a proxy for the financial system development I use private credit to GDP. This proxy also reflects the supply of credit in the market. Surprisingly, there is no evidence that the amount of private credit relative to GDP is related to any of the stages of credit constraints.

Overall, I find that higher discouragement and rejection rates are associated with higher firm risk, tighter lending standards, and weaker banking sectors. Discouragement and rejections generally show similar patterns. This is likely because banks are effective in screening borrowers and, at the same time, borrowers correctly anticipate the screening outcome. Conditional on the approval, borrowers obtain more favorable terms, mainly higher loan volume, when lending standards are high. These findings point to a possibility of an inefficient lending. The inefficiency arises from the frictions in the conditional progression through the stages of the loan application process. The logic is as follows. For a marginal increase in lending standards, banks tend to reject more borrowers, but approved borrowers obtain larger loans. If banks realize the changes in their lending policies through loan rejections

rather than loan terms, they may exclude from lending some borrowers that would otherwise qualify for a loan. In this sense, banks substitute higher rejection rates in the second stage for higher loan volume in the third stage. In addition, higher lending standards (and rejections) are associated with higher discouragement in the first stage, further exacerbating the problem. This process might lead to a distorted loan allocation. As a counterfactual, a more efficient outcome would be a non-significant or positive relationship between the tightness of lending standards and the occurrence of unfavorable terms (as measured by the loan volume or the cost of a loan). Such result would indicate that, for a given level of bank risk aversion, banks reject an optimal level of borrowers (non-significant outcome), or that banks adjust their lending terms in line with their lending standards (significant positive coefficient). It is also possible that the result is optimal for banks as they internalize the screening and the information production costs by creating economies of scale in the loan application process. In such case banks may prefer to approve a smaller number of larger and higher quality borrowers as opposed to a larger number of smaller and more risky borrowers.

To investigate further the role of bank lending standards, I decompose the lending standards by individual loan terms. The loan terms in the sample are interest margins, loan size, maturity, collateral, covenants, and non-interest margins. The purpose of this analysis is to examine how the loan terms relate to the stages of credit constraints and to examine the transmission channels through which banks implement the changes in their lending policies.

Table 3.4 shows that the transmission effect operates mainly through the collateral requirements and covenants. The two components have opposing sign across the stages. This finding is in line with the borrower signaling. If collateral requirements increase, low-quality borrowers are less likely to pool with high-quality borrowers. Consequently, a lower number of borrowers apply for a loan and borrowers that do apply are less likely to be rejected. However, approved borrowers are more likely to obtain insufficient loan amount. It is possible that this outcome is due to differing views between lenders and borrowers on the value of collateral or the firm risk. Unfortunately, this information is not observed in the survey. In contrast, the effect of covenants operates in the opposite direction. Higher covenants lead to more discouragement and rejection, but post-approval, higher covenants are related to lower likelihood of unfavorable terms. Borrowers are further more discouraged in the presence of tighter lending standards for obtaining loans with longer maturity. Surprisingly, there is no significant relationship between the changes in the interest margins and the occurrence of credit constraints. Controlling for the changes in loan size, I find that the loan size is negatively related to the occurrence of unfavorable terms (both in terms of the insufficient amount and the high

cost of a loan), implying that banks may be trading-off stricter lending standards for larger loans with lower cost.

This analysis suggests that collateral requirements and covenants are the main factors that influence, in the opposing directions, the occurrence of credit constraints in all three stages. I find consistent results using nested models and including one loan term at a time. One concern is that loan terms and lending outcomes are determined simultaneously. While studies on this topic report mixed findings (Brick and Palia, 2007; Dennis et al., 2000), banking practice documents that the process of loan term determination is in fact sequential (Bharath et al., 2009; Kirschenmann and Norden, 2012; Standard & Poor's, 2011).

3.4.3 Do credit constraints exist at the borrower level or at the loan level?

Bank loans represent one of several credit instruments available to a firm. Accordingly, a firm that needs external finance may choose to apply for different credit instruments or adjust its financing mix in response to various factors specific to a given instrument. It is not clear whether credit constraints are specific to a credit instrument or whether they exist at the firm-level consistently across different credit instruments. In the latter case, analyzing credit constraints in the context of bank loans would have limited interpretation. The following analysis investigates the boundaries of credit constraints by checking the consistency of credit constraints across 4 credit instruments: bank loans, credit lines, trade credit, and other loans, including loans from friends, family, or other company.

Further, I examine the consistency of bank lending policies. Bank lending standards may affect borrowers' choices of credit instruments. If credit constraints arise at the loan level independently from other credit instruments, then bank lending standards will have a differential impact on the occurrence of credit constraint in relation to a particular credit instrument. In contrast, if credit constraints arise at the borrower level, bank lending standards will have joint effect on the stages of credit constraints of other instruments.

To address these questions, I analyze the relationships among the stages of credit constraints of all types of credit instruments. Table 3.5 shows that the stages of credit constraints are strongly related at each stage, signifying that credit constraints exist at the firm level. The results are reported in reference to firms that applied for a given credit instrument. Credit constraints of other instruments are consistently positively related to the bank loan credit constraints. The relationship holds at each stage. These results signify that the boundaries of credit constraints encompass the whole firm regardless of the credit instrument.

Further, firms and banks use consistent set of criteria in evaluating financing options and determining the lending outcomes. I also find an association between the stages of credit constraints across credit instruments. For example, firms with rejected credit line applications are more likely to be discouraged from applying for bank loans and vice versa. However, firms with rejected trade credit applications are more likely to apply for bank loans. The effect of bank lending standards remains significant in the second and the third stage, which suggests that there is a spillover effect. It is not significant at the discouragement stage. This result is in line with a notion that firms submit their loan application strategically according to the availability of other instruments. I confirm the robustness of the results using nested models.

While the previous analyses use backward-looking information about the credit availability, it is not known whether firms take into account the future outlook on financing availability. Controlling for the macro-economic environment, banks might react to the borrower expectations by adjusting future bank lending standards. The presence of strategic behavior from both firms and banks might obscure the true occurrence of credit constraints and the effect of bank lending standards. The following analysis examines the relationship between firm expectations of the financing availability and the stages of credit constraints. I include in the models the expectations of the availability of 7 sources of financing: bank loans, internal finance, credit line, trade credit, equity, debt securities, and other loans. I decompose lending standards into forward and backward looking values. The time horizon of the expectations are 6 months. While the actual loan application (or discouragement) is a manifestation of a firm's intent to obtain external finance, the underlying cause is the loan demand. In the following table I also report an estimation where the dependent variable is the categorical indicator of a change in the loan demand. Table 3.6 reports the results.

I do not find evidence that firms time strategically their loan demand or loan applications according to their expectations of future bank loan availability. Firms are more discouraged when they expect less bank loan availability in the future. They are even more discouraged when they expect an increase in bank lending standards. The results indicate that, at the application stage, firms trade-off bank loans with trade credit. If firms expect less availability of trade credit in the future, they are more likely to apply for a bank loan now. They are also more likely to apply if they do not have a credit line. Effects of the firm expectations are less pronounced at the bank application stage, likely because they are not observable by banks. However, there is an indication that firms that expect less future bank loan availability are more likely to be rejected, suggesting that negative firm expectations might contain information content about the firm quality. Conversely, firms are less likely to be rejected if

they do not use other credit instruments. As in the previous analysis, I check the robustness of the results with nested models.

3.4.4 Credit constraints and the availability of alternative finance

The presence of non-bank financing options might affect the occurrence of credit constraints and influence the transmission of bank lending standards. Greater availability of non-bank finance may reduce the overall financing constraints, but the relationship depends on a number of factors, such as the type and the composition of borrowers, risk levels, and strategic choices of borrowers and banks. In the following analysis I investigate the impact of non-bank financing options through the effect of changing bank lending standards. The main explanatory variables represent the variation in lending standards due to the changes in the availability of non-bank finance. I examine separately the effects of non-bank competition and the availability of market finance. Non-bank competition represents all non-bank financing options that compete with bank lending services. I further decompose the market financing options into two components. First, bank market finance represents the ability of a bank to obtain market financing. Second, firm market finance represents the availability of market financing to firms. Table 3.7 presents the results.

I find that firms are less discouraged from applying for a loan in countries with a relatively greater increase in non-bank competition. I do not observe a significant association between non-bank competition and the other stages of credit constraints. There is an opposing effect of bank market finance and firm market finance in the first and the second stage. Higher bank lending standards due to the availability of market financing are related to lower discouragement and lower rejection rates. I surmise that the effect is likely driven by the demand side. The availability of market financing might exert some disciplining effect on prospective borrowers or improve the bargaining position of borrowers vis-à-vis banks. In contrast, higher bank lending standards due to the ability of banks to obtain market finance are related to higher discouragement and higher rejection rates. This effect is likely driven by the supply-side since the ability of banks to obtain market financing facilitates larger loan volumes (lower likelihood of obtaining insufficient credit).

3.4.5 Tests of robustness

In this section I summarize additional empirical tests. First, I estimate the sensitivity of my results to the specification of the sample period. Within the available period, year 2009 is marked by an ongoing financial crisis. In all previous specifications I use time-fixed effects. In the additional tests, I separate the sample into observations from 2009 and post-2009 periods. I find that in the crisis year, the firm level factors are strongly associated with credit constraints. Borrowers are likely to be more discouraged in this period, but credit constraints in the second and the third stages do not exhibit significant relationship with lending standards. It is interesting to note, that the explanatory power of the model is higher in the crisis year, driven mainly by the firm-level characteristics.

In another set of tests, I examine the role of foreign banks. A large presence of foreign banks influences the occurrence of credit constraints through the differential effects of business models, tendencies to risk-taking in foreign markets, regulation and domestic supervision (Barth et al., 2004; Laeven and Levine, 2009; Ongena et al., 2013). If the regulation in a foreign bank's home country is strict, a bank might have incentives to increase its risk exposure by lowering lending standards abroad. The sample does not allow matching data on individual foreign banks that operate in a particular market, but I can observe the aggregate effect of all foreign banks in a country. Controlling for the foreign bank presence (as a percentage of all bank assets), I do not find a differential effect of foreign banks. Holding the other factors fixed, the effect of lending standards on credit constraints is consistent regardless of the structure of the banking sector by bank origin. In addition, I find that larger presence of foreign banks is associated with relatively higher discouragement.

I further examine whether foreign banks apply differential lending standards by including interaction terms for foreign bank assets and lending standards. I find that borrowers in countries with more foreign banks and higher lending standards are associated with less likelihood of unfavorable terms, and borrowers in these countries obtain larger credit volume. Because foreign banks might be less likely to lend to small local borrowers (Berger et al., 2001), I estimate the models with two-way interactions between the foreign ownership, lending standards, and firm size. I find that, relative to large firms, smaller firms with 10-50 employees are more likely to obtain unfavorable terms in countries with higher presence of foreign banks, but this effect is reversed if bank lending standards are high.

Since the credit constraints boundaries encompass the whole firm, as shown above, I test the spillover effect of bank lending standards across credit instruments. I estimate whether

lending standards influence the outcomes of the stages of credit constraints, particularly for credit lines and trade credit. I find positive relationship between the lending standards and the first and the second stage of credit constraints for trade credit. For credit lines the relationship holds for the first stage. These results suggest that bank lending standards implemented for bank loans spill over to credit lines and trade credit through discouragement and rejections, but do not affect the loan terms applied for other instruments.

I conduct additional analyses to study the robustness of the results to alternative definitions of country-level proxies. Specifically, I estimate the models by using alternative proxies for bank concentration (Lerner index, H-statistic), bank efficiency (bank cost to income ratio), bank interest margins (bank lending-deposit spread), market capitalization (turnover ratio), legal system and property rights (rule of law index), banking system development (bank deposits to GDP). I confirm the main findings using these alternative variables.

3.5 Conclusion

In this paper I investigate the conditional nature of credit constraints in a cross-country context. Credit constraints occur in sequential, conditional stages. I define three stages of credit constraints: discouragement, rejection, and unfavorable terms. I estimate the prevalence of credit constraints at each stage and examine whether and how the likelihood of the occurrence depends on firm, bank, and country characteristics. I base the analysis on micro-data of over 58,000 SMEs in the Euro area in the period 2009-2013.

My main findings reveal the differential effects of the key determinants on the likelihood of the occurrence of credit constraints.

First, I find that credit constraints vary with the firm, bank, and country characteristics, but the direction and the magnitude of the effect depends on the stage of credit constraints. Firms are more likely to be discouraged or rejected if they are smaller, more risky, or if they are based in the economies where the banking sector is more risky. Discouragement and rejection rates are higher if bank lending standards are high, but conditional on approval, borrowers are less likely to obtain unfavorable loan terms. The effect is mainly due to a higher loan volume, but not due to a lower cost of bank loans. I show evidence that the transmission channel of bank lending standards to credit constraints operates mainly through collateral requirements and covenants.

Second, I analyze the boundaries of credit constraints. I find that credit constraints exist at the firm level and are consistent across various credit instruments. The individual stages of credit constraints are strongly related to the stages of credit constraints reported for other credit instruments. Bank lending standards applied for bank loans tend to spill over to other credit instruments.

Third, I document that the availability of market financing for firms is associated with lower discouragement and rejections while the ability of banks to access market finance is associated with higher loan volume for approved borrowers. There is a limited evidence that borrowers behave strategically in response to the expectations of the availability of finance in time and across credit instruments.

This study has important implications for banks, firms, and policymakers. In the conditional framework of credit constraints, I document more fully the extent of credit constraints. To put the problem in perspective, in countries with the highest levels of credit constraints, 40% or more of SMEs are discouraged from applying for bank loans even though they need credit. In these economies, even if firms do apply, 20% are rejected and of those that are approved, 20% obtain unfavorable terms. These numbers represent a significant portion of the productive economy. As a result, credit constraints lead to a large loss of the economic output and welfare. I show that there is a more complex relationship among the key determinants and credit constraints within and across the conditional stages. I find that the direction of the key determinants depends on the stage of credit constraints. Not accounting for these relationships might have ramification for the credit availability and loan allocation. For instance, bank lending policies aimed at increasing credit availability by reducing rejection rates might create unintended consequences of increasing the occurrence of unfavorable terms. Because credit constraints exist at the firm level, strategies aimed at promoting availability of a specific credit instrument need to be formulated in context of other credit instruments. This study opens questions about the marginal effect that the changes of bank lending policies have on the efficiency of loan provision. If banks that increase lending standards substitute higher rejection rates with higher loan volumes, the overall effect might result into the lower credit availability to smaller and more risky borrowers and a potentially distorted loan allocation. The paper also shows how the structure of the financial markets and the availability of other financing instruments interacts with the bank loan provision and the occurrence of credit constraints.

