Relationship Lending and Small Business Finance: Empirical Analysis of Cost of Capital, Credit Rationing, and Firm Performance

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Chapter 1

Introduction

Lending relationships play a prominent role for financing small and medium enterprises (SMEs) within a context of asymmetric information. This thesis investigates the sources of the value of lending relationships to the borrowing firm. In particular, we examine the importance of lending relationships to SMEs in terms of credit availability and the cost of capital. Given the significant effects revealed, we then proceed to examine the influence of relationship lending on the overall performance of the firm.

Recent research on financial intermediation provides support for the value of relationship lending for small business finance. Small and young firms, highly dependent on banking finance to undertake their projects, benefit most from this lending technology. However, the "dark side" of relationship lending is that lenders endogenously gain an information monopoly and are able to extract additional rents from borrowers. That is, relationship lending entails many benefits as well as some costs for the borrowing firm which usually affect the credit amount and loan covenants. Pointing in this direction, my research seeks to shed light on the following question: When and through which mechanisms does relationship lending add value to the borrowing firms?

This thesis explores a causal chain in which the number of simultaneous lenders that a firm has, together with banking market competition are the main determinants of the bargaining power of lenders; this determines the feasibility and the profitability of relationship lending vis-à-vis other lending technologies. In turn, the choice of lending technology has important effects on the availability and cost of funds for SMEs, which affects the firm's investment policy, and ultimately determines the overall performance of the firm.

The structure of this thesis is as follows. The second chapter reviews the most relevant contributions to the relationship lending literature. We start by defining the concept of relationship lending and then proceed to discuss the benefits as well as the costs entailed with this lending technology for the lending bank and the borrowing firm. Next, we briefly review the most influential theoretical contributions in relation-

ship lending. The conclusion from the review of theories is that, while there is general agreement among the authors that banks are specialists in gathering information and building close relationships with borrowers, there is no consensus about the optimal loan contract in a relationship lending context. In consequence, empirical research has attracted much attention as a means to disentangle the ambivalent predictions of theoretical models. Accordingly, we also opt for an empirical approach. However, the review of the empirical contributions also shows that researchers have reached different conclusions depending on the sample of firms, time period and approach applied. Many of these empirical works are subject to two main criticisms. First, they usually rely on a cross-section to infer long-term effects. Second, the models usually have endogeneity problems. Recent papers address these issues, by means of panel data and/or instrumental variables estimation. Our research also deals with these difficulties when possible, by using a very large panel dataset and by exploiting the exogenous information of the data.

In chapter 3 we investigate whether relationship lending technologies can be used in the most competitive banking markets. Previous studies suggested that competition may be inimical to the formation of mutually beneficial long-term relationships between banks and firms. The reason is that banks need some bargaining power to engage in relationship lending and competitive pressures from the market inhibit the formation of such long-term relationships. In this chapter we emphasize that the relationship lending technology itself is the mechanism that confers bargaining power to the lender. We investigate this issue empirically using a survey of small firms in the United States. The empirical analysis consists of examining the availability of credit and the loan interest rate over the course of the relationship between the bank and the firm, depending on the degree of banking market competition and the number of lenders. We show that credit availability and loan interest rates are determined by the interaction of these two types of competition. We find that when both types of competition are in place, that is, when a firm is located in the competitive market and borrows from multiple lenders, then banks use transaction lending technologies. If a

firm has a single bank relationship then the bank will be relationship oriented. The extent to which the bank makes firm-specific investments depends on its expected capacity to extract rents in the future, which is determined by the degree of banking market competition. The main result is that relationship lending technologies are used in the most competitive banking markets as long as firms commit to borrowing from a single lender.

In chapter 4 we explore the sources of the value of borrower-lender relationships in small business financing in Spain. We develop a theoretical framework in order to provide a starting point for the assessment of the benefits and the costs related to exclusive lending relationships. The theoretical models point out that an exclusive bank relationship enhances the bank's investment in information gathering which maximizes the value of relationship lending, but at the same time it facilitates the exploitation of the monopoly of information by the single lender which reduces the value of the relationship. The other side of the same coin is that multiple banking avoids the hold-up problem while at the same time it decreases the incentives to invest in the relationship for each individual bank. Some models emphasize the crucial importance of banking market concentration on the bank's incentives to engage in relationship lending. We confirm this in the analysis of chapter 3. Therefore, the empirical analysis consists of estimating the effect of exclusive bank relationships on the cost of capital and on the availability of credit, focusing on the differential impact of the banking market concentration. We use a panel dataset of more than 70,000 small and medium Spanish firms from year 1993 to 2004 (603,350 firm-year observations). The SABI database (Sistema de Análisis de Balances Ibéricos) provides financial information of firms, income statements and balance sheets, as well as complementary information such as the number of bank relationships, number of employees, location, industry, etc.

The main findings of chapter 4 are the following. From the analysis of the cost of capital, we find that the effect of the number of banks on the cost of capital depends on the degree of banking market concentration. In concentrated banking markets, firms

with one bank have a higher cost of capital than multiple banking firms; while in less concentrated markets the opposite applies, i.e. firms with one bank enjoy a lower cost of capital than multiple banking firms. This evidence is consistent with hold-up problems in concentrated markets. Next, we proceed to analyze credit availability by following two different approaches. First, we examine the amount and the maturity of bank credit. The most interesting result is that firms increase their number of bank relationships to raise bank credit. However, we do not find a significant effect of the number of banks on the maturity of bank credit. Second, we estimate the investment-cash flow sensitivity in order to find evidence on credit rationing. We find that firms in concentrated markets with multiple banks display the larger sensitivity, suggesting that those firms are the most financially rationed. We then divide the sample into three groups by firm size (micro, small and medium). For small and medium firms we observe the same pattern of results. However, micro firms demonstrate quite different behavior: the number of lenders has a negative effect on the cost of capital while it is insignificant for bank credit availability and maturity. Moreover, banking market concentration does not play any role. These findings suggest that micro firms are particularly susceptible to hold-up problems when they have a single bank relationship. Taken together, our results indicate that banking market concentration is harmful to firms. Even when accounting for the potential benefits of relationship lending, in the most concentrated banking markets banks exploit their monopoly of information when they are the single lender, and banks ration credit to firms when there are multiple lenders. A key result from the Spanish credit markets is that some degree of banking competition is necessary to induce banks to share the value created by relationship lending with the borrowing firms.

In the last chapter of this thesis, using the same dataset of Spanish firms, we examine the effects of relationship lending on firm performance. Exclusive lending relationships may enhance investment efficiency by inducing firms to take optimal projects and from the point of view of banks it facilitates the allocation of funds in favour of firms with good investment opportunities. On the negative side, lending re-

lationships may create substantial hold-up problems. In this chapter we test whether firms that have a single bank relationship outperform firms with multiple bank relationships. The novelty of this study is in proposing a simultaneous equations model to account for the joint determination of firm performance and the number of bank relationships. We find valid instrumental variables for the exogenous determinants of the number of lenders. A particularly powerful instrument is the number of bank mergers which occurred in the past three years in the province where the firm is located. The two-equation model is estimated using the Generalized Method of Moments (GMM). We additionally account for firm heterogeneity by including firm fixed effects. The main finding is that firms maintaining exclusive bank relationships have lower profitability than firms with multiple lenders. This result is robust to several specifications and definitions of firm profitability. We further obtain evidence on the determinants of the number of bank relationships. As firms get larger and increase leverage they tend to increase their average number of bank relationships. As firms get older and improve their quality in terms of liquidity and asset tangibility they decrease the number of lenders. The analysis presented in chapter 4 and chapter 5 is consistent with the view that banks appropriate most of the value generated through close relationships with borrowers as long as they do not face competition from other lenders.

This dissertation focuses on financing of SMEs for various reasons. First, small firms are more likely to suffer information problems in the capital markets. The value of relationship lending, which is based on a bank gathering soft information, is likely to be higher for the smallest, youngest and most informationally opaque firms because of the lack of credit history, the absence of rating, the impossibility to credibly disclose their quality, and the lack of separation between ownership and management, which increases the asymmetric information between insiders and outsiders (lenders). Second, small firms are typically restricted to obtaining external finance only from financial institutions. Public debt markets are only accessible for large firms. This is particularly relevant in bank-based economies, like Spain, where loans are the

preferred source for financial investment. The Eurobarometer on access to finance (October 2005) reports that 8 out of the 10 companies surveyed went to a bank in order to obtain financing. Third, the funding decisions and conditions of small firms determine its ability to develop a business activity and growth strategy, which is crucial for economic growth.

In recent years the role of relationship banking has been the subject of intensive discussion. This thesis contributes to the debate by providing new insights into the role of banking competition and by exploring a unique and comprehensive dataset of Spanish firms. We pay particular attention to the effect that changes in the banking market structure may have on lending relationships. This research is particularly relevant due to the recent changes in the market structure of the banking industry. After a process of deregulation of the banking industry and the incorporation of new information technologies in banking which had presumably increased competition in the banking market, the current wave of bank mergers in Europe and in the United States, and the expectation of a continued or even accelerating consolidation process, have raised concerns as to the competitive conditions in the banking markets. Ultimately, the concerns mainly refer to whether changes in the banking market structure may affect the conduct of banks, and in turn, affect credit availability and credit terms. As small businesses turn to banks as their first choice for external financing, policy makers, regulators, and academics have shown increased interest in the nature and behavior of the financial markets that fund these small businesses. As for the policy implications, this thesis contributes to the current debate on banking markets liberalization and banking consolidation. The convenience of restricting credit market competition to promote relationships does not seem justified by our findings.