3.6 Appendix

Table A3.1 Definitions of variables

Variable name	Definition	Source
Dependent variables	Credit constraints in this study relate to bank loans (new loans or renewals, excluding overdrafts and credit lines), measured at semi-annual intervals	
Discouraged	Dummy variable, equals 1 if a firm needs a bank loan but does not apply due to a possible rejection	SAFE
Rejected	Dummy variable, equals 1 if a firm applies for a bank loan but is rejected	SAFE
Unfavorable terms	Dummy variable, equals 1 if a firm applies for a bank loan but obtains only up to 74% of the requested amount (indicated in the analysis as 'small amount', or refused the bank loan due to the high cost (indicated in the analysis as 'high cost')	SAFE
Loan demand	Dummy variable, equals 1 if a firm applies for a bank loan or is discouraged	SAFE
Bank lending standards	All variables related to lending standards are measured as diffusion indices at a country level. The measurements are quarterly backward-looking estimates of changes aggregated over the semi-annual intervals. The values have theoretical maximum range (-200, +200). The indices are equal-weighted at a bank level, except for France, Malta, and Slovakia, where the indices are weighted by bank size. The diffusion index is defined as the difference between the weighted sum of the percentages of banks that respond "tightened considerably" and "tightened somewhat", and the weighted sum of the percentages of banks that respond "eased considerably" and "eased somewhat". The diffusion index is weighted according to the intensity of the response, giving lenders that answer "considerably" a weight twice as high (score of 1) relative to lenders that answer "somewhat" (score of 0.5) (ECB, 2014b)	
Bank lending standards	Bank's guidelines and criteria regarding the provision of credit. (ECB, 2014b) defines the bank lending standards as the written and unwritten criteria, or other practices related to this policy, which define the types of loan a bank considers desirable and undesirable, the designated geographic priorities, the collateral deemed acceptable and unacceptable, etc. In the survey, changes in written loan policies should be considered together with changes in their application.	BLS
Loan terms	Terms and conditions agreed upon by a lender and a borrower. In this analysis the terms consist of interest margins, loan size, maturity, collateral, covenants, and non-interest margins.	BLS
Non-bank factors affecting lending standards	Diffusion indices that measure changes in the impact of the availability of non-bank financing for banks, firms, or both. Non-banks are defined as non-monetary financial corporations, e.g. insurance corporations, pension funds, financial auxiliaries, and other financial intermediaries.	BLS
Firm characteristics	All firm characteristics are measured as categorical variables at semi-annual intervals	
Size	Size of the firm is measured by the number of employees (full-time or part-time). A firm must have at least 1 employee excluding the founders to be included in the survey. Categories: 1-9 employees; 10-49 employees; 50-249 employees; 250 or more employees	SAFE
Age	Number of years from the registration of the firm at the time of taking the survey. Categories: 10 years or more; 5-10 years; 2-5 years; less than 2 years	SAFE
Turnover	Annual turnover of a firm in the previous year in millions €. Categories: up to €2m; €2m-€10m; €10m-€50m; more than €50m	SAFE
Ownership	Majority owners of a firm. Categories: public shareholders (listed company); family or entrepreneurs; other firms or business associates; venture capital firms or business angels; a natural person (one person only); other; not reported	SAFE

Table A3.1 (continued)

Variable name	Definition	Source
Gender	Gender of a firm owner/director/CEO. Categories: male; female	SAFE
Firm outlook	Change in a firm-specific outlook over the past 6 months with respect to a firm's sales, profitability, or business plan with respect to the availability of external finance. Categories: improved; remained unchanged; deteriorated	SAFE
Credit history	Change in a firm's credit history over the past 6 months. Categories: improved; remained unchanged; deteriorated	SAFE
Banking sector	Variables of banking sector and economic environment are measured annually, unless indicated otherwise	
Bank concentration	Assets of three largest commercial banks as a share of total commercial banking assets. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets.	Bankscope (via GFDD)
Bank z-score	Probability of default of a country's commercial banking system. Z-score compares the buffer of a country's commercial banking system (capitalization and returns) with the volatility of those returns.	Bankscope (via GFDD)
Bank net interest margin	Accounting value of a bank's net interest revenue as a share of its average interest-bearing (total earning) assets.	Bankscope (via GFDD)
Bank ROA	Commercial banks' after-tax net income to yearly averaged total assets.	Bankscope (via GFDD)
Bank overhead costs	Bank overhead costs over total assets (%). Operating expenses of a bank as a share of the value of all assets held. Total assets include total earning assets, cash from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets.	Bankscope (via GFDD)
Economic environment		
Private credit/GDP	Private credit by deposit money banks and other financial institutions to GDP	International Financial Statistics, International Monetary Fund (via GFDD)
Stock market cap	Total value of all listed shares in a stock market as a percentage of GDP	Global Stock Markets Factbook and supplemental S&P data, Standard & Poor's (via GFDD)
ln(GDP)	Logarithm of gross domestic product in current prices in $. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates.	World Bank national accounts data, and OECD National Accounts data files. (via GFDD)
Expected economic activity	Diffusion index measuring the impact of expected economic activity on the supply of credit. The index is measured semi-annually.	BLS
Inflation	Annual growth rate of GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.	World Bank national accounts data
Property rights	Index of the protection of property rights, including financial assets on a continuous scale from 1 (low level of property protection) to 10.	World Economic Forum Global Competitiveness Report (via Economic Freedom of the World)

Table A3.1 (continued)

Variable name	Definition	Source
Credit info depth	Credit information depth index measures the rules affecting the scope, accessibility, and quality of credit information available through public or private credit registries. The index ranges from 0 to 6, with higher values indicating the availability of more credit information, from either a public registry or a private bureau, to facilitate lending decisions.	World Bank, Doing Business
Regulation index	Composite index of regulation consisting of credit, labor, and business regulation on a continuous scale from 1 (high regulation) to 10 (low regulation)	Economic Freedom of the World

3.7 Figures

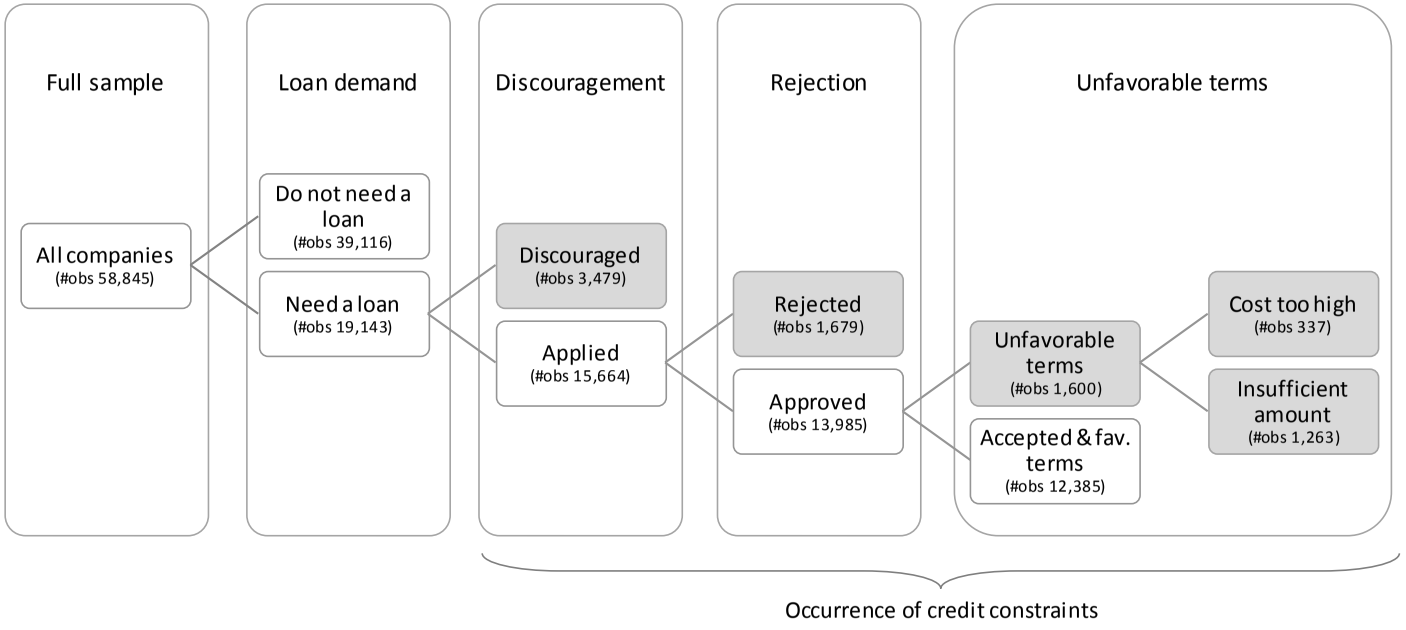


Figure 3.1 Sequential, conditional stages of credit constraints

This figure represents the sequential, conditional stages of credit constraints. Firms that do not need a loan include those firms that have sufficient internal funds or did not apply for other reasons. The definition of the rest of the variables is in the Appendix table A3.1. The differences in total number of observations are due to missing or invalid responses.

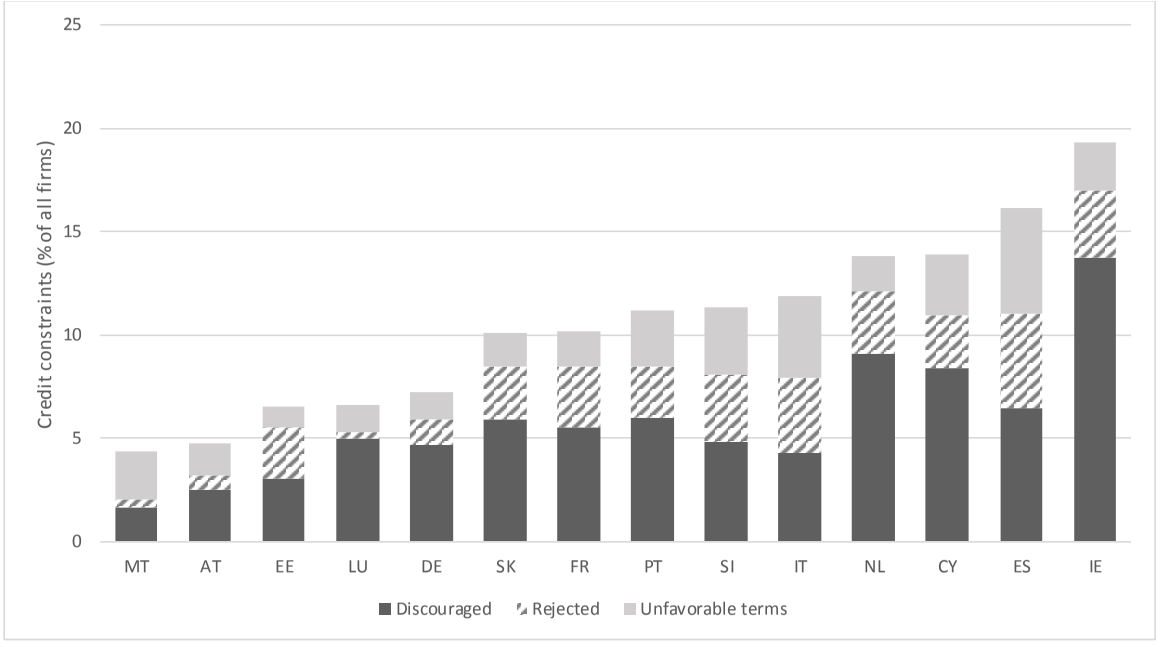


Figure 3.2 Stages of credit constraints across countries

This figure shows the overall credit constraints in the period 2009-2013 by country and the decomposition of the overall credit constraints into the three stages: discouragement, rejection, and the unfavorable terms. The values reported are unconditional and represent a percentage of observations that are constrained relative to all observations in a country. Countries: AT=Austria, CY=Cyprus, DE=Germany, EE=Estonia, ES=Spain, FR=France, IE=Ireland, IT=Italy, LU=Luxembourg, MT=Malta, NL=Netherlands, PT=Portugal, SI=Slovenia, SK=Slovakia.

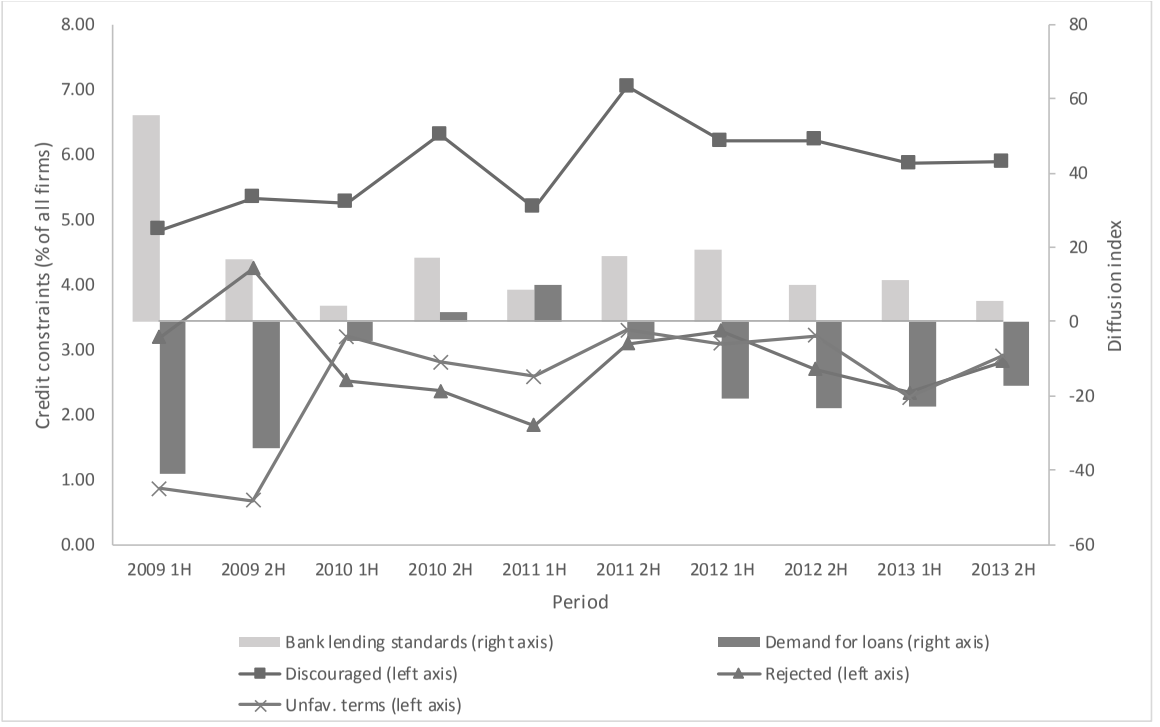
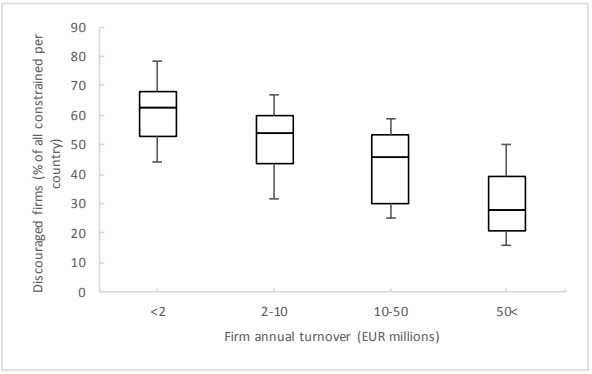


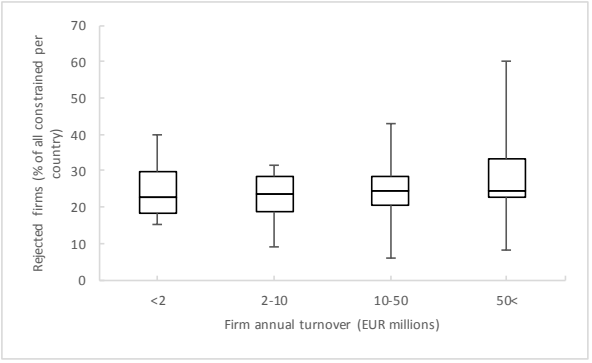
Figure 3.3 Credit constraints and bank lending over time

This figure shows unconditional credit constraints, changes in bank lending standards, and changes in credit demand over the period 2009-2013 aggregated over all countries in the sample. Bank lending standards and credit demand variables measure changes over the past 6 months.

Discouraged



Rejected



Unfavorable terms

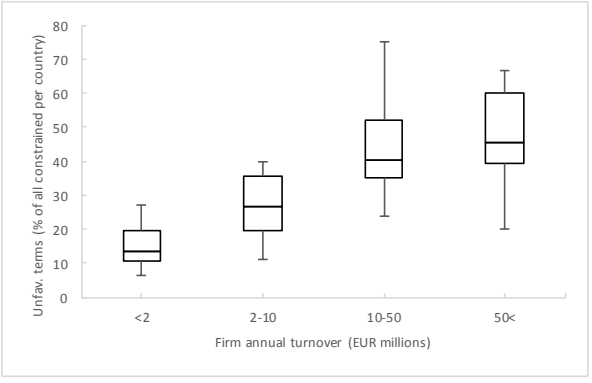


Figure 3.4 Stages of credit constraints by firm turnover

This figure shows the frequency distribution of observations by the stage of the credit constraints and firm annual turnover. The values are aggregated at the country level. The composition of the stages of credit constraints (left-axis) represents the proportion of credit constrained firms in a particular stage relative to all credit constrained firms per country.

3.8 Tables

Table 3.1 Summary statistics

This table represents the summary statistics. The values are based on the full sample of firms from 14 countries in the period 2009-2013. Firm characteristics in Panel A come from the ECB Survey on the Access to Finance of SMEs. Bank lending standards in Panel B come from the ECB Bank Lending Survey and are reported as diffusion indices.