Chapter 2

Literature Review

2.1 Introduction

This chapter reviews the recent literature on relationship lending. Since research on this area is relatively new, the concept of relationship lending itself does not enjoy a unique definition in the literature. Therefore, we start in section 2.2 by defining the concept of relationship lending, and then we identify the benefits and the costs entailed by the lending bank and the borrowing firm. Next, in section 2.3, we briefly review the most influential theoretical contributions in relationship lending. There is no unique model which is widely accepted. Rather, researchers have developed independent models that illustrate a particular feature of relationship lending; and, as we describe below, sometimes leading to conflicting predictions. In consequence, empirical research has attracted much attention as a means to disentangle the confounding views of theoretical models. Thanks to the greater accessibility of micro level data, the last decade has been marked by the proliferation of empirical works on relationship lending in many countries. In section 2.4 we extensively review the empirical contributions, although we acknowledge it is not a comprehensive review due to the large diversity of situations that have been analyzed from an empirical stance. Reviews of the relationship banking literature can be found in Ongena and Smith (2000a), Boot (2000) and Elyasiani and Goldberg (2004).

2.2 The concept of relationship lending

2.2.1 Definition and relevant framework

The special role performed by lending banks has led economists to develop the concept of "relationship lending" during the nineties. Several authors provide complementary definitions. Ongena and Smith (2000a) define a bank relationship to be "the connection between a bank and a customer that goes beyond the execution of simple, anonymous, financial transactions". Boot (2000) also provides a definition of relationship banking as "the provision of financial services by a financial intermediary that:

(i) invests in obtaining customer-specific information, often proprietary in nature; and (ii) evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products". More recently, Elsas (2005) defines relationship lending as "a long-term implicit contract between a bank and its debtor" and Freixas (2005) as "the investment in providing financial services that will allow to repeatedly deal with the same customer".

All definitions refer to a special form of interaction between a bank and its borrowing firm in which banks gather private information through repeated interaction with the same customer. The key issue is that lenders produce or gather information about the borrower beyond the information that is readily available. This information is obtained *ex ante* in the screening process and during the relationship, with continued monitoring, and provision of multiple financial services. This information can be costly to acquire but sometimes the information is generated as a free by-product of the relationship. An additional motivation for the agents to invest in the search for information is being able to reuse the information in the future. The most recent contributions give special emphasis to banks gathering "soft information", i.e. generally non-quantifiable information obtained through interactions with the firm, its owner, suppliers, customers and the community. For instance, Berger and Udell (2002, 2006) describe relationship lending as a lending technology where the lender bases its decisions mainly on soft information.

Relationship banking goes beyond lending and it may include the provision of other financial services as well. Even more, it may also apply to investment banking and non-bank financial intermediaries. For this reason, Boot (2000) argues that a more appropriate term would be "relationship intermediation". Nevertheless, our focus is on *relationship lending*. This concept emphasizes that the bank is the one making the necessary investment to obtain borrower-specific information in the lending process. The customer may choose to invest or not in the relationship (Freixas 2005).

Banks can employ a variety of technologies for their lending activity, which in-

cludes several transaction technologies plus relationship lending (Boot and Thakor 2000, Berger and Udell 2002). Relationship lending is characterized by close monitoring, renegotiability, implicit long-term contractual agreements and the collection of soft information over time. In contrast, transaction lending is generally associated with arm's-length lending based on readily observable information about the firm or "hard information", such as financial ratios, produced at the time of loan origination.[1] In general, transaction lending is focused on informationally transparent, high-quality borrowers that can more credibly signal their creditworthiness while relationship lending is mostly used by informationally opaque borrowers; this includes young firms that have little credit history or collateral, and privately owned firms.

Jayaratne and Wolken (1999), and Berger and Udell (2002) highlight the competitive advantages of certain financial institutions, like small banks, when processing the soft information they gather throughout their relationship with the SMEs. Indeed, many recent contributions emphasize the role of credit officers in gathering soft information and the importance of bank organizational structure to make use of it (e.g. Stein 2002, Takáts 2004, Berger and Udell 2002, Berger *et al.* 2005). However, this literature refers to contracting problems within the bank and our focus is on contracting problems between the bank and the borrower.

The financial system of countries can be classified as market or banking oriented. Mayer (1994) defines banking economies as those with a small proportion of listed companies, high concentration of ownership, and long-term relations between banks and industry. Germany and Japan are the typical examples. By contrast, market economies like the U.S. and the U.K. have the opposite characteristics. Spain has a bank based financial system.

The literature on relationship lending has identified many benefits and some costs of such relationships. Boot (2000) provides a very detailed explanation of each of them with their implications. In the following two subsections we summarize the

[1]Financial statement lending, small business credit scoring, asset-based lending, factoring, fixed-asset lending and leasing are classified as transaction lending technologies by Berger and Udell (2006).

main insights in Boot (2000) and complement them with some recent contributions.

2.2.2 Benefits of relationship lending

Relationship lending adds value through various channels. Relationship lending facilitates the information exchange between the borrower and the lender. Lenders invest in generating information from their client firms and borrowers are more inclined to disclose information because of the preservation of certain confidentiality (Yosha 1995). The lower informational asymmetries make it possible to overcome problems of moral hazard and adverse selection otherwise inherent in credit markets. For instance, they ameliorate the project-choice moral hazard (Diamond 1991) and solve agency problems of managerial behavior (Weinstein and Yafeh 1998).

Relationship lending allows for loan contracts that are welfare enhancing which otherwise could not be contractible. Boot (2000) argues that relationship lending allows for implicit long-term contracts, more flexibility in renegotiation and some discretion in order to make use of soft information disclosed during the relationship. When a firm experiences a temporary negative shock which prevents it meeting the contracted loan payments, renegotiability of contracts *ex post* can help accommodate the firm with delayed payment or new lending (Boot, Greenbaum and Thakor 1993, Greenbaum and Thakor 1995, Von Thadden 1995).[2] Relationship lending permits the funding of loans that are not profitable from a short-term perspective but may be profitable in the long-run. Therefore, relationships increase credit availability, in particular to the youngest and informationally opaque borrowers, which may have projects that generate few rents in the first period but may be profitable from a long term perspective (Petersen and Rajan 1995). Even more, relationships permit smoothing the loan interest rate over the duration of the relationship (Petersen and Rajan 1995) and over the interest rate cycle (e.g. Berlin and Mester 1998, Ferri and Messori 2000).

Boot and Thakor (2000) argue that banks invest in developing expertise or "sector

[2]We review below the potential costs associated with renegotiation.

specialization". Therefore, a relationship loan adds more value to the borrower than a transaction loan because the bank uses its expertise to improve the borrower's project payoff. Another benefit of relationship lending that has been highlighted in the literature is that repeated lending from a bank provides credible certification of payment ability. This permits borrowers to build a reputation that would allow eventual borrowing through public markets (Fama 1985, Diamond 1991).

2.2.3 Costs of relationship lending

Bank relationships produce an asymmetric evolution of the information between the relationship bank, who acquires private information on the borrower, and the rest of financial intermediaries outside the relationship. This results in an informational monopoly ("hold-up") of the former. Sharpe (1990) and Rajan (1992) argue that informed banks endogenously gain bargaining power and are able to extract monopoly rents from borrowers. The hold-up problem *per se* does not imply that an informed lender earns positive rents over the lifetime of the bank-borrower relationship. Rather, the single bank can offer below-cost interest rates because it expects to recover the investment later on. Even in this case, however, the existence of the monopoly entails many welfare dissipating effects. For instance, it induces distortions in investment incentives (Rajan 1992); the effort level of the borrower in management is reduced (Dewatripont and Maskin 1995); and managers are more inclined to strategically default (Bolton and Scharfstein 1996). Furthermore, firms anticipating that relationship banks may exploit the monopoly *ex post* decide to diversify away from the single relationship bank and borrow from multiple banks. In consequence, the potential benefits of relationship lending are diluted.

Following Dewatripont and Maskin (1995), another potential cost of relationship lending is the soft budget constraint problem. This problem arises from inefficient renegotiations of loan contracts, that is, situations where it would be optimal to liquidate the firm but the relationship lender further extends credit in the hope of recovering previous loans. The borrower anticipating the *ex post* soft budget constraint

of its lender has lower incentives to exert effort *ex ante* (Bolton and Scharfstein 1996).

2.3 Theoretical approaches to relationship lending

We start in section 2.3.1 by briefly sketching the origins of the theory of relationship banking, and then, we review the most influential works that have derived the optimal loan contract in a relationship lending context. The review of these theoretical models is fundamental for the subsequent chapters because they permit to develop the adequate framework to formulate the hypothesis to be tested empirically. In section 2.3.2, in a more narrow area, we focus on the theoretical contributions that examine the effect of banking competition on relationship lending. Throughout the thesis we pay particular attention to banking competition and banking market structure; the review in this subsection allows setting up the current state of the debate in the literature. Finally, in section 2.3.3, we describe the models determining the optimal number of bank relationships. These models are used in chapter 5 in order to set up the empirical model for the determinants of the number of simultaneous bank relationships that firms have. From the review of theoretical approaches to relationship lending we conclude that there is no consensus on a single theoretical model with specific predictions. In consequence, empirical research has attracted much attention. This empirical literature is reviewed in section 2.4.