Panel A. Firm characteristics (frequency distribution)

Size (# emp)		Age (years)		Turnover		Ownership		Gender		Industry		Firm		Credit	
1-9	19,117	10<	43,322	<2	27,190	Shareholders	2,167	M	45,714	Minin	14,209	+	11,628	+	12,329
10-49	18,955	5-10	7,620	2-10	14,896	Family/entre	28,597	F	6,713	Constr	5,680	0	27,149	0	34,820
50-250	15,811	2-5	4,174	10-50	10,251	Other firms	7,012	N/r	6,418	Manuf	14,004	-	16,957	-	8,449
250<	4,962	<2	1,241	50<	4,812	Venture cap.	615			Trade	19,990	N/r	3,111	N/r	3,247
		N/r	2,488	N/r	1,696	Nat. person	13,230			N/r	4,962				
						Other	1,092								
						N/r	592								
Total	58,845		58,845		58,845		53,305		58,845		58,845		58,845		58,845

Panel B. Country characteristics

	Obs	Mean	Std. Dev.	Min.	Max
Credit constraints					
Overall credit constraint	58,845	0.11	0.32	0	1
Discouraged	58,845	0.06	0.24	0	1
Rejected	15,664	0.03	0.17	0	1
Unfavorable terms	13,985	0.03	0.16	0	1
Bank lending standards					
Lending standards SMEs	59,013	16.46	27.94	-40	135
Lending standards LT loans	59,013	23.23	36.62	-40	190
Lending standards ST loans	59,013	13.19	26.48	-42	130
Overall Lending standards	59,013	18.41	30.53	-42	150
Loan supply terms					
Collateral	58,845	14.09	23.57	-32	140
Covenants	58,845	8.75	17.85	-32	120
Interest margins	58,845	20.11	34.26	-50	160
Maturity	58,845	13.31	25.03	-12	160
Non-interest margins	58,845	6.86	15.90	-25	110
Loan size	58,845	10.58	21.28	-20	130
Factors affecting lending					
Impact of bank competition	58,845	-4.11	10.88	-44	42
Capital position	58,845	13.29	24.91	0	130
Liquidity	58,845	6.88	24.44	-50	120
Non-bank competition	58,845	0.30	3.06	-10	30
Banking sector					
Bank concentration	34,006	70.10	10.01	29.74	99.64
Bank z-score	34,006	14.48	6.30	-0.005	35.77
Bank net interest margin	34,006	1.34	0.50	0.54	4.50
Bank overhead costs/total	34,006	1.14	0.36	0.26	2.55
Bank ROA	34,006	-0.02	0.85	-4.49	4.39
Country-level variables					
Private credit / GDP	34,006	147.48	47.75	48.18	284.62
Stock market capitalization	34,006	47.52	26.08	4.78	169.25
Log of GDP	34,006	27.83	1.13	22.82	28.91
Expected economic activity	58,845	26.01	33.23	-15.14	160
Inflation	46,030	1.73	1.17	-4.48	4.98
Protection of property rights	46,030	7.18	1.11	5.10	8.70
Regulation index	46,030	6.94	0.38	5.4	7.8
Depth of credit information	58,645	5.00	0.82	0.00	6.00

Table 3.2 Stages of credit constraints across countries

This table reports the decomposition of the stages of credit constraints by countries. Unconditional relative frequencies represent the proportion of credit constrained firms to all firms. Conditional frequencies represent the proportion of credit constrained firms relative to the conditional sample from the previous stage as follows: (discouraged|need a loan), (rejected|applied), (unfavorable terms|approved loan application). Countries: AT=Austria, CY=Cyprus, DE=Germany, EE=Estonia, ES=Spain, FR=France, IE=Ireland, IT=Italy, LU=Luxembourg, MT=Malta, NL=Netherlands, PT=Portugal, SI=Slovenia, SK=Slovakia.

		Credit constraints												
		# of firms						Unconditional relative frequencies (%)				Conditional relative frequencies (%)		
Country	All firms	Need credit	Disc.	Applied	Appr.	Rej.	Unfav. terms	Disc.	Rej.	Unfav. terms	Total	Disc.	Rej.	Unfav. terms
AT	4,136	1,031	104	927	853	27	64	2.51	0.65	1.55	4.71	10.09	2.91	7.50
CY	310	98	26	72	55	8	9	8.39	2.58	2.90	13.87	26.53	11.11	16.36
DE	10,018	2,863	468	2,395	2,089	121	135	4.67	1.21	1.35	7.23	16.35	5.05	6.46
EE	200	25	6	19	13	5	2	3.00	2.50	1.00	6.50	24.00	26.32	15.38
ES	10,022	4,003	642	3,361	2,508	465	510	6.41	4.64	5.09	16.13	16.04	13.84	20.33
FR	10,025	3,635	553	3,082	2,642	294	168	5.52	2.93	1.68	10.12	15.21	9.54	6.36
IE	3,813	1,127	522	605	403	125	88	13.69	3.28	2.31	19.28	46.32	20.66	21.84
IT	10,015	3,767	428	3,339	2,693	364	399	4.27	3.63	3.98	11.89	11.36	10.90	14.82
LU	303	82	15	67	62	1	4	4.95	0.33	1.32	6.60	18.29	1.49	6.45
MT	300	55	5	50	42	1	7	1.67	0.33	2.33	4.33	9.09	2.00	16.67
NL	4,337	981	392	589	360	132	76	9.04	3.04	1.75	13.83	39.96	22.41	21.11
PT	4,344	1,166	261	905	681	108	116	6.01	2.49	2.67	11.16	22.38	11.93	17.03
SI	310	135	15	120	99	10	10	4.84	3.23	3.23	11.29	11.11	8.33	10.10
SK	712	175	42	133	107	18	12	5.90	2.53	1.69	10.11	24.00	13.53	11.21
Total	58,845	19,143	3,479	15,664	12,607	1,679	1,600							
Mean								5.78	2.38	2.35	10.51	20.77	11.43	13.69

Table 3.3 Differential impact of the key determinants on the stages of credit constraints

This table reports the results of probit regressions to estimate the probability of the occurrence of credit constraint. The dependent variable is a binary indicator of credit constraints equal to 1 if a firm is constrained. In models (1-3) the dependent variable corresponds to the conditional stages of credit constraints. Models (4-5) decompose the third stage of credit constraints (unfavorable terms) into insufficient amount and high cost of a loan. Omitted category variables are as follows: size=1-9 employees, age>10 years, turnover<2m, owners=shareholders, gender=male, firm outlook=improved, credit history=improved. Each specification accounts for the sample selection bias. All regressions include time fixed effects and industry fixed effects. Z-values are based on robust standard errors, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Variable definitions are described in the Appendix table A3.1.

	(1)		(2)		(3)		(4)		(5)	
Dep. var.:	Discouraged		Rejected		Unfav. terms		Unfav. terms		Unfav. terms	
	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z
Bank lending standards										
Bank lending standards	0.0034**	(2.01)	0.0049**	(2.26)	-0.007**	(-2.53)	-0.01***	(-3.54)	0.0030	(0.65)
Firm characteristics										
Size=10-49emp	-0.18***	(-3.84)	-0.23***	(-3.23)	0.041	(0.38)	0.12	(1.00)	-0.077	(-0.50)
Size=50-249emp	-0.13**	(-1.97)	-0.21**	(-2.35)	0.038	(0.33)	0.11	(0.86)	-0.085	(-0.52)
Age=<2y	0.095	(0.83)	0.15	(1.00)	0.11	(0.63)	-0.018	(-0.080)	0.23	(1.01)
Age=>2y & <5y	0.30***	(4.93)	0.48***	(5.50)	-0.40*	(-1.87)	-0.48**	(-2.00)	-0.13	(-0.41)
Age=>5y & <10y	0.073	(1.43)	0.25***	(3.86)	-0.37***	(-2.91)	-0.40***	(-2.81)	-0.25	(-1.33)
Turnover=>2m & <10m	-0.32***	(-6.39)	-0.14*	(-1.66)	0.11	(1.39)	0.23***	(2.58)	-0.20*	(-1.65)
Turnover=>10m & <50m	-0.57***	(-7.59)	-0.41***	(-3.11)	0.26	(1.56)	0.44**	(2.32)	-0.13	(-0.51)
Turnover=>50m	-0.85***	(-5.26)	-0.63***	(-2.87)	0.71***	(2.65)	0.93***	(3.17)	0.11	(0.28)
Owners=Fam/entrep	-0.11	(-0.96)	-0.077	(-0.54)	0.013	(0.084)	0.067	(0.35)	-0.087	(-0.39)
Owners=Other firms	-0.047	(-0.39)	0.047	(0.31)	-0.083	(-0.49)	-0.0094	(-0.046)	-0.26	(-1.07)
Owners=VC/angels	0.14	(0.74)	0.56**	(2.50)	-0.47	(-1.34)	-0.60	(-1.48)	-0.087	(-0.18)
Owners=One nat person	-0.012	(-0.10)	0.14	(0.97)	-0.20	(-1.17)	-0.17	(-0.81)	-0.23	(-0.97)
Owners=Other	0.021	(0.12)	0.055	(0.24)	-0.20	(-0.82)	-0.023	(-0.085)		
Owners=Na	0.34	(0.43)	1.64***	(2.79)						
Gender=Female	0.17***	(3.29)	0.083	(1.13)	-0.14*	(-1.66)	-0.16*	(-1.71)	-0.057	(-0.48)
Firm outlook=Unchngd	-0.082	(-1.60)	-0.14**	(-2.16)	0.0012	(0.013)	0.039	(0.41)	-0.066	(-0.50)
Firm outlook=Detertd	0.13***	(2.58)	0.14**	(1.96)	-0.030	(-0.34)	-0.070	(-0.71)	0.029	(0.21)
Firm outlook=Na	-0.20*	(-1.66)	0.078	(0.57)	-0.18	(-1.18)	-0.42**	(-2.20)	0.30	(1.52)
Credit hist=Unchanged	0.18***	(3.71)	0.24***	(3.15)	-0.22**	(-2.02)	-0.27**	(-2.19)	-0.10	(-0.60)
Credit hist=Deteriorated	0.45***	(7.18)	0.68***	(7.84)	-0.38	(-1.36)	-0.58*	(-1.87)	0.039	(0.098)
Credit history=Na	0.35***	(3.20)	0.60***	(3.58)	-0.40	(-1.35)	-0.58*	(-1.79)	-0.072	(-0.16)
Banking sector										
Bank concentration	-0.0029	(-0.64)	0.0067	(1.15)	0.0063	(1.17)	0.010*	(1.65)	-0.007	(-0.81)
Bank z-score	-0.04***	(-5.46)	-0.03***	(-3.22)	0.020	(1.33)	0.042**	(2.57)	-0.028	(-1.27)
Bank net interest margin	0.13	(1.08)	0.53***	(3.71)	-0.77***	(-2.80)	-1.14***	(-3.65)	0.18	(0.43)
Bank ROA	-0.023	(-0.57)	-0.085	(-1.61)	-0.10	(-1.62)	-0.089	(-1.30)	-0.11	(-1.22)
Bank overhead costs	-0.18	(-1.24)	-0.49**	(-2.43)						
Economic environment										
Private credit/GDP	0.00039	(0.26)	0.00054	(0.33)	0.00013	(0.061)	-0.00069	(-0.26)	-0.001	(-0.21)
Stock market cap	0.0061**	(1.98)	0.0023	(0.58)	-0.0028	(-0.63)	-0.0061	(-1.20)	0.0093	(1.54)
ln(GDP)	-0.11*	(-1.86)	0.039	(0.53)	-0.13	(-1.47)	-0.18*	(-1.69)	-0.045	(-0.42)
Expected econ act	-0.004**	(-2.14)	-0.0035	(-1.55)	0.00020	(0.10)	0.00078	(0.32)	-0.001	(-0.33)
Inflation	0.077*	(1.68)	-0.037	(-0.68)	0.39***	(4.29)	0.44***	(3.49)	0.16	(1.35)
Property rights	0.090	(1.55)	-0.031	(-0.40)	-0.22***	(-2.99)	-0.32***	(-3.88)	0.042	(0.41)
Credit info depth	0.19***	(3.02)	0.11	(1.38)	0.016	(0.19)	-0.084	(-0.80)	0.26**	(2.21)
Regulation index	-0.19**	(-2.11)								
Inverse Mills ratios										
IMR (need credit)	0.58***	(7.52)								
IMR (discouraged)			0.18	(0.89)						
IMR (rejected)					-1.41***	(-2.73)	-1.75***	(-3.03)	-0.38	(-0.51)
Constant	1.69	(0.82)	-3.22	(-1.30)	6.27*	(1.67)	5.50	(1.24)	-0.98	(-0.20)
Observations	7,581		6,056		5,370		5,370		5,278	
Pseudo R2	0.12		0.11		0.10		0.13		0.074	
Time fixed effects	Yes		Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes		Yes	

Table 3.4 Decomposition of lending standards by loan terms

This table reports the results of probit regressions to estimate the effect of the individual loan terms on the probability of the occurrence of credit constraint. The dependent variable is a binary indicator of credit constraints equal to 1 if a firm is constrained. In models (1-3) the dependent variable corresponds to the conditional stages of credit constraints. Models (4-5) decompose the third stage of credit constraints (unfavorable terms). The individual components of lending standards are changes in loan terms measured as diffusion indices. Each specification accounts for the sample selection bias. All regressions include firm and country characteristics, time fixed effects, and industry fixed effects. Z-values are based on robust standard errors, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Variable definitions are described in the Appendix table A3.1.

	(1)		(2)		(3)		(4)		(5)	
Dep. var.:	Discouraged		Rejected		Unfav. terms		Unfav. terms (small amt)		Unfav. terms (high cost)	
	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z
Bank lending standards										
Interest margins	0.0012	(0.62)	0.0028	(1.26)	-0.0025	(-0.89)	-0.0046	(-1.40)	-0.00056	(-0.12)
Loan size	0.0029	(0.74)	0.0017	(0.39)	-0.016***	(-3.06)	-0.013*	(-1.93)	-0.013*	(-1.71)
Maturity	0.012***	(3.09)	-0.0012	(-0.24)	0.0076	(1.33)	0.0094	(1.50)	-0.00072	(-0.083)
Collateral	-0.011**	(-2.27)	-0.011*	(-1.80)	0.017**	(2.15)	0.019*	(1.80)	0.0071	(0.60)
Covenants	0.011***	(2.76)	0.017***	(3.47)	-0.024**	(-2.27)	-0.025*	(-1.73)	-0.0082	(-0.52)
Non-interest margins	-0.0060*	(-1.81)	-0.0071	(-1.63)	0.021***	(2.89)	0.0094	(1.20)	0.025**	(2.40)
Observations	7,581		6,056		5,370		5,370		5,278	
Pseudo R2	0.12		0.11		0.10		0.13		0.081	
Correction for sample selection	Yes		Yes		Yes		Yes		Yes	
Controls for firm, country characteristics	Yes		Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes		Yes	

Table 3.5 Consistency of credit constraints across credit instruments

This table reports the results of probit regressions to estimate the probability of the occurrence of credit constraint. The dependent variable is a binary indicator of credit constraints equal to 1 if a firm is constrained. In models (1-3) the dependent variable corresponds to the conditional stages of credit constraints. Explanatory variables for credit lines, trade credit, and other loan, represent a binary variable that measure the lending outcome for a given credit instrument. The definition of the lending outcomes for these instruments are equivalent to the definitions used for the bank loans. The lending outcomes for credit lines, trade credit, and other loans are unconditional. Each specification accounts for the sample selection bias. All regressions include firm and country characteristics, time fixed effects, and industry fixed effects. Z-values are based on robust standard errors, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Variable definitions are described in the Appendix table A3.1