2.3.1 Loan contracts with relationship lending

The theoretical foundations of relationship banking are found in the modern literature of financial intermediation that acknowledges the special role of banks in alleviating the informational asymmetries in the credit markets.[3] Early works of Leland and Pyle (1977), Diamond (1984, 1989, 1991), Ramakrishnan and Thakor (1984), Fama (1985), Boyd and Prescott (1986) and Hellwig (1989) stress the information production function of banks. Screening and monitoring procedures give an information

[3]See Freixas and Rochet (1997) for a review of the modern theory of financial intermediation.

advantage to banks that allow them to overcome information and incentive problems between the bank and the borrower. Therefore, the main benefit attributed to bank financing with respect to other sources of finance is that banks help overcome problems of asymmetric information by producing and analyzing information and by designing loan contracts that improve borrowers' incentives.

Bank financing may also entail some costs. Greenbaum, Kanatas and Venezia (1989) develop a model of loan pricing in which firms bear search costs to find a new bank. They show that loan rates offered by the relationship bank are higher than those offered at competing banks, because the latter are willing to offer an interest lower than their funding cost in order to capture the firm. The critical assumption in that model is the existence of exogenous search costs.

In the early nineties, two influential papers warned about the potential costs of bank lending even when there are no exogenous costs of starting a relationship. Sharpe (1990) presents a model in which relationships arise endogenously. A bank that lends to a firm learns more about that borrower's characteristics than do other banks. This generates an asymmetry of information among banks. Therefore, a distinction is made between relationship (informed) banks and transaction (uninformed) banks. Informed lenders can capture some rents generated by their older costumers, while the uninformed competitors face a winner's curse problem. In a competitive world, the implication for loan pricing is increasing interest rates with the duration of the relationship.[4] In the model of Rajan (1992) a firm balances the costs and benefits associated to two borrowing sources, namely informed debt and arm's length debt. Bank debt is provided by an informed bank that monitors the firm and exerts some control on the owner's decision to continue a project only if it has positive net present value. However, informed bank debt generates distortions on the owner's incentives to exert effort. In contrast, arm's length debt guarantees that the owner exerts the optimal level of effort but lenders do not have control over the owner's continuation decision. Rajan shows that borrowing from multiple sources is a way to restrict the

[4]Von Thadden (2004) gives the correct solution to the model which is characterized by the absence of equilibrium in pure strategies.

bank's ability to extract surplus.

In a later contribution, Von Thadden (1995) derived the optimal loan contract that avoids the lock-in costs with a single lender: a long-term debt contract consisting in a line of credit that the lending bank may terminate at any point in time, but if it chooses to continue financing it should do so at *ex ante* specified terms. This arrangement can optimally limit the informed lender's bargaining power without the need for multiple bank relationships.

Boot and Thakor (1994) consider a model of repeated moral hazard, without learning and risk neutrality. In the optimal loan contract, the loan interest rate and collateral requirements decrease with the duration of the bank-borrower relationship, after the firm has demonstrated some project success.

In a recent contribution, Freixas (2005) presents a model where relationships arise because there is an initial fixed cost of monitoring, that is, repeated lending from the same bank avoids duplication of monitoring costs. The consequence is that the loan interest rate in the second period is larger than in the initial one because incumbent banks are able to extract rents on the loan renewal.

Summarizing, the optimal contract in the models of Greenbaum, Kanatas and Venezia (1989), Sharpe (1990), Rajan (1992) and Freixas (2005) predicts that interest rate increases with the duration of the relationship. In contrast, the models of Diamond (1989) and Boot and Thakor (1994) show that interest rates should decline as relationships matures. Finally, some authors argue that loan rate smoothing arises as part of an optimal contract between borrowers and banks, that is, loan interest rates should be flat over the duration of the bank firm relationship (Petersen and Rajan 1995, Berlin and Mester 1998).

Many other theoretical contributions incorporate the role played by relationship banks as a key element of the model. Since they do not derive the optimal loan contract they are beyond the scope of this review. Nevertheless, it is worth mentioning the paper of Diamond and Rajan (2001) for the modelling choice of relationship lending. In their model a relationship lender develops specific skills in identifying

the liquidation value of the firms' assets, that is, by building a relationship with the borrower the bank learns about its borrower business and can identify the second best use of the assets in case of liquidation. The focus of the paper is on bank fragility and liquidity of assets. Other related theoretical contributions analyze the incentives of lenders to share information about borrowers (Jappelli and Pagano 1993).