	(1)		(2)		(3)	
Dep. var.:	Discouraged (bank loan)		Rejected (bank loan)		Unfav. terms (bank loan)	
	Coeff.	z	Coeff.	z	Coeff.	z
Bank lending standards						
Bank lending standards	0.00035	(0.16)	0.0079**	(2.48)	-0.0075**	(-2.33)
Credit line						
Cred line-discouraged	1.82***	(25.5)	0.76**	(2.05)	0.27	(0.98)
Cred line-no need	0.015	(0.22)	0.10	(1.05)	0.068	(0.82)
Cred line-no app other reason	0.17**	(2.36)	0.38***	(3.57)	-0.0064	(-0.046)
Cred line-na	0.43	(1.41)				
Cred line-rejected	0.23**	(2.25)	2.39***	(18.7)	-0.32	(-0.53)
Cred line-unfav.terms	0.15	(1.59)	0.75***	(6.62)	1.10***	(4.72)
Trade credit						
Trade cred-discouraged	0.94***	(9.70)	0.42*	(1.71)	0.16	(0.79)
Trade cred-no need	0.034	(0.45)	0.12	(1.15)	0.016	(0.17)
Trade cred-no app other reason	0.14**	(2.02)	0.22**	(2.07)	-0.0010	(-0.010)
Trade cred-na	0.069	(0.37)	-0.20	(-0.71)	0.25	(1.07)
Trade cred-rejected	-0.35**	(-2.00)	1.28***	(6.05)	-0.38	(-1.01)
Trade cred-unfav.terms	0.13	(1.10)	0.0029	(0.018)	0.89***	(6.94)
Other loan						
Other loan-discouraged	0.70***	(6.97)	-0.0027	(-0.012)	0.33**	(2.13)
Other loan-no need	0.12	(1.54)	-0.40***	(-3.34)	0.15	(0.98)
Other loan-no app other reason	0.024	(0.32)	-0.089	(-0.93)	0.18**	(2.02)
Other loan-na	0.086	(0.48)	0.39	(1.54)	-0.017	(-0.070)
Other loan-rejected	-0.23	(-1.10)	0.81***	(3.75)	0.57*	(1.76)
Other loan-unfav.terms	0.073	(0.43)	0.074	(0.39)	0.68***	(3.47)
Observations	6,284		4,940		4,420	
Pseudo R2	0.41		0.45		0.27	
Correction for sample selection	Yes		Yes		Yes	
Controls for firm, country characteristics	Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	

Table 3.6 Firm expectations of the availability of external financing

This table reports the results of probit regressions to estimate the effect of firm expectations. The dependent variable in models (1-2) is a binary indicator equal to 1 if a firm needs a bank loan. The dependent variable in models (3-6) is a binary indicator of credit constraints equal to 1 if a firm is constrained. In models (3-6) the dependent variable corresponds to the conditional stages of credit constraints. Lending standards are measured as diffusion indices over the past 6 months (BW). Firm expectations are measured as category variables with forward-looking period of 6 months (FW) where "0" denotes unchanged expectations, "-" denotes firm expectations that the availability of a given instrument will decline. The omitted category is the firm expectation that the availability of a given instrument will increase. Each specification accounts for the sample selection bias. All regressions include time fixed effects and industry fixed effects. Z-values are based on robust standard errors, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Variable definitions are described in the Appendix table A3.1.

	(1)		(2)		(3)		(4)		(5)		(6)	
Dep. var.:	Loan demand		Loan demand		Discouraged		Discouraged		Rejected		Unfav. terms	
	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z
Bank lending standards												
Bank lending standards BW	-0.00064	(-0.55)			0.0027	(1.21)			0.0059**	(2.12)	-0.0066**	(-2.49)
Bank lending standards FW			-0.0017	(-1.28)			0.0056**	(2.21)				
Firm expectations - bank loan availability												
Bank loans FW 0	-0.088**	(-2.36)	-0.087**	(-2.36)	0.026	(0.37)	0.026	(0.36)	0.11	(1.10)	-0.082	(-0.94)
Bank loans FW -	0.046	(0.95)	0.047	(0.97)	0.17**	(2.02)	0.17**	(1.99)	0.60***	(5.28)	0.025	(0.14)
Firm expectations - availability of other external												
Intern funds FW 0	-0.033	(-1.01)	-0.032	(-0.98)	-0.075	(-1.18)	-0.076	(-1.21)	-0.14	(-1.64)	-0.031	(-0.36)
Intern funds FW -	-0.041	(-0.95)	-0.041	(-0.94)	-0.0068	(-0.085)	-0.0067	(-0.084)	-0.19*	(-1.86)	0.10	(0.96)
Intern funds FW na	-0.019	(-0.47)	-0.018	(-0.43)	-0.063	(-0.80)	-0.066	(-0.83)	-0.23**	(-2.15)	0.087	(0.77)
Cred line FW 0	-0.016	(-0.40)	-0.016	(-0.40)	0.043	(0.57)	0.043	(0.57)	-0.024	(-0.24)	-0.14	(-1.52)
Cred line FW -	0.055	(1.07)	0.055	(1.08)	0.082	(0.90)	0.079	(0.87)	-0.044	(-0.38)	-0.062	(-0.57)
Cred line FW na	0.10**	(2.07)	0.10**	(2.06)	-0.27**	(-2.53)	-0.27**	(-2.52)	-0.63***	(-4.00)	0.063	(0.34)
Trade credit FW 0	0.012	(0.26)	0.011	(0.24)	-0.18**	(-2.20)	-0.18**	(-2.19)	-0.089	(-0.74)	-0.17	(-1.57)
Trade credit FW -	0.021	(0.36)	0.020	(0.36)	-0.24**	(-2.50)	-0.24**	(-2.49)	-0.025	(-0.18)	-0.062	(-0.51)
Trade credit FW na	0.14***	(3.03)	0.14***	(3.02)	-0.45***	(-5.07)	-0.45***	(-5.09)	-0.35**	(-2.43)	-0.064	(-0.51)
Equity FW 0	0.056	(1.00)	0.050	(0.90)	-0.020	(-0.18)	-0.0039	(-0.036)	-0.095	(-0.56)	0.31*	(1.83)
Equity FW -	0.084	(1.05)	0.080	(0.99)	0.16	(1.15)	0.17	(1.23)	-0.082	(-0.40)	0.33	(1.48)
Equity FW na	0.073	(1.27)	0.064	(1.11)	-0.21*	(-1.89)	-0.18	(-1.62)	-0.12	(-0.72)	0.30*	(1.84)
Debt sec FW 0	0.10	(0.93)	0.10	(0.94)	0.28	(1.16)	0.28	(1.15)	-0.0015	(-0.0050)	0.94***	(2.68)
Debt sec FW -	0.078	(0.62)	0.078	(0.62)	0.34	(1.30)	0.34	(1.29)	0.041	(0.13)	0.56	(1.44)
Debt sec FW na	0.30***	(2.86)	0.30***	(2.89)	0.38	(1.57)	0.37	(1.53)	0.017	(0.060)	0.91***	(2.66)
Other loan FW 0	-0.042	(-0.89)	-0.042	(-0.88)	-0.075	(-0.87)	-0.075	(-0.86)	-0.20*	(-1.77)	0.016	(0.14)
Other loan FW -	-0.015	(-0.23)	-0.014	(-0.22)	-0.087	(-0.79)	-0.085	(-0.78)	-0.33**	(-2.33)	0.31*	(1.94)
Other loan FW na	-0.059	(-1.25)	-0.057	(-1.22)	-0.20**	(-2.28)	-0.20**	(-2.32)	-0.39***	(-3.50)	-0.0006	(-0.004)
Observations	14,790		14,790		5,702		5,702		4,606		4,131	
Pseudo R2	0.089		0.089		0.15		0.15		0.17		0.11	
Correction for sample selection	Yes		Yes		Yes		Yes		Yes		Yes	
Controls for firm, country chars.	Yes		Yes		Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	

Table 3.7 Impact of non-bank alternative finance on credit constraints

This table reports the results of probit regressions to estimate the probability of the occurrence of credit constraint. The dependent variable is a binary indicator of credit constraints equal to 1 if a firm is constrained. In models (1-6) the dependent variable corresponds to the conditional stages of credit constraints. Models (7-8) decompose the third stage of credit constraints (unfavorable terms) into insufficient amount and high cost of a loan. Variables non-bank competition, bank market finance, and firm market finance represent the variation in the bank lending standards due to each respective factor. Each specification accounts for the sample selection bias. All regressions include time fixed effects and industry fixed effects. Z-values are based on robust standard errors, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Variable definitions are described in the Appendix table A3.1.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
Dep. var.:	Discouraged		Discouraged		Rejected		Rejected		Unfav. terms		Unfav. terms		Unfav. terms (small amount)		Unfav. terms (high cost)	
	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z	Coeff.	z
Non-bank competition	-0.017**	(-2.14)			-0.016	(-1.42)			0.013	(0.79)						
Bank market finance			0.0029*	(1.94)			0.0040*	(1.91)			-0.006**	(-2.30)	-0.011***	(-3.97)	0.0049	(1.15)
Firm market finance			-0.03***	(-4.03)			-0.025**	(-2.43)			0.022	(1.45)	0.010	(0.55)	0.019	(0.90)
Observations	7,581		7,581		6,056		6,056		5,370		5,370		5,370		5,278	
Pseudo R2	0.12		0.12		0.11		0.11		0.100		0.10		0.13		0.076	
Sample sel. correction	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Firm characteristics	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Country characteristics	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	

Chapter 4

Credit Information Sharing and Financing Constraints*

4.1 Introduction

Financing constraints arise due to information asymmetries if finance providers cannot accurately assess the true position of a firm. Credit information sharing systems can mitigate information asymmetries and thereby reduce financing constraints. But an increase in credit information sharing may lead to rationing if, due to greater credit information transparency, more financing gets allocated to a smaller number of higher quality firms at the expense of smaller and more risky firms. In this paper I investigate the relationship between credit information sharing systems and financing constraints. In particular, I disentangle the effect of credit information scope (depth, content, and accessibility) from credit information scale (coverage).

Credit information sharing systems help to reduce the adverse selection, mitigate the hold-up problems, and align interests between finance providers and firms (e.g., Klein, 1992; Padilla and Pagano, 1997; Pagano and Jappelli, 1993). Empirical evidence shows that greater credit information sharing is associated with larger credit volume and lower defaults (e.g., Djankov et al., 2007; Jappelli and Pagano, 2002). By reducing uncertainty and facilitating accurate pricing of capital, information sharing should be particularly beneficial for smaller and informationally opaque firms and in countries with weak legal systems where the

* This chapter is based on Beck, Kysucky and Norden (2015)

enforcement of contracts is more costly. Accurate and deep information further facilitates the screening of borrowers by finance providers (Jappelli and Pagano, 2002). It is not known how firms' ability to access financing depends on the credit information content, depth of the information, its accessibility and coverage.

In this paper I focus on the differential effect of credit information scope and scale. I decompose credit information scope by depth (amount of information), content (type of information), and accessibility. I investigate how credit information sharing affects the relationship between financing constraints on the one hand, and firm characteristics and economic environment on the other hand.

The empirical analysis is based on the firm-level survey from 45 emerging economies from the period 2006-2012. My key findings are as follows. First, credit information scope is associated with lower financing constraints. Deeper, more complete information is beneficial for the provision of finance, but firms are more financially constrained in countries where credit information is more easily accessible by borrowers. Second, credit information scale is associated with higher financing constraints. This finding implies that greater information coverage may lead to a redistribution of financing from smaller firms to larger firms. Third, smaller firms benefit from greater access to financing in countries with higher scope of credit information. This effect is mainly due to more financing provided by non-bank users of credit information. Fourth, financing constraints are less likely in countries with lower credit regulation, safer and more competitive banking systems, and higher economic growth.

The results suggest that credit information sharing systems play an important role in alleviating financing constraints. Deep and comprehensive firm information, rather than the coverage alone, contribute to greater access to finance, especially for small firms.

The rest of the paper is organized as follows. Section 4.2 provides an overview of the related literature. Section 4.3 describes the data and the empirical strategy. Section 4.4 presents the results and robustness checks, and section 4.5 concludes.

4.2 Credit information sharing mechanism

Financing constraints have a negative impact on growth, new business creation, and economic activity (Beck, Demirgüç-Kunt, and Maksimovic, 2005; Beck, Demirgüç-Kunt, and Levine, 2005a). In the presence of financing obstacles, some desirable projects are not funded (e.g., Fazzari et al., 1988). This has adverse effects on corporations, and, in aggregate, leads to

inefficient resource allocation with macro-economic and welfare implications (Lamont et al., 2001). Financing constraints are more acute for small firms and in developing countries where access to finance is particularly critical for growth (Beck, 2007).

Credit information sharing can help mitigate financing constraints through 4 channels (Jappelli and Pagano, 2002). First, credit information sharing reduces the adverse selection by improving lenders' knowledge about borrowers (Pagano and Jappelli, 1993). The improved knowledge facilitates more accurate pricing of the financing products. Second, sharing credit information among finance providers reduces the 'hold up' problem of a single lender that has private information about a borrower (Sharpe, 1990; von Thadden, 2004). Credit information sharing allows a borrower to switch to an uninformed competitor with relatively lower switching costs. Third, information sharing motivates borrowers to exert effort to maintain good financial standing, because negative information is visible to other prospective finance providers, potentially increasing financing costs and limiting alternative sources of outside financing (Klein, 1992; Padilla and Pagano, 1997; Vercammen, 1995). Fourth, credit reporting agencies keep records on the financial positions of borrowers and therefore reduce their incentives to over-borrow from multiple sources (Bennardo et al., 2014).

Credit information sharing systems are operated by two types of credit reporting agencies. First, public credit registries are government-operated institutions typically managed by central banks. Information reporting to credit registries is mandatory and the information collected serves to support the regulatory role of central banks and financial supervisors. Credit registries tend to collect data only on specific financing instruments that are relevant to policy measures and with values exceeding a certain threshold. All banks within a country are required to report information to credit registries. These characteristics of credit registries imply that the information (collected and retrieved) tends to concentrate primarily on financial institutions and larger financing instruments.

Second, private credit bureaus are privately operated organizations with the mission of facilitating the information exchange among finance providers. Information reporting to credit bureaus is voluntary and is based on the principle of reciprocity. This means that credit bureaus grant access to information providers in exchange for the information supplied. Credit bureaus tend to collect more data across a wider range of entities and financing instruments, including individuals and small companies.

Theoretical models predict that credit information sharing tends to result in lower defaults and interest rates at the individual firm level (Pagano and Jappelli, 1993). Padilla and Pagano (2000) show that the information content affects lending outcomes. However, an

increase in credit information sharing may also lead to lower availability of finance. If banks exchange more information about borrowers while the quality of the borrowers remains the same, the overall increase in lending due to better information may be a redistribution effect from lower-quality borrowers to higher-quality borrowers (Jappelli and Pagano, 2000).

Empirical evidence confirms that credit information sharing is generally associated with higher credit volumes, better credit market performance, and greater access to finance (Beck, Demirgüç-Kunt, Levine, 2005b; Beck et al., 2007; Beck and Levine, 2005; Brown et al., 2009; Djankov et al., 2007; Haselmann et al., 2010; Jappelli and Pagano, 2002; Visaria, 2009). In a cross-country study in Latin America, Galindo and Miller (2001) show that, not only the information content, but also the quality of the information matters for reducing financing constraints. Love and Mylenko (2003) study the effects of different types of credit reporting agencies. They find that the existence of private registries lowers financing constraints and increases the share of banking financing, but the presence of public registries does not have significant effect on financing constraints.

This paper contributes to the literature by investigating the relationship between financing constraints and credit information scope and scale. Using detailed firm-level data from 45 countries, the empirical analysis disentangles the effect credit information scope by information content and accessibility, and examines the redistribution effect of credit information scale. The paper sheds new light on the relationship between the components of credit information and financing constraints.

4.3 Data and methodology

4.3.1 Data sources

The empirical analysis is based on 28,651 firm-year observations from 45 emerging economies over the period 2006-2012. The firm-level data comes from the World Bank's Enterprise Surveys. The dataset contains firm-level data about operations and financing. The sampling procedure is based on the randomized selection of firms with replacement and ensures that the firms are stratified representatively by size, industries, and geographic regions. The surveys are administered in a standardized format to business owners and managers of mainly small and medium-sized enterprises.

Data on credit information sharing systems comes from the World Bank Credit Reporting Database. The dataset contains information about the ownership, corporate structure,

content, and information distribution by public credit registries and private credit bureaus. The data is collected in three stages. First, data is collected from public sources. Second, a detailed survey is administered to the management of a public credit registry or a private credit bureau. Third, the dataset is verified by following-up with the reporting entity and by consulting third parties and public sources.