2.3.2 Relationship lending and banking competition

Can banking competition improve the information production function of banks and thus foster relationship lending? Or, on the contrary, does the value of relationship lending diminish when banking markets become more competitive? Theoretical contributions offer opposite results on the relation between banking market competition and the incentives of lenders and borrowers to engage in relationship lending.

Banking competition inhibits relationship lending

A first set of theories argues that competition and relationship lending are incompatible. The reasoning is that with competition, borrowers might be tempted to switch to other banks or to the financial market. When banks anticipate shorter relationships, they may respond by reducing their relationship-specific investments and thus diminish the value of relationships.

Chan, Greenbaum and Thakor (1986) propose a model in which banks screen loan applicants at a (exogenous) cost. The information gathered by screening the first loan can be re-used for second-period loans. That gives an informational advantage to the incumbent bank who can gain a positive surplus. Hence, investment on screening in the first period depends on the anticipated informational surplus obtained later on. When banking market competition increases, the informational surplus in the second-period is reduced. Since the value of information acquisition decreases, the investment in screening is reduced. Therefore, bank investment in generating information decreases with competition.

The seminal work of Petersen and Rajan (1995) presents a two-period model

with both adverse selection and moral hazard in which the information effect yields lower rates in the second period: banks offer higher interest rates in the first period, when borrowers' types are unknown, and then reduce rates in later periods after borrowers' types have been revealed. Relationship lending permits the funding of loans that are not profitable for the bank from a short-term perspective but may be profitable if the relationship with the borrower lasts long enough. The reason is that long-term relationships make possible value-enhancing intertemporal transfers in loan pricing. Increased credit market competition could impose constraints on the ability of borrowers and lenders to share intertemporal surpluses. They argue that a bank that has market power is more willing to engage in relationship lending. The supply of credit available to young firms is higher and the cost of such funds is lower in more concentrated markets than in a competitive environment. If a bank has market power, it is more credible that the firm will not switch to a competitor and the bank will benefit by lending to the firm again in the future. Therefore, the bank is more willing to offer credit in early periods at a subsidized rate, to establish the lending relationship. As a consequence, Petersen and Rajan argue that especially young and lower quality firms may be negatively affected by banking competition.

Banking competition enhances relationship lending

Some recent theories argue that competition and relationship lending are compatible. The intuition is that relationship loans may constitute a factor of differentiation from competitors which operates as protection from competition.

Boot and Thakor (2000) present a model in which banks can engage in both relationship and transactional lending. A relationship loan requires the bank to previously invest in acquiring expertise or "sector specialization" in the borrowers' industry. By contrast, a transaction loan is a pure funding transaction similar to arm's length lending. A relationship loan adds more value to the borrower because the bank uses its expertise to improve the borrower's payoff but it also entails more costs. The authors show that relationship loans are offered to low and medium quality borrowers

because they have a higher value for such borrowers. As the quality of the borrower increases however, the marginal value added by the bank expertise declines and hence high quality borrowers are offered transactional loans. Boot and Thakor distinguish between two sources of competition - interbank competition and capital market competition. As competition among banks increases, banks have greater incentives to offer relationship loans but each has lower added value for borrowers. The reason is that interbank competition decreases the bank's profits in transactional lending more than its relationship lending profits because relationship loans clearly differentiate the lending bank from competing banks. This encourages the bank to shift towards relationship lending. However, interbank competition pressures the surplus that each bank can extract from relationship loans. This reduces the investment in sector specialization, which reduces the added value of relationship loans. On the other hand, capital market competition produces exactly the opposite effect: competition from the capital market reduces banks' *ex ante* rents from lending, which reduces entry into banking, reduces interbanking competition and thus results is less relationship loans but each one with greater added value.

Freixas (2005) finds that more competition in the banking industry decreases the monitoring effort in each relationship bank loan. However, more competition increases (or leaves unchanged) the extent of the credit market; therefore, the amount of relationship loans does not decrease with competition. Freixas also analyzes the effect of increased competition on loan pricing. He obtains the traditional industrial organization result that in a less competitive framework the access of funds is reduced and interest rate increases in both the first and the second period.

Finally, some models do not predict a single direction for the effect of competition on relationship lending. Dell'Ariccia (2001) develops a theoretical model of spatial differentiation to demonstrate how asymmetric information can affect both bank competitive conduct and market structure. He obtains ambiguous results regarding the effect of competition on relationship lending. Dinç (2000), Anand and Galetovic (2006), and Yafeh and Yosha (2001) propose models where relationship

lending is more likely to occur when the degree of competition is not too low or too high, leading to a non-monotonic relationship between the degree of concentration in banking markets and lending relationships.