Data on the economic and legal environment is obtained from the World Bank databases (Doing Business Database, Development Indicators, Global Financial Development Database). I merge the firm-level data with the country-level data for each country and the year of the survey. From the merged sample I remove records with missing values and those survey responses, which do not contain valid responses.

4.3.2 Main variables and methodology

The main variable of interest is the occurrence of financing constraints. This measure is a firm's assessment of obstacles to its operations due to difficulties of accessing finance. It refers to both the availability of finance and the cost of finance. I transform the ordinal scale from the survey (0 = "no obstacle", 4="very severe obstacle") into a binary variable, which takes the value of 1 if a firm reports financing constraints that fall into categories 3 or 4. Using the binary variable imposes a less restrictive functional form on the estimations to isolate the presence of financing constraints.

While most of the empirical studies use various measures of financing constraints derived from the optimal investment patterns, or from the relationship between the cash-flows and investments (Fazzari et al., 1988), the self-reported estimate is obtained directly from a firm's management. The advantage of using this measure is that it is a direct representation of financing constraints rather than a proxy and it is not endogenous to other firm characteristics. However, because it is reported by a firm itself, it might be biased in the sense that firms are more likely to report that they are financially constrained when they are not. The problem is mitigated by the fact that the surveys are anonymous and in the empirical analyses I control for the trustworthiness estimate of the interviewees.

I focus on two main variables that estimate the extent of credit information sharing in an economy. First, the *scope of credit information* is an index that measures the depth of the information and its accessibility in both public credit registry and private credit bureau. The scope of credit information consists of 6 components: data on both firms and individuals is distributed; both positive and negative credit information is available and distributed; data from

retailers and utility companies is distributed in addition to data from financial institutions; at least 2 years of historical data is distributed; data on loan amounts below 1% of income per capita is distributed; by law, borrowers have the right to access their data in the largest credit bureau or registry in the economy. Second, the *scale of credit information* represents the coverage of the credit reporting agencies measured as a percentage of adults and firms relative to the adult population. This variable reports the number of individuals and firms listed in a public credit or private registry with current information on repayment history, unpaid debts, or credit outstanding. I calculate the overall scale as the maximum of the scale of credit registry and credit bureau.

I include firm-level variables to control for the heterogeneity in firm size, age, growth, transparency (presence of audited statements), government ownership, and the legal form of an establishment. At the country level I control for the overall growth options in an economy (using a proxy GDP per capita growth), pricing stability (inflation rate), financial development (stock market capitalization), and the quality of the institutional and legal environment. I use four variables related to the structure of banking systems that might influence the access to finance: prevalence of bank finance (proportion of firms using banks to finance investments), bank concentration, riskiness of the banking sector (bank z-score), and credit market regulation.

Table 4.1 presents the summary statistics of the main variables. On average, 26% of all firms are financially constrained across all countries in the sample, but there is a large variation in the presence of financing constraints (44% standard deviation). The mean coverage of credit information sharing systems is 36% of firms and individuals as a proportion of population in a country. The majority of the credit registries and bureaus capture at least 4 out of the 6 dimensions of credit information sharing. The most frequent users of credit information data are banks, followed by non-bank financial institutions, and retailers/traders. Private credit bureaus tend to collect a greater amount and more detailed information compared to public credit registries. The largest difference is apparent in the availability of data about liabilities and financial positions of borrowers where private credit bureaus exert considerably more ongoing effort in data collection on current financial standing of borrowers. A typical company in the dataset is a small, privately held, limited liability company with less than 50 employees and with average age of around 10 years.

The purpose of the empirical analysis is to explain the cross-sectional differences in the relationship between credit information sharing systems and the occurrence of financing constraints. In particular, I investigate whether and how the credit information scope and scale relate to a firm's perceived obstacles in accessing external finance. The empirical analysis is

based on a repeated cross-sectional setup with probit estimations where the dependent variable is the binary indicator of financing constraints. Each estimation includes industry and year-fixed effects to isolate the time-invariant component in cross-country differences. Because the characteristics of credit information sharing systems are fairly stable over time, I do not include country-fixed effects in the baseline analyses. I report results using robust standard errors adjusted for clustering at the country-level. In each estimation I control for the perceived truthfulness of the interviewee.

4.4. Empirical results

4.4.1 In which countries are firms more likely to experience financing constraints?

In the first step of the analysis, I estimate the prevalence of financing constraints across the countries. Table 4.2 shows the distribution of countries by financing constraints and credit information sharing systems. The values are reported in a descending order by the extent of financing constraints. In absolute terms, the most financially constrained firms reside in four African countries (66% of all firms in Ghana are financially constrained, 54% in Uganda, 51% in Mozambique, 50% in Senegal). The least proportion of financially constrained firms are in Panama (9%), South Arica (10%), Hungary (10.1%), and Philippines (12%). While the large majority of all countries maintain either public credit registry or private credit bureau or both, surprisingly, none of the least constrained countries have public credit registry. Only two countries in the sample have neither credit registry nor credit bureau (Sierra Leone and Moldova). Over 90% of all firms reside in countries with a credit bureau and 62% of all firms reside in countries with a credit registry. The table shows that there is a large heterogeneity across the countries in financing constraints and the credit information sharing systems.

To investigate further the systematic differences in firms' perceptions of financing constraints across the countries, I split the sample 2-way by country-level factors and firm size. Table 4.3 shows that small firms (bottom tercile by number of employees) are consistently more financially constrained compared to large firms (top tercile). The difference is statistically significant at 1% confidence level. Firms are relatively less constrained in countries where the scope of credit information is high, but they are more constrained when the scale of credit information is high. The difference is larger, both in absolute and relative terms, for small firms. On average, 19% of large firms are constrained in countries where the scope of information is high, as opposed to 35% of small firms that are constrained in countries where the scope of information is low. The greatest contrast is manifested by the information content. In countries

where neither credit registry nor credit bureau report positive and negative information, 44% of all firms are financially constrained, relative to 25% of firms in countries where this information is available from at least one of the agencies. There is no significant difference in the mean values of financing constraints of firms based in countries with a different quality of the legal system. However, the values differ by legal origin. The least financially constrained firms are in German-based legal systems, whereas the largest proportion is in countries with a socialist legal origin. In countries with English origin, 41% of small firms are financially constrained. This table indicates that the firm size, together with the characteristics of credit information sharing systems, are important factors in explaining the occurrence of financing constraints.

4.4.2 Differential effect of credit information scope and scale

In this section I investigate the relationship between the occurrence of financing constraints and the characteristics of credit information sharing systems using probit estimations. I analyze the differential effect of credit information scope and scale, and the effect of the institutional environment. Table 4.4 reports the results.

The multivariate analyses show that higher scope of credit information (deeper and more accessible credit information) is associated with lower financing constraints, whereas higher scale of credit information (greater coverage of credit information) is associated with higher financing constraints. These results are in line with two of the theoretical propositions described above. First, the theories on information asymmetries and the alignment of incentives state that greater depth of accurate and accessible information is beneficial for the provision of external finance. Second, the positive relationship between the information scale and financing constraints implies that the information coverage might lead to aggregate redistribution of financing.

Further, financing constraints are lower in countries with high GDP growth per capita, low level of credit markets regulation, and safe and competitive banking systems. As expected, smaller firms are more likely to be financially constrained. Credit information sharing as a tool for financing provision crucially depends on the legal system. This follows from the quality of the legal framework that defines possible contractual recourse in which reliable information plays a crucial role. The results in Table 4.4, Model 2 do not support the view that greater scope of credit information is more important in countries with weak legal systems. The table shows that there is little difference between English, French and German systems, but firms in

countries with socialist origin are more likely to be constrained. The structure of banking systems influences the access to finance and the incentives of banks to share information about borrowers. However, Model 4 shows no evidence that firms in more competitive banking systems benefit more from the scope of credit information. In Model 5, I decompose the overall level of bank loan financing into loans provided by domestic and foreign banks. I find that larger volume of lending by domestic banks (measured as a percentage of GDP), but not by foreign banks, is associated with lower constraints. This result supports the view that foreign banks are more likely to focus on larger clients or specialized financing instruments. In unreported analyses I interact the extent of foreign loans in a country with large firms and confirm the result. Since foreign lenders might be relatively less informed about local borrowers, they may benefit more from greater scope of credit information. To check this proposition, I interact the information scope with the presence of foreign lenders, but do not find a significant relationship.

4.4.3 The components of credit information scope

The scope of credit information is a multi-dimensional variable. The overall measure might conceal the differential effect of its components. In the following analysis I decompose the scope of credit information into its sub-components related to the information content and accessibility[2].

Table 4.5 shows that financing constraints are lower if credit information agencies distribute information on both firms and individuals, and when the distributed content contains both positive and negative information about borrowers. Information about firms and individuals helps finance providers to assess more completely the true financial position of a borrower beyond a firm boundary, and to detect a possible moral hazard of a borrower. Positive and negative information is further useful in well-rounded screening. The presence of negative information, in the absence of positive information, might overestimate borrower risk and lead to greater adverse selection problem.

Credit information might be more accurate if borrowers have the right to investigate the records and request corrections if some information is not correct. On the other hand, guaranteed inspections might alter the incentives of reporting entities to provide information

[2] In this analysis I skip the component on loan amount threshold due to limited data availability.

(if the provision is voluntary as in the case of private credit bureaus). Model 4 shows that the latter effect prevails. Firms are more likely to be financially constrained if borrowers have the right to inspect their credit records. Regarding the source of the information, banks remains the most relevant source for the occurrence of financing constraints. The information content from retailers and traders does not appear to be related to financing constraints. Adding all components together, I find that the existence of secrecy laws is associated with higher constraints. Apparently, secrecy is an obstacle that inhibits effective reduction of information asymmetries. The coefficient on information content for firms and individuals is not significant when controlling for positive and negative information, suggesting that the type of information (positive and negative) is an important factor that encompasses the type of the information subject (firm and individual)

These results imply that deeper information content is associated with lower financing constraints, but the accessibility of information by borrowers may have an opposing effect. For given information content, lower secrecy restrictions on information sharing is associated with lower financing constraints.

4.4.4 Types of information content

To gain further insights on the role of credit information content, in the following analysis I decompose credit information by the type and the source. I analyze three types of credit information: personal information, loan information, and information on liabilities and financial positions. Each measure is constructed as an index that estimates the amount information about the credit behavior of a borrower available either through a credit registry, credit bureau, or both.

The results are reported in Table 4.6. I do not find evidence of a differential effect of the information type. Namely, the marginal amount of information collected about individuals, loans, and liabilities, is not individually related to the occurrence of financing constraints. In unreported analyses I find that credit information types collected by credit registries and credit bureaus are complementary. Credit information agencies are more likely to collect and distribute information that is not already present in the other source.

If the type of distributed information is systematically different between credit registries and credit bureaus, then it is possible that the information content type from each source has a differential association with financing constraints. Table 4.6 shows that greater depth of personal information and information on liabilities of the borrowers in credit registries are

associated with lower constraints. The results for credit bureaus are not significant except for a weakly positive association between financing constraints and personal information.

In the next analysis I investigate how financing constraints depend on users of credit information sharing systems. Finance providers can directly influence financing outcomes. Therefore the usage of credit information systems by finance providers provides insights on the transmission channels of credit information sharing effect. In Table 4.7, I whether the occurrence of financing constraints is systematically related to the use of credit information by a specific type of entity. I focus on three types of information users: banks, non-bank financial institutions, and retailers and traders. The results show that financing constraints are higher in countries where non-bank financial institutions are more frequent and heavy users of credit information sharing systems (relatively greater amount of credit information is distributed to non-bank financial institutions as measured by the information distribution index). Since the models control for the prevalence of bank finance, the effect is not likely due to the aggregate amount of non-bank finance provision. The coefficient on bank users is insignificant, suggesting that, in relative terms, banks rely primarily on their own proprietary information. The findings from the two previous analyses reveal an interesting pattern. While banks are the main providers of credit information, the use of the information by non-bank financial institutions influences the financing constraints at the margin.

4.4.5 Additional results

Firm size is an important determinant of financing constraints. Since the information production about borrowers has fixed costs, finance providers are not willing to extend financing to smaller firms if the cost of information production does not justify expected payoff. Sharing the information collection costs among multiple finance providers can therefore help smaller firms to access finance. Results in Table 4.8 confirm this proposition. While small firms are more financially constrained on average, they benefit more from larger scope of credit information. The effect is not significant for credit information scale, suggesting that greater credit information coverage of small firms does not necessarily translate into greater access to finance. Further, I interact the small firm dummy with the credit information users. To the extent that non-bank finance providers might have different requirements or focus on specific clientele, the overall effect might reflect greater barriers to access financing by larger fraction of small companies. The purpose of this analysis is to uncover whether there is a clientele effect among credit information users driven by firm size. The results in Table 4.8

indicate that smaller firms are more likely to be less constrained if non-bank financial institutions or retailers/traders retrieve their credit information. However, the effect is only marginally significant.

A significant fraction of the firms in the sample do not have any outside financing. There are systematic unobserved differences between these two groups of firms in terms of their quality, operations, or growth options. Moreover, firms that do not have external financing also do not have current (or past) credit records and therefore cannot benefit directly from credit information sharing mechanism. In Table 4.9, I analyze separately firms with an existing bank loan or credit line (Model 1) and those firms without any credit facility (Model 2). The estimations confirm the baseline results on the beneficial effect of credit information scope. In the sub-sample of firms with no credit, the coefficient on credit information scale is not significant. This is likely due to the fact that firms that are already excluded from the financing market are not affected by the redistribution effect of greater credit information scale.

Finally, I investigate how credit information sharing relates to loan terms. In Models 3-5 as the dependent variables I use, respectively, loan size, collateral, and maturity. I find that greater credit information scope is associated with lower collateral requirements, supporting the hypothesis that credit information can substitute collateral. The scale of the information is positively related to the collateral, which is consistent with the redistribution theory, but there is no significant relationship with the loan size.

4.5 Conclusion

Credit information sharing can help firms to reduce financing constraints. However, it is not known whether and how credit information scope and scale affect financing outcomes. Using a comprehensive database of over 28,000 firm-year observations from 45 countries, I investigate in detail the relationship between credit information sharing systems and financing constraints. I disentangle the effect of the credit information scope (depth, content, and accessibility) from the credit information scale (coverage). The former measure is a policy variable with a direct relationship to the credit information sharing system design. The latter variable is an intermediated outcome of credit information sharing systems.

I find that credit information scope is associated with lower financing constraints, but credit information scale is associated with higher financing constraints. This effect implies that greater information coverage may lead to a redistribution of financing among firms. Smaller

firms benefit more from greater scope of credit information, especially in obtaining non-bank finance. These findings suggest that credit information systems provide beneficial mechanisms to alleviate the financing constraints, but the effects depend on credit information content, accessibility, and usage.

4.6 Appendix

Table A4.1 Definitions of variables

Variable name	Definition	Source
Financing constraints		
Financing constraints	Binary variable equals 1 if a firm considers access to financing as a severe or very severe obstacle to its current operations (the values correspond to values 3 (severe) or 4 (very severe obstacle) on the scale 0-4). Access to finance refers to both the availability of finance, and the cost of finance. The availability of finance refers to difficulty of a firm to obtain external financing. Cost of finance refers to the price of a loan and the transaction costs that are necessary to fulfill the application and disbursement process (interest rates, fees, collateral premiums).	WB ES
Credit information sharing		
Scope of credit information	Index measuring the depth of information, including the rules affecting the scope, accessibility, and quality of credit information available through public or private credit registries. The index ranges from 0 to 6, with higher values indicating the availability of more credit information, from either a public registry or a private bureau.	WB Doing Business
Scale of credit information	Public and private credit registry coverage reports the number of individuals and firms listed in a public credit registry with current information on repayment history, unpaid debts, or credit outstanding. The coverage is expressed as a percentage of the adult population within a country. The overall scale of credit information is the maximum of either public registry coverage or private bureau coverage per each country and year. The regression models include orthogonal component from the regression of the Scope of credit information on the Scale of credit information.	WB Doing Business
Information on firms and individuals	=1 if credit registry collects information on both firms and individuals, 0 otherwise.	WB Credit Reporting
Positive and negative information	=1 if credit registry/credit bureau record both positive and negative information, 0 otherwise.	WB Credit Reporting
Guaranteed inspection by borrowers	=1 if borrowers are authorized by law to inspect the records of credit registry/credit bureau, 0 otherwise.	WB Credit Reporting
Information from retailers and traders	=1 if credit registry collects information from retailers and traders, 0 otherwise.	WB Credit Reporting
Secrecy law	=1 if secrecy law imposes limits on information sharing via credit registry/credit bureau, 0 otherwise.	WB Credit Reporting
Users	Set of binary variables specifying which types of institutions retrieve data from credit registry/credit bureau. The types of institutions include banks, non-bank financial institutions, and retailers/traders. The overall measure represents the sum of the indicators for the credit registry and credit bureau.	WB Credit Reporting
Personal information	Index measuring the type of personal information provided by credit registry/credit bureau. The information components include name, address, tax id, national id, borrower's ownership of a business, tax statements. Index values range from 0 (low information content) to 1 (high information content).	WB Credit Reporting
Loan information	Index measuring the type of loan information provided by credit registry/credit bureau. The information components include type of loan, interest rates, maturity, value of a collateral, guarantees, and the original amount of a loan. Index values range from 0 (low information content) to 1 (high information content).	WB Credit Reporting
Liabilities and financial positions	Index measuring the type of liabilities and financial positions provided by credit registry/credit bureau. The information components include income and other financial information, utility payment, presence on bad check list, bankruptcy information, court judgments, information on defaults. Index values range from 0 (low information content) to 1 (high information content).	WB Credit Reporting

Table A4.1 (continued).

Variable name	Definition	Source
Firm characteristics		
Ln firm age	Log of the age of a firm at the time of the survey.	WB ES
Direct exports (% of sales)	Percent of a firm's sales in the last fiscal year from direct exports.	WB ES
Ln number of full time employees	Log of the number of permanent, full-time employees end of last complete fiscal year.	WB ES
2-year firm growth ln(t-1/t-3)	Log of last complete fiscal year's total sales over total annual sales three years ago over.	WB ES
Government ownership (>20%)	=1 if % of a firm owned by a government/state is greater than 20%.	WB ES
Audited financial statements	=1 if annual financial statements are checked and certified by an external auditor, 0 otherwise.	WB ES
Legal form	Legal status of a firm. Available categories are: publicly listed company; privately held, limited liability company; sole proprietorship; partnership; limited partnership; other.	WB ES
Legal and economic environment		
GDP per capita growth	Annual percentage growth rate of GDP per capita based on constant local currency (annual %).	WB DI
Inflation rate	Inflation as measured by the annual growth rate of the GDP (annual %).	WB DI
Prevalence of bank finance	Firms using banks to finance investment (% of firms).	WB DI
High bank concentration	=1 if bank concentration is greater than 55 (overall median). Bank concentration is measured by assets of three largest commercial banks as a share of total commercial banking assets. Total assets include total earning assets, cash from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets.	Bankscope (via GFDD)
Bank z-score	Probability of default of a country's commercial banking system. Z-score compares the buffer of a country's commercial banking system (capitalization and returns) with the volatility of those returns.	Bankscope (via GFDD)
Credit market regulation index	Composite index of credit market regulation on a continuous scale from 0 (high regulation) to 10 (low regulation). Index components are regulation on the ownership of banks, foreign banks, private sector credit, and interest rates.	EFW
Loans from domestic banks	Domestic credit provided by the banking sector (% of GDP). The measure includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data is available.	WB DI
Loans from foreign banks	International Debt Securities (Net Issues) as a share of GDP.	GFDD
Stock market capitalization	Total value of all listed shares in a stock market as a percentage of GDP.	WB DI
Weak legal system	=1 if legal system & property rights index < 5 (approx. overall median). The index is measured on a continuous scale from 0=low to 10=high. This is an aggregate indicator consisting of the following components: judicial independence, impartial courts, protection of property rights, military interference in rule of law and the political process, integrity of the legal system, legal enforcement of contracts, and regulatory restrictions on the sale of real property.	EFW
Legal origin	Set of binary variables specifying the legal origin of the company law or commercial code of each country. The categories are: English, French, German, and Socialist (Nordic legal origin is not present in the sample).	Djankov et al. (2007)

Data sources: WB ES (World Bank Enterprise Survey), WB Doing Business (World Bank Doing Business), WB Credit Reporting (World Bank Credit Reporting Database), GFDD (World Bank Global Financial Development Database), EFW (Economic Freedom of the World).

4.7 Tables

Table 4.1 Summary statistics

This table shows the summary statistics. The values refer to the full sample of firms from 45 countries in the period 2006-2012. "CR" stands for public credit registry, "CB" stands for private credit bureau. Mean values are pooled across all countries and periods. Definitions of the variables are in Appendix A4.1.

	Obs.	Mean	Std. dev.	Min.	Max.
Financing constraints					
Constrained	28,651	0.26	0.44	0	1
Credit information sharing					
Scope of credit information	28,651	4.33	1.79	0	6
Scale of credit information	28,651	35.71	29.33	0	100
Information on firms and individuals	28,651	0.58	0.49	0	1
Positive and negative information	28,651	0.95	0.21	0	1
Guaranteed inspection by borrowers	27,339	0.79	0.41	0	1
Secrecy law	27,640	0.60	0.49	0	1
Users = banks	28,090	1.17	0.54	0	2
Users = non-banks	28,090	0.87	0.63	0	2
Users = retailers and traders	28,090	0.48	0.60	0	2
CR - Personal information	28,651	0.30	0.27	0	0.83
CR - Loan information	28,651	0.33	0.31	0	0.95
CR - Liabilities and financial positions	28,651	0.20	0.20	0	0.89
CB - Personal information	28,090	0.40	0.28	0	0.83
CB - Loan information	25,533	0.48	0.31	0	1.00
CB - Liabilities and financial positions	28,090	0.43	0.30	0	0.89
Firm characteristics					
Ln firm age	28,651	2.77	0.72	0	5.35
Direct exports (% of sales)	28,631	8.95	23.68	0	100.00
Ln number of full time employees	28,651	3.51	1.44	0	10.54
2-year firm growth ln(t-1/t-3)	28,651	0.34	0.98	-11.74	11.84
Government ownership (>20%)	28,159	0.01	0.08	0	1
Audited financial statements	28,428	0.52	0.50	0	1
Legal form = publicly listed company	1,635				
Legal form = privately held, limited liability	17,661				
Legal form = sole proprietorship	5,860				
Legal form = partnership	1,662				
Legal form = limited partnership	739				
Legal form = other	634				
Economic environment					
GDP per capita growth	28,651	2.53	4.69	-17.55	13.04
Inflation rate	28,651	7.30	5.46	-3.71	46.68
Prevalence of bank finance	28,374	27.75	14.25	1.15	60.00
High bank concentration	28,651	0.43	0.50	0.00	1.00
Bank z-score	27,799	16.36	9.00	2.34	36.80
Credit market regulation index	28,651	8.60	0.96	5.70	10.00
Loans from domestic banks	28,208	53.85	33.59	7.51	195.34
Loans from foreign banks	28,651	16.00	39.27	0.32	359.30
Stock market capitalization	25,607	43.44	48.75	1.08	265.68
Legal environment					
Weak legal system	28,651	0.51	0.50	0	1
Legal origin = English	4,726				
Legal origin = French	18,576				
Legal origin = German	3,252				
Legal origin = Socialist	2,097				

Table 4.2 Credit information sharing systems by countries

This table reports the distribution of financing constraints and credit information systems by countries. The mean values are equal-weighted averages across countries. Start year for the credit registries or credit bureaus represents the start year of the operations, which is typically later than the year of the establishment. If a registry/bureau exists but it is not in operation or the data is not available, the information is blank. Information distribution index is a measure of the number of the types of information distributed. The values range from 0 (low information distribution) to 1 (high information distribution). Definitions of the variables are in Appendix A4.1.

					Public credit registry			Private credit bureau		
Country	Obs.	Financially constr.	Scope of credit info.	Scale of credit info.	Exists	Start year	Info. distr	Exists	Start year	Info. distr.
Ghana	436	66.06	0.00	0.00	No		0.00	Yes	2010	0.04
Uganda	505	54.26	0.00	0.00	No		0.00	Yes	2009	0.75
Mozambique	426	51.41	3.00	0.70	Yes	1997	0.30	Yes		
Senegal	410	50.49	1.00	4.70	Yes	1962	0.18	No		0.00
Brazil	1,447	49.58	5.00	59.20	Yes	1987	0.55	Yes	1968	0.68
Russia	603	45.03	4.00	14.30	No		0.00	Yes	2006	0.68
Costa Rica	333	42.77	5.00	64.80	Yes	1996	0.50	Yes	1992	0.82
Ukraine	451	40.41	0.00	3.00	No		0.00	Yes	2007	0.18
Kenya	574	38.15	2.00	1.50	No		0.00	Yes	2008	0.71
Moldova	328	37.58	0.00	0.00	No		0.00	No		0.00
Georgia	213	36.71	4.00	4.50	No		0.00	Yes	2005	0.79
Argentina	1,566	36.30	6.00	100.00	Yes	1991	0.36	Yes	1957	0.11
Rwanda	157	34.39	2.00	0.10	Yes	1990	0.68	Yes	1990	0.21
Kazakhstan	351	32.07	5.00	29.50	No		0.00	Yes	2006	0.89
Romania	264	30.58	5.00	30.20	Yes	2000	0.46	Yes	2004	0.43
Bosnia and H.	234	29.91	5.00	64.30	Yes	2007	0.30	Yes	2001	0.50
Armenia	198	28.43	5.00	34.50	Yes	2003	0.52	Yes	2007	0.75
El Salvador	785	27.76	5.33	84.63	Yes	1996	0.48	Yes	1967	0.68
Lithuania	203	26.63	6.00	18.40	Yes	1996	0.63	Yes	2009	0.68
Latvia	211	25.60	4.00	3.50	Yes	2008	0.39	No		0.00
Paraguay	593	25.25	6.00	51.46	Yes	1995	0.30	Yes	1963	0.00
Bangladesh	1,432	25.07	2.00	0.60	Yes	1992	0.48	No		0.00
Colombia	1,623	24.46	5.00	46.10	No		0.00	Yes	1981	0.79
Ecuador	735	24.18	4.80	44.22	Yes	2008	0.57	Yes	2005	0.61
Fyr Macedonia	257	23.53	4.00	6.50	Yes	1997	0.45	Yes	2010	0.64
Bolivia	533	23.31	5.27	23.25	Yes	1988	0.38	Yes	2003	0.54
Albania	121	23.08	0.00	0.00	Yes	2008	0.46	No		0.00
Poland	236	22.67	4.00	68.30	No		0.00	Yes	2001	0.46
Mexico	2,301	20.33	6.00	70.61	No		0.00	Yes	1995	0.39
Sierra Leone	35	20.00	0.00	0.00	No		0.00	No		0.00
Croatia	488	19.78	0.00	72.40	No		0.00	Yes	2007	0.61
Czech Rep.	170	19.64	5.00	73.10	Yes	2002	0.21	Yes	2002	0.43
Chile	1,600	19.62	5.00	29.65	Yes	1977	0.52	Yes	1928	0.32
Dominican	278	19.49	6.00	47.30	Yes	1993	0.36	Yes	1997	0.57
Guatemala	828	19.46	5.45	12.70	Yes	2004	0.29	Yes	1975	0.61
Pakistan	701	18.83	4.00	1.40	Yes	1993	0.57	Yes	2001	0.21
Namibia	234	18.80	5.00	35.20	No		0.00	Yes	1990	0.57
Bulgaria	1,083	17.69	5.19	22.55	Yes	2000	0.36	Yes	2005	0.64
Slovenia	228	17.54	4.00	2.70	Yes	1993	0.20	No		0.00
Slovak Rep.	151	15.23	4.00	44.00	Yes	1997	0.66	Yes	2004	0.54
Peru	1,351	14.70	6.00	31.41	Yes	1984	0.43	Yes		0.00
Turkey	613	14.50	5.00	26.30	Yes	1951	0.34	Yes	1999	0.50
Indonesia	1,069	13.88	4.00	26.10	Yes	1988	0.75	Yes		0.00
Venezuela	136	13.33	0.00	0.00	Yes		0.00	Yes		
Philippines	997	12.16	3.00	6.10	No		0.00	Yes	1990	0.00
Hungary	259	10.16	5.00	10.30	No		0.00	Yes	1995	0.25
South Africa	813	9.96	5.00	52.10	No		0.00	Yes	1901	0.54
Panama	469	8.86	6.00	41.59	No		0.00	Yes	1957	0.57
Total	29,029									
Average		26.31	4.33	35.71			0.28			0.39
Proportion all obs (%)					62.43			90.44		

Table 4.3 Cross-tabulation of financing constraints

This table reports the distribution of financing constraints by credit information sharing scope, firm and country-level characteristics. 'Low' and 'High' threshold refers to the sample median of a given country variable and a firm indicator. Small and large firm represent, respectively, the bottom and the top tercile, of the firm size distribution. Mean financing constraints represent the fraction of firms that are financially constrained within a given group below or over the median (except for legal origin and the developed status, which are determined by the World Bank income group category). Definitions of the variables are in Appendix A4.1.

		Mean financing constraints		
		Large firms	Small firms	All firms
Scope of credit information	High	0.19	0.27	0.24
	Low	0.23	0.35	0.29
	All	0.20	0.31	0.26
Scale of credit information	High	0.23	0.29	0.28
	Low	0.19	0.32	0.25
	All	0.20	0.31	0.26
Positive and negative information	Yes	0.20	0.29	0.25
	No	0.37	0.54	0.44
	All	0.20	0.31	0.26
Information on firms and individuals	Yes	0.21	0.31	0.27
	No	0.20	0.31	0.25
	All	0.20	0.31	0.26
Guaranteed inspection by borrowers	Yes	0.21	0.31	0.26
	No	0.15	0.19	0.19
	All	0.20	0.28	0.25
Secrecy law	Yes	0.21	0.30	0.26
	No	0.18	0.30	0.25
	All	0.20	0.30	0.26
Audited statements	Yes	0.19	0.29	0.23
	No	0.24	0.32	0.29
	All	0.20	0.31	0.26
Government ownership	Yes	0.21	0.31	0.27
	No	0.20	0.31	0.26
	All	0.20	0.31	0.26
Bank concentration	High	0.19	0.34	0.26
	Low	0.21	0.29	0.26
	All	0.20	0.31	0.26
Legal system	Strong	0.22	0.29	0.26
	Weak	0.19	0.32	0.26
	All	0.20	0.31	0.26
Legal origin	English	0.34	0.41	0.30
	French	0.27	0.29	0.25
	German	0.20	0.22	0.19
	Socialist	0.37	0.35	0.38
	All	0.28	0.31	0.26

Table 4.4 Financing constraints and credit information sharing systems

This table reports the estimates of probit regressions where the dependent variable is the measure of f*inancing constraints*. Each regression includes dummies for the legal form of the firms in the sample, sectors, years, and perceptions of truthfulness of the survey interviewees. The models are estimated with robust standard errors adjusted by clustering by countries. Reference category for legal origin = "English". The definitions of the variables are in Appendix A4.1. Z values are reported in brackets. *, **, *** indicate respectively significance at 10%, 5%, and 1 % level.