As it is evident from the review of all these papers, the effect of banking competition is ultimately an empirical question. We review later on the empirical contributions related to banking competition (section 2.4.4) and we devote chapter 3 and part of chapter 4 to empirically analyze the role of banking competition on lending relationships.

2.3.3 Determinants of the number of bank relationships

The traditional theory of banks as delegated monitors implies that the optimal number of relationship banks is one. Diamond (1984) argues that a single banking relationship is optimal because it avoids duplication of screening and monitoring efforts and, at the same time, gives greater incentives to the lender to supervise, thus minimizing free-riding. Having a single relationship gives an informational monopoly to the single informed bank. Banks are able to expropriate some rents from borrowers which distort firms' incentives to make proper investment choices. Firms anticipating a potential hold-up problem may opt for multiple banking relationships. Sharpe (1990) and Rajan (1992) show that competition from an additional informed bank eliminates such hold-up costs. It is worth noting though, that Von Thadden (1995) shows that it is possible to avoid the hold-up problem even with a single lender. Dewatripont and Maskin (1995) regard multiple banking as a solution to the soft-budget-constraint problem inherent with single banking relationships. Bolton and Scharfstein (1996) endogenize the optimal number of creditors and find that increasing the number of creditors complicates debt renegotiation, but the loss of *ex post* efficiency may be beneficial *ex ante*, as it limits incentives for strategic default. In equilibrium, high quality firms are better off with two banks. The implication is that the optimal number of bank relationships in these situations is two.

Researchers have identified several reasons why it can be optimal for firms to have

multiple banks (more than two). Thakor (1996) analyzes firms' incentives to borrow from multiple banks as a way to reduce the probability of being credit rationed. Increasing the number of banks with which firms work increases the *ex ante* probability of credit rationing because credit entities are not willing to invest time and money in analyzing the risks that this would entail. However, working with a large number of banks may increase the *ex post* probability of access to credit.

Detraguiache, Garella and Guiso (2000) present a model in which it is optimal for some firms to establish multiple bank relationships in order to increase the probability that when needing refinancing at least one informed bank will be able to provide funding. That is, multiple bank relationships provide an insurance against liquidity shortage. This could be relevant in a context where banks suffer severe liquidity shocks.

Carletti (2004) and Carletti, Cesari and Daltung (2004) analyze the bank's incentives to monitor firms in a model with two moral hazard problems (borrower has to exert effort and banks need to exert monitoring). They argue that multiple bank lending can be optimal when bank funds are raised through deposits and banks have limited lending capacities. The optimality of multiple banks comes from the fact that banks can achieve greater diversification through funding of more projects of smaller size which increases aggregate monitoring and thus improves the value of the relationships. That is, overall monitoring can be increased with the number of banks that monitor.

Guiso and Minetti (2004) propose a model in which firms distribute information differentially across creditors in such a way that there are informed (relationship) banks and less informed (transactional) banks. A trade-off exists between giving all the information to one bank that may generate inefficient project continuation when it is better to liquidate (soft budget constraint) and differentiating the information disclosed among lenders which may lead to premature liquidation of a project (strategic default).

Elsas, Heinemann and Tyrell (2004) analyze the optimal debt structure in a model

in which borrowers balance the risk of coordination failure when borrowing from multiple banks against the bargaining power of a single relationship. The model shows that it can be optimal for a borrower to have multiple lenders as long as they borrow asymmetrically from them. That is: borrow a large proportion from a relationship bank with more bargaining power and then borrow small fractions from multiple lenders.

The models of Bhattacharya and Chiesa (1995), Yosha (1995), and Von Rheinbaben and Ruckes (2004) all consider the costs of confidential information leakage. Bhattacharya and Chiesa (1995) model the choice between bilateral and multilateral financing in a context of firms investing in R&D. In the model of Yosha (1995) there is a trade-off between bilateral and multilateral financing. With multilateral financing firms bear an exogenous cost of disclosing information to a large number of lenders. Bilateral financing entails an endogenous cost due to the fact that firm competitors may believe that the choice of bilateral financing means that the firm has some sensitive information, and hence react more aggressively in the product market which has an impact on firm's profits. In equilibrium, high quality firms prefer bilateral relationships. Von Rheinbaben and Ruckes (2004) determine the optimal number of bank relationships and how close these relationships should be in terms of providing banks with confidential information as a function of the characteristics of the firms.