Model:	(1)		(2)		(3)		(4)		(5)	
Dep var: financing constraints										
Credit information sharing										
Scope of credit information	-0.095***	(-4.13)	-0.084***	(-2.80)	-0.081***	(-3.06)	-0.071***	(-3.01)	-0.077***	(-3.71)
Scale of credit information	0.059**	(2.13)	0.066**	(2.15)	0.053*	(1.79)	0.056**	(2.29)	0.077**	(2.56)
Firm characteristics										
Ln firm age	-0.023	(-1.09)	-0.023	(-1.08)	-0.016	(-0.76)	-0.021	(-1.00)	-0.017	(-0.80)
Direct exports (% of sales)	-0.00096	(-1.27)	-0.00094	(-1.21)	-0.00070	(-0.97)	-0.00089	(-1.17)	-0.00099	(-1.33)
Ln number of full time employees	-0.079***	(-4.77)	-0.080***	(-4.98)	-0.081***	(-5.35)	-0.077***	(-4.80)	-0.075***	(-5.24)
2-year firm growth ln(t-1/t-3)	-0.0013	(-0.12)	-0.00076	(-0.071)	-0.0055	(-0.50)	-0.0020	(-0.19)	-0.0072	(-0.71)
Government ownership (>20%)	0.15	(1.14)	0.16	(1.18)	0.15	(1.13)	0.15	(1.09)	0.15	(1.08)
Audited financial statements	-0.070	(-1.62)	-0.068	(-1.59)	-0.058	(-1.49)	-0.065	(-1.52)	-0.050	(-1.29)
Economic environment										
GDP per capita growth	-0.029***	(-2.61)	-0.030***	(-2.76)	-0.025**	(-2.41)	-0.030***	(-2.88)	-0.030***	(-2.88)
Inflation rate	0.013	(1.28)	0.016	(1.50)	0.011	(1.00)	0.019*	(1.88)	0.021**	(2.24)
Prevalence of bank finance	-0.0028	(-0.86)	-0.0025	(-0.72)	-0.0021	(-0.59)	-0.0015	(-0.51)		
High bank concentration	0.16*	(1.88)	0.15*	(1.68)	0.17**	(2.11)	0.43*	(1.85)	0.24***	(3.26)
Bank z-score	-0.0094**	(-2.24)	-0.0092**	(-2.22)	-0.0068	(-1.63)	-0.0082**	(-2.03)	-0.0077**	(-2.23)
Credit market regulation index	-0.20***	(-3.77)	-0.20***	(-3.80)	-0.23***	(-4.26)	-0.20***	(-3.78)	-0.17***	(-3.72)
Scope of credit information										
* High bank concentration							-0.065	(-1.41)		
Loans from domestic banks									-0.0045***	(-3.88)
Loans from foreign banks									-0.00084	(-1.38)
Legal environment										
Weak legal system	-0.027	(-0.28)	0.086	(0.31)			-0.041	(-0.41)	-0.087	(-1.00)
Scope of credit information										
* Weak legal system			-0.028	(-0.53)						
Legal origin = French					0.0080	(0.055)				
Legal origin = German					0.078	(0.38)				
Legal origin = Socialist					0.36*	(1.74)				
Constant	2.13***	(3.44)	2.08***	(3.24)	2.20***	(3.86)	1.96***	(3.18)	1.85***	(3.61)
N	21,277		21,277		21,277		21,277		20,971	
Pseudo R2	0.061		0.061		0.063		0.062		0.068	

Table 4.5 Information content and accessibility

This table reports the estimates of probit regressions where the dependent variable is the measure of f*inancing constraints*. Each regression includes dummies for the legal form of the firms in the sample, sectors, years, and perceptions of truthfulness of the survey interviewees. The models are estimated with robust standard errors adjusted by clustering by countries. The definitions of the variables are in Appendix A4.1. Z values are reported in brackets. *, **, *** indicate respectively significance at 10%, 5%, and 1 % level.

Model:	(1)		(2)		(3)		(4)		(5)		(6)	
Dep var: financing constraints												
Credit information sharing												
Information on firms and individuals	-0.22**	(-2.04)									-0.13	(-1.17)
Positive and negative information			-0.54**	(-2.54)							-0.78**	(-2.47)
Guaranteed inspection by borrowers					0.52***	(4.59)					0.51***	(4.62)
Information from retailers and traders							0.078	(0.61)			0.061	(0.59)
Secrecy law									0.0059	(0.045)	0.25**	(2.54)
Firm characteristics												
Ln firm age	-0.035	(-1.52)	-0.032	(-1.39)	-0.030	(-1.30)	-0.040*	(-1.77)	-0.040*	(-1.70)	-0.023	(-1.06)
Direct exports (% of sales)	-0.00059	(-0.80)	-0.00099	(-1.30)	-0.00072	(-1.10)	-0.00070	(-0.96)	-0.0011	(-1.50)	-0.00054	(-0.87)
Ln number of full time employees	-0.075***	(-4.63)	-0.072***	(-4.52)	-0.064***	(-5.07)	-0.075***	(-4.59)	-0.077***	(-4.70)	-0.068***	(-5.42)
2-year firm growth ln(t-1/t-3)	-0.0043	(-0.42)	-0.0011	(-0.10)	-0.011	(-1.02)	-0.0033	(-0.33)	0.00034	(0.034)	-0.0069	(-0.62)
Government ownership (>20%)	0.20	(1.48)	0.19	(1.50)	0.15	(1.11)	0.23*	(1.73)	0.23	(1.61)	0.16	(1.10)
Audited financial statements	-0.088**	(-2.01)	-0.077*	(-1.70)	-0.093**	(-2.36)	-0.071	(-1.58)	-0.047	(-1.09)	-0.088**	(-2.27)
Legal and economic environment												
GDP per capita growth	-0.027**	(-2.01)	-0.017	(-1.22)	-0.0018	(-0.15)	-0.022	(-1.41)	-0.014	(-1.04)	0.0096	(0.95)
Inflation rate	0.018	(1.40)	-0.0024	(-0.16)	-0.0088	(-0.62)	0.012	(0.80)	0.0087	(0.60)	-0.025	(-1.51)
Prevalence of bank finance	-0.0019	(-0.47)	-0.0022	(-0.60)	-0.0048	(-1.29)	-0.0051	(-1.32)	-0.0055	(-1.39)	-0.0041	(-0.98)
High bank concentration	0.15	(1.43)	0.15	(1.51)	0.078	(0.91)	0.13	(1.27)	0.10	(1.00)	0.058	(0.87)
Bank z-score	-0.0090*	(-1.86)	-0.0071	(-1.60)	-0.0090**	(-2.41)	-0.0075	(-1.58)	-0.0078	(-1.54)	-0.012***	(-3.20)
Credit market regulation index	-0.27***	(-5.17)	-0.22***	(-4.37)	-0.21***	(-6.12)	-0.23***	(-4.62)	-0.26***	(-5.17)	-0.26***	(-8.74)
Weak legal system	0.063	(0.59)	0.062	(0.63)	0.25**	(2.24)	0.0073	(0.066)	-0.056	(-0.51)	0.21*	(1.79)
Constant	2.32***	(3.92)	2.31***	(4.00)	1.28***	(2.92)	1.91***	(3.36)	2.24***	(3.94)	2.51***	(5.40)
N	21,277		21,277		19,982		21,277		20,418		19,982	
Pseudo R2	0.052		0.053		0.053		0.049		0.050		0.059	

Table 4.6 Information content type and information provider

This table reports the estimates of probit regressions where the dependent variable is the measure of f*inancing constraints*. "CR" refers to public credit registry, "CB" refers to private credit bureau. Each regression includes dummies for the legal form of the firms in the sample, sectors, years, and perceptions of truthfulness of the survey interviewees. The models are estimated with robust standard errors adjusted by clustering by countries. The definitions of the variables are in Appendix A4.1. Z values are reported in brackets. *, **, *** indicate respectively significance at 10%, 5%, and 1 % level.

Model:	(1)		(2)		(3)	
Dep var: financing constraints						
Credit information sharing						
Personal information	-0.10	(-0.52)				
Loan information	0.22	(1.18)				
Liabilities and financial positions	-0.071	(-0.23)				
CR - Personal information			-0.65**	(-2.19)		
CR - Loan information			0.35	(1.35)		
CR - Liabilities and financial positions			-0.44*	(-1.73)		
CB - Personal information					0.58*	(1.87)
CB - Loan information					0.30	(0.96)
CB - Liabilities and financial positions					-0.40	(-1.35)
Firm characteristics						
Ln firm age	-0.035	(-1.35)	-0.037	(-1.62)	-0.032	(-1.22)
Direct exports (% of sales)	-0.00070	(-0.94)	-0.00042	(-0.61)	-0.00039	(-0.57)
Ln number of full time employees	-0.077***	(-4.47)	-0.066***	(-4.90)	-0.077***	(-4.96)
2-year firm growth ln(t-1/t-3)	-0.0043	(-0.37)	-0.011	(-1.07)	-0.013	(-1.05)
Government ownership (>20%)	0.26*	(1.90)	0.21	(1.54)	0.24*	(1.86)
Audited financial statements	-0.071*	(-1.81)	-0.11***	(-2.91)	-0.077**	(-1.99)
Legal and economic environment						
GDP per capita growth	-0.0096	(-0.65)	-0.022*	(-1.75)	-0.013	(-0.77)
Inflation rate	0.020	(1.40)	0.015	(1.23)	0.022*	(1.67)
Prevalence of bank finance	-0.0063	(-1.36)	-0.0022	(-0.56)	-0.0071*	(-1.78)
High bank concentration	0.057	(0.53)	0.12	(1.19)	0.068	(0.63)
Bank z-score	-0.0080	(-1.57)	-0.010**	(-2.08)	-0.011**	(-2.32)
Credit market regulation index	-0.22***	(-4.34)	-0.29***	(-5.87)	-0.22***	(-5.34)
Weak legal system	-0.0010	(-0.0090)	0.067	(0.66)	-0.027	(-0.24)
Constant	1.70***	(3.20)	2.56***	(4.36)	1.58***	(3.46)
N	19,115		21,277		19,115	
Pseudo R2	0.048		0.058		0.053	

Table 4.7 Information users

This table reports the estimates of probit regressions where the dependent variable is the measure of f*inancing constraints*. Each regression includes dummies for the legal form of the firms in the sample, sectors, years, and perceptions of truthfulness of the survey interviewees. The models are estimated with robust standard errors adjusted by clustering by countries. The definitions of the variables are in Appendix A4.1. Z values are reported in brackets. *, **, *** indicate respectively significance at 10%, 5%, and 1 % level.

Model:	(1)		(2)		(3)		(4)	
Dep var: financing constraints								
Credit information sharing								
Scope of credit information	-0.12***	(-4.30)	-0.15***	(-4.43)	-0.12***	(-4.39)	-0.15***	(-4.18)
Scale of credit information	0.060**	(2.16)	0.064**	(2.57)	0.061**	(2.12)	0.064**	(2.22)
Users - banks	0.087	(1.19)					-0.036	(-0.40)
Users - non-banks			0.24**	(2.43)			0.25**	(2.23)
Users - retailers and traders					0.11	(1.24)	0.043	(0.47)
Firm characteristics								
Ln firm age	-0.019	(-0.87)	-0.018	(-0.79)	-0.020	(-0.91)	-0.018	(-0.81)
Direct exports (% of sales)	-0.00095	(-1.21)	-0.00063	(-0.92)	-0.00084	(-1.11)	-0.00058	(-0.86)
Ln number of full time employees	-0.080***	(-4.92)	-0.076***	(-5.11)	-0.082***	(-5.06)	-0.077***	(-5.24)
2-year firm growth ln(t-1/t-3)	-0.0052	(-0.45)	-0.012	(-0.99)	-0.0064	(-0.56)	-0.012	(-1.07)
Government ownership (>20%)	0.14	(1.05)	0.14	(1.02)	0.15	(1.11)	0.14	(1.05)
Audited financial statements	-0.052	(-1.32)	-0.061	(-1.58)	-0.059	(-1.47)	-0.064	(-1.64)
Legal and economic environment								
GDP per capita growth	-0.030***	(-2.64)	-0.027**	(-2.41)	-0.031***	(-2.81)	-0.027**	(-2.50)
Inflation rate	0.015	(1.50)	0.0055	(0.54)	0.012	(1.12)	0.0040	(0.39)
Prevalence of bank finance	-0.0019	(-0.61)	-0.0034	(-1.16)	-0.0021	(-0.64)	-0.0035	(-1.14)
High bank concentration	0.11	(1.39)	0.064	(0.89)	0.12	(1.42)	0.065	(0.90)
Bank z-score	-0.011***	(-2.87)	-0.014***	(-4.11)	-0.0089**	(-2.16)	-0.013***	(-2.96)
Credit market regulation index	-0.18***	(-3.40)	-0.13***	(-2.61)	-0.17***	(-3.35)	-0.13**	(-2.53)
Weak legal system	-0.060	(-0.63)	-0.17	(-1.62)	-0.078	(-0.72)	-0.18	(-1.63)
Constant	1.97***	(3.34)	1.81***	(3.30)	1.98***	(3.41)	1.81***	(3.32)
N	20,851		20,851		20,851		20,851	
Pseudo R2	0.061		0.064		0.061		0.064	

Table 4.8 Differential effect of firm size

This table reports estimates of probit regressions where the dependent variable is the measure of f*inancing constraints*. Each regression includes dummies for the legal form of the firms, sectors, years, and perceptions of truthfulness of the survey interviewees. The models are estimated with robust standard errors adjusted by clustering by countries. Small firm is a dummy variable representing the bottom tercile of the firm size distribution. The definitions of the variables are in Appendix A4.1. Z values are reported in brackets. *, **, *** indicate respectively significance at 10%, 5%, and 1 % level.

Model:	(1)		(2)		(3)		(4)		(5)	
Dep var: financing constraints										
Credit information sharing										
Scope of credit information	-0.080***	(-3.51)	-0.095***	(-4.09)	-0.12***	(-4.32)	-0.15***	(-4.49)	-0.12***	(-4.39)
Scale of credit information	0.057**	(2.12)	0.066**	(2.20)	0.059**	(2.11)	0.061**	(2.51)	0.059**	(2.08)
Users - banks					0.11	(1.47)				
Users - non-banks							0.27***	(2.76)		
Users - retailers and traders									0.13	(1.44)
Firm characteristics										
Ln firm age	-0.041*	(-1.94)	-0.042**	(-1.98)	-0.038*	(-1.75)	-0.037	(-1.62)	-0.039*	(-1.79)
Direct exports (% of sales)	-0.0018**	(-2.21)	-0.0018**	(-2.20)	-0.0018**	(-2.18)	-0.0014**	(-2.02)	-0.0017**	(-2.02)
Ln number of full time employees										
2-year firm growth ln(t-1/t-3)	-0.0044	(-0.41)	-0.0037	(-0.34)	-0.0076	(-0.65)	-0.014	(-1.16)	-0.0086	(-0.75)
Government ownership (>20%)	0.13	(0.97)	0.12	(0.89)	0.11	(0.80)	0.11	(0.81)	0.12	(0.89)
Audited financial statements	-0.10**	(-2.54)	-0.10**	(-2.52)	-0.088**	(-2.34)	-0.097***	(-2.61)	-0.095**	(-2.46)
Small firm	0.34***	(3.39)	0.14***	(3.10)	0.23**	(2.22)	0.22***	(2.76)	0.18***	(3.55)
Small firm * Scope of credit information	-0.053***	(-2.62)								
Small firm * Scale of credit information			-0.040	(-1.14)						
Small firm * Users - banks					-0.084	(-1.15)				
Small firm * Users - nonbanks							-0.12*	(-1.82)		
Small firm * Users - retailers and traders									-0.100*	(-1.89)
Legal and economic environment										
GDP per capita growth	-0.028***	(-2.62)	-0.028***	(-2.59)	-0.029***	(-2.67)	-0.027**	(-2.44)	-0.031***	(-2.82)
Inflation rate	0.013	(1.28)	0.013	(1.27)	0.015	(1.50)	0.0052	(0.52)	0.012	(1.12)
Prevalence of bank finance	-0.0024	(-0.76)	-0.0025	(-0.77)	-0.0016	(-0.53)	-0.0031	(-1.07)	-0.0018	(-0.53)
High bank concentration	0.15*	(1.84)	0.16*	(1.88)	0.11	(1.42)	0.062	(0.89)	0.12	(1.45)
Bank z-score	-0.0091**	(-2.25)	-0.0090**	(-2.17)	-0.010***	(-2.78)	-0.014***	(-4.14)	-0.0083**	(-2.05)
Credit market regulation index	-0.20***	(-3.79)	-0.20***	(-3.73)	-0.17***	(-3.36)	-0.13***	(-2.58)	-0.17***	(-3.27)
Weak legal system	-0.019	(-0.21)	-0.025	(-0.26)	-0.052	(-0.56)	-0.16	(-1.55)	-0.073	(-0.68)
Constant	1.74***	(2.84)	1.80***	(2.90)	1.59***	(2.75)	1.46***	(2.77)	1.61***	(2.77)
N	21277		21277		20851		20851		20851	
Pseudo R2	0.059		0.059		0.058		0.062		0.059	

Table 4.9 Conditional financing constraints and loan terms

This table reports the estimates of regressions where the dependent variable is the measure of *financing constraints* (models 1 and 2), loan size (models 3 and 4), collateral (model 5), and maturity (model 6). Models 1, 2 and 5 use probit regressions, models 3 and 5 use OLS regressions. Loan size represents the value of the most recent loan as a percentage of the annual sales of a firm. Collateral is a binary variable indicating whether a firm was requested to post a collateral for its most recent loan. Maturity is the number of months that a firm was granted to pay-off the loan or credit line. Each regression includes dummies for the legal form of the firms, sectors, years, and perceptions of truthfulness of the survey interviewees. The models are estimated with robust standard errors adjusted by clustering by countries. The definitions of the variables are in Appendix A4.1. Z values are reported in brackets. *, **, *** indicate respectively significance at 10%, 5%, and 1 % level.

Model:	(1)		(2)		(3)		(4)		(5)	
Dep var:	Financing constraints		Financing constraints		Loan size		Collateral		Maturity	
Credit information sharing										
Scope of credit information	-0.079***	(-3.86)	-0.11***	(-4.88)	-0.0074	(-0.50)	-0.15***	(-3.98)	0.72	(0.40)
Scale of credit information	0.073***	(3.11)	0.037	(0.99)	0.030	(1.56)	0.10**	(2.24)	3.45*	(1.75)
Firm characteristics										
Ln firm age	-0.022	(-0.70)	-0.030	(-1.25)	-0.039	(-1.36)	-0.066*	(-1.83)	-2.47*	(-1.95)
Direct exports (% of sales)	-0.00027	(-0.34)	-0.00078	(-0.73)	0.0018	(1.21)	0.00091	(0.88)	-0.032	(-1.19)
Ln number of full time employees	-0.076***	(-4.18)	-0.079***	(-4.98)	0.022	(0.74)	0.039	(1.42)	0.31	(0.97)
Ln number of full time employees * Scope										
2-year firm growth ln(t-1/t-3)	-0.018	(-1.10)	0.000054	(0.0035)	-0.16**	(-2.36)	-0.0012	(-0.10)	-0.72	(-0.72)
Government ownership (>20%)	-0.17	(-0.82)	0.47***	(2.90)	-0.092	(-1.46)	-0.48***	(-2.79)	-19.3***	(-3.47)
Audited financial statements	-0.024	(-0.62)	-0.16***	(-2.84)	-0.0026	(-0.046)	0.068	(1.28)	4.36**	(2.22)
Legal and economic environment										
GDP per capita growth	-0.019*	(-1.68)	-0.023**	(-2.07)	0.0022	(0.27)	-0.017	(-0.94)	0.85	(0.49)
Inflation rate	0.011	(1.15)	0.0056	(0.52)	0.012*	(1.92)	-0.0054	(-0.29)	0.14	(0.27)
Prevalence of bank finance	-0.0054	(-1.62)	-0.00046	(-0.13)	-0.0066***	(-2.90)	-0.0075	(-1.31)	0.12	(0.49)
High bank concentration	0.048	(0.64)	0.14*	(1.66)	0.069	(1.40)	0.42***	(2.96)	9.29	(1.61)
Bank z-score	-0.014***	(-4.03)	-0.012***	(-3.26)	-0.0030	(-1.21)	-0.018***	(-2.80)	0.76*	(2.02)
Credit market regulation index	-0.14**	(-2.50)	-0.29***	(-5.34)	0.0054	(0.16)	0.38***	(5.64)	3.43	(0.65)
Weak legal system	-0.037	(-0.43)	0.0057	(0.059)	-0.0025	(-0.048)	0.22	(1.39)	7.72	(1.28)
Constant	1.68**	(2.53)	3.05***	(4.57)	0.20	(0.52)	-1.95**	(-2.14)	-18.1	(-0.32)
N	9,177		10,504		8,218		9,066		4,510	
Pseudo R2	0.049		0.094				0.10			
R2					0.020				0.069	

Chapter 5

Summary and Conclusion

Access to finance is crucial for firms' operations and growth. New investment projects frequently require financing that is greater than internally available resources. The role of financial intermediaries is to allocate capital to its most productive use. However, financial markets pose a number of frictions that inhibit the efficient capital allocation. The most significant frictions include information asymmetries and agency costs. If investors or financial intermediaries cannot accurately assess the prospects of a firm, they tend to tighten financing terms. Tighter financing terms attract lower quality firms – an adverse selection problem. The problem of agency costs relates to diverging incentives between finance providers and firms. Since firms have control over the use of the capital, finance providers undergo the risk that firms will engage in activities that are not in their interest – moral hazard. The existence of these frictions leads to financing constraints. Financially constrained firms have to forego profitable investment opportunities because they cannot access external finance or the financing terms are unfavorable. Financing constraints are greater for smaller firms due to larger information asymmetries and due to higher fixed screening costs of a larger number of smaller firms. The question of financing constraints belongs to the most important problems of corporate finance, which continues to severely impact firms worldwide.

This dissertation investigates financing constraints in a cross-country context. We examine three core subjects related to financing constraints: i) the costs and benefits of relationship lending; ii) the conditional occurrence of credit constraints; and iii) the role of credit information sharing systems.

In chapter 2, we focus on relationship lending as the most important financing technology for SMEs. Both lenders and borrowers can benefit from close lending relationships. Through repeated interactions lenders obtain more private information about borrowers. With lower information asymmetries lenders can offer better lending terms to borrowers. However, the accumulated private information makes switching to competition costly. Therefore, lenders have an incentive to informationally capture borrowers. First, a lender can offer favorable terms in the beginning of the relationship, but later extracts additional rents, such as higher interest rates, when the switching to a competitor becomes costly for a borrower – a hold-up problem. The empirical literature on the costs and benefits of relationship lending is widely mixed due to different samples, periods, and measures. In this chapter we use meta-analysis to quantify the overall effect of relationship lending and to explain the differences in the results. Lending relationships operate through multiple channels and lending outcomes occur through different lending terms. We develop a multidimensional conceptual framework by combining four dimensions of the relationship strength (time, distance, exclusivity, and cross-product synergies) with four lending outcomes (cost of credit, volume, collateral, and maturity). First, we estimate the overall effect of relationship lending for each category of relationship lending dimensions and lending terms. Next, we use meta-regressions to explain the heterogeneity in the studies by differences in lending environments. The empirical analysis is based on 2,979 effects from 101 studies. The datasets from the original studies encompass more than 4.1million data observations from 28 countries. The results show that relationship lending is generally beneficial for borrowers, but lending outcomes differ across the relationship dimensions. For instance, interest rates are lower in longer and more exclusive relationships, but higher if firms are located in a close proximity to a lender. Borrowers in exclusive relationships are also required to post more collateral. In meta-regression analyses we find that relationship lending benefits are more likely in countries with more competitive banking systems. Surprisingly, they are not related to the importance of SMEs in an economy, suggesting that prevalence of relationship lending does not necessarily come along with borrower benefits.

In chapter 3, I investigate credit constraints in a sample of small firms from 14 Euro-area countries in the period 2009-2013. Economic literature considers credit constraints in the context of credit rejection rates. However, the problem is significantly larger. Borrowers may be discouraged from applying for credit because they anticipate that they will rejected (Brown et al., 2011; Cole, 2008; Popov and Udell, 2011). Moreover, approved borrowers may also be credit constrained if the loan amount is insufficient or if the credit terms are unfavorable for the full execution of an intended investment project. Accounting for these instances, the total number of credit constrained firms in the sample is four times as high in absolute terms

compared to the credit rejections (over 10% of all firms). The large prevalence of credit constraints is largely undocumented and not explained in the literature. In this chapter I develop a more complete framework of credit constraints. I decompose the credit constraints into three conditional stages: discouragement, rejections, and unfavorable terms. The occurrence of credit constraints is conditional because the outcome at each stage is conditional on the result from the previous stage. I document the prevalence of each stage and explain the cross-country differences by firm, bank, and country characteristics. I find large variation in the likelihood of credit constraints across countries and across the individual stages of credit constraints. The variation cannot be explained by firm risk characteristics alone. The results show that cross-sectional differences are related to bank lending environment and, in particular, to bank lending standards. I find that tighter lending standards are associated with higher discouragement and rejection rates, but, conditional on approval, tight lending standards make unfavorable loan terms to borrowers less likely. The effect is mainly due to higher loan volume rather than lower loan rates. Borrowers are more likely to be discouraged or rejected in countries with risky banking sectors. In the additional tests, I examine the consistency of the stages of credit constraints across various credit instruments and test the effects of the alternative financing options. The empirical analysis suggests that bank lending standards may induce inefficient lending. If banks substitute higher rejection rates with higher credit volume, the overall outcome may lead to lower credit availability to smaller and more risky borrowers.

In the last chapter, we analyze the role of credit information sharing systems in alleviating financing constraints. Credit information sharing systems can reduce information asymmetries between finance providers and firms by pooling private information about firms from multiple sources. This mechanism can reduce the impact of several market frictions. By making information about financing behavior accessible to other parties, credit information sharing systems allow finance providers to reduce uncertainty and set more accurately the financing terms for firms. It can also mitigate the hold-up problems by reducing the switching costs. If information is shared and readily available, firms can more easily switch to a competition if financing terms are not favorable. Finally, credit information sharing systems incentivize firms to honor their financial obligations and maintain their good standing since the information is visible to other parties. On the one hand, greater credit information sharing can lead to greater availability of finance. On the other hand, the aggregate increase in credit information sharing can lead to credit rationing. If banks exchange more information about borrowers while the quality of the borrowers remains the same, the overall increase in lending due to better information may be a redistribution effect from lower-quality borrowers to higher-quality borrowers (Jappelli and Pagano, 2000). In this chapter we disentangle the effect of credit information scale (credit information coverage) from credit

information scope (depth of credit information). In a large sample of companies from 45 developing economies in the period 2006-2012, we examine the components of credit information sharing mechanisms and information content. We present evidence of a dichotomous effect of credit information sharing. While information scope is associated with lower financing constraints, information scale is associated with higher financing constraints. Greater credit information scope is more beneficial for small firms. The significance of credit information scope is unaffected by information sharing mechanism and content. We find that financing constraints are less likely in countries with lower credit regulation, safer and more competitive banking systems, and higher growth. Overall, these findings indicate that accurate and deep information, rather than information coverage alone, contribute to lower financing constraints.

In summary, this dissertation examines the mechanisms that can help firms to lower the barriers in accessing finance. This study offers insights on the role of the institutional environment and policy interventions that can influence the outcomes of financial intermediation. The empirical results demonstrate that promising venues exist for increasing firms' access to finance. It is the hope of the author that this study will open opportunities for developing and implementing new effective solutions for greater access to finance.

Nederlandse samenvatting

(Summary in Dutch)

Toegang tot financiering is cruciaal voor de activiteiten en groei van bedrijven. Nieuwe investeringsprojecten vereisen regelmatig meer kapitaal dan de intern beschikbare financiële middelen. De rol van financiële intermediairs is om kapitaal zo toe te wijzen dat het de productiviteit optimaal vergroot. Echter, financiële markten vertonen een aantal fricties die een efficiënte allocatie van kapitaal tegenwerken. Financieel beperkte bedrijven moeten van winstgevende investeringsmogelijkheden afzien omdat ze geen toegang hebben tot externe financiering of omdat de financieringsvoorwaarden ongunstig zijn. Financieringsbeperkingen zijn groter voor kleinere bedrijven als gevolg van meer informatie asymmetrie. Het onderwerp financieringsbeperkingen behoort tot de belangrijkste problemen van bedrijfsfinanciering, dat nog steeds een enorm effect heeft op bedrijven wereldwijd.

In dit proefschrift worden in drie studies de mechanismes besproken die kunnen bijdragen aan het reduceren van financieringsbeperkingen voor bedrijven. In de eerste studie worden de kosten en baten van het hebben van kredietrelaties besproken. Een meta-analyse laat zien dat kredietrelaties over het algemeen gunstig zijn voor kredietnemers, maar dat resultaten van het lenen variëren over de dimensies van de relatie. De rente is bijvoorbeeld lager in langere en meer exclusieve relaties, maar hoger als zij zich dicht bij de uitlener bevinden. Ook wordt van kredietnemers in exclusieve relaties vereist om meer onderpand aan te bieden. Daarnaast zijn de voordelen van kredietrelaties waarschijnlijker in landen met meer concurrerende banksystemen. Verrassend is dat zij niet gerelateerd zijn aan het belang van het MKB in een economie, wat suggereert dat de prevalentie van relatie leningen niet per se overeenkomt met de voordelen van de kredietnemer.

In de tweede studie ontwikkel ik een completer kader van finacieringsbeperkingen. Dit nieuwe kader beschrijft het voorkomen van financieringsbeperkingen in sequentiële conditionele fases. De resultaten laten zien dat financieringsbeperkingen varieëren met het klimaat van bancaire kredietverlening bovenop bedijfsrisico. Strengere kredietvoorwaarden worden geassocieerd met meer financieringsbeperkingen, maar gegeven goedkeuring resulteren striktere kredietvoorwaarden in een lagere waarschijnlijkheid van ongunstige leningsvoorwaarden voor de kredietnemers. Uit de empirische analyse blijkt dat kredietvoorwaarden inefficiënte kredietverlening kunnen veroorzaken. Als banken hogere afwijzingspercentages vervangen door meer kredietverstrekking, kan het algehele resultaat leiden tot een lagere beschikbaarheid van krediet voor kleinere en meer risicovolle kredietnemers.

In de derde studie analyseren we de rol van kredietinformatie uitwisselingssystemen in het verlichten van financieringsbeperkingen. Kredietinformatie uitwisselingssystemen kunnen de informatieasymmetrie tussen de financiers en de bedrijven verminderen door privé-informatie over de bedrijven uit meerdere bronnen te bundelen. Aan de ene kant kan een hogere mate van het delen van kredietinformatie leiden tot een grotere beschikbaarheid van financiering. Aan de andere kant kan deze totale toename leiden tot rantsoenering van financiering. De analyse laat zien dat er een dichotoom effect is van krediet informatie-uitwisseling; enerzijds via informatie detail en anderzijds via informatie hoeveelheid. Terwijl informatieomvang wordt geassocieerd met minder financieringsproblemen, wordt informatie schaal geassocieerd met meer financieringsproblemen. Deze bevindingen wijzen erop dat nauwkeurige en diepe informatie, in plaats van informatie over de dekking alleen, bijdragen aan de vermindering van financieringsbeperkingen. De bevindingen tonen aan dat er veelbelovende nieuwe mogelijkheden bestaan om voor bedrijven de toegang tot kapitaal te verbeteren.

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ACCESS TO FINANCE IN A CROSS-COUNTRY CONTEXT

Access to finance is one of the most serious obstacles faced by companies. Financing constraints lead to large opportunity costs, which translate into negative consequences for economic growth, productivity, and welfare. In three studies, this dissertation examines the mechanisms that can help to reduce financing constraints. The first study investigates the costs and benefits of relationship lending – an essential financing instrument of private companies. Using meta-analysis, this study reveals that relationship lending is generally beneficial for companies, but lenders and companies face trade-offs in lending relationships and lending outcomes. Borrower benefits are more likely in the US and in countries where bank competition is high. They are not related to the importance of small and medium-sized enterprises (SMEs) in an economy, suggesting that prevalence of relationship lending does not necessarily come along with borrower benefits. The second study develops a more complete conceptual framework of credit constraints. The new framework describes the occurrence of credit constraints in sequential, conditional stages. The results show that credit constraints vary with bank lending environment beyond the firm risk. Bank lending standards are strongly related to credit constraints, but the direction and the magnitude of the effect depend on the conditional stage. The conditional nature and the stage-specific differences in the determinants provide an important guidance for economic policies aimed at efficient allocation of credit. The third study examines the role of credit information sharing systems. The analysis documents dichotomous effects of the information scope (depth of information) and scale (information coverage). While the information scope is associated with lower financing constraints, the information scale is associated with higher financing constraints. These findings suggest that accurate and deep information sharing systems, rather than the information coverage alone, contribute to lower financing constraints. The empirical results from the three studies demonstrate that promising new venues exist for improving firms' access to finance.

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