2.4 Empirical approaches to relationship lending

Empirical evidence that examines whether lending relationships are valuable comes from a variety of approaches. The first contributions appeared in the late eighties. These early studies have resulted in a prolific branch of the literature with relevant contributions up to the present. These studies use event analysis to measure the impact of bank loan announcements on the firm stock price. Data on listed firms is needed to perform these studies, hence, the sample of firms analyzed are publicly traded and relatively large. Since relationship lending is expected to be even more important for small privately held firms, researchers have made an effort to

compile datasets of loan contracts to non-listed (and usually small) firms. Generally these datasets are complemented with information on firm characteristics, the lender's characteristics and features of the bank-firm relationship. Initially the datasets were constructed from cross-section surveys that have the limitation of relying on across-firm variation to identify the effect of building relationships. Later on, researchers have access other sources of data, like credit registers, and have constructed panel datasets that allow reaching more robust conclusions by exploiting within-firm variation. Finally, some studies deal with aggregate data, for instance at country level, to draw international comparisons.

We start in section 2.4.1 by briefly reviewing the event studies on listed firms. Then, we turn to the analysis of privately held firms. In section 2.4.2 we describe the different empirical measures that have been used as proxies for relationship strength. In section 2.4.3 we review contributions that analyze the effect of relationships on availability of credit and on loan contract terms, such as the interest rate and collateral requirements. Section 2.4.4 is focused on the effects of banking market competition and section 2.4.5 on the determinants of the number of bank relationships. Finally, in section 2.4.6 we briefly address related issues that have been empirically examined in the relationship banking literature.

2.4.1 Bank lending and stock performance

The first empirical contributions that measure the value of bank relationships analyze the impact of establishing or terminating a lending relationship on the firm stock price. James (1987) is the first to examine the average stock price reaction of firms that publicly announce a bank loan agreement. He finds a positive abnormal price reaction after a bank loan announcement which indicates that bank loans reveal positive information about the future value of the firm. Numerous contributions have expanded on these results (e.g. Lummer and McConnell 1989, Slovin *et al.* 1993, Best and Zhang 1993, Billet *et al.* 1995, Preece and Mullineaux 1996, Dahiya, Puri and Saunders 2003, James and Smith 2000, Billett, *et al.* 2006, Gande and

Saunders 2005). Generally, these event studies find a favourable impact of bank loan announcements on borrowers' stock returns, which contrast to the insignificant or negative response of investors to the announcement of other forms of financing. Using event studies analysis, Dahiya, Saunders and Srinivasan (2003) analyze the other side of the coin: the effect of the announcement of firm financial distress on bank's stock price. Reviews of this branch of the literature can be found in Ongena and Smith (2000a) and James and Smith (2000).

2.4.2 Measures of strength of relationship

The relationship intensity between a bank and a borrower cannot be observed directly. Therefore, empirical studies have relied on a variety of proxies to measure the strength of the relationship between a bank and a borrower. Elsas (2005) and Ongena and Smith (2000a) provide a detailed explanation of the pros and cons of the different proxies. The latter study also presents international comparisons on the average values of the relationship variables.

The most widely used empirical measure of relationship lending is the duration of the relationship; that is, the time since the bank and the borrower initiated the first deal. The rationale behind duration is that it reflects the accumulation of private information over multiple time periods by the lender. Even though it is a very intuitive measure, it is subject to many caveats. First, a recent paper has challenged its appropriateness to measure relationship strength. Elsas (2005) explores the determinants of self assessments of German universal banks with respect to their housebank status[5], and finds that duration of the bank-borrower relationship is not related to housebank status. Another issue is that many studies find that the duration of the bank-borrower relationship is highly correlated with firm age (e.g. Berger and Udell 1995, Cole 1998). The length of the relationship reflects private information obtained

[5]In Germany, a lender is considered a housebank if it is regarded as the main lender of a firm, who has more relevant and timely information than other lenders. Furthermore, a housebank is supposed to finance its client when if faces temporary difficulties. Therefore, housebanks can be assimilated to relationship banks.

by the lender whereas age reflects public information on the reputation and survival of the firm. Consequently, the studies that do not control for age and examine the effect of length are susceptible to biased results. Finally, the length of the relationship is right censored, meaning that it measures the past history between the bank and the firm. Lending relationship has to do with the future expectation to deal with the same customer, and therefore, duration may be undervaluing the strength of relatively new relationships.

A second proxy is the scope of the relationship, that is, the extent of a relationship in terms of the bank providing multiple services or multiple accounts to the firm. With day by day transactions, the bank may acquire more timely information on the firm. The main problem with this proxy is data availability: datasets usually have information on loans and do not report information on additional services purchased at the same bank (an exception is the U.S. National Survey of Small Business Finance). This proxy is also subject to criticism: a lending relationship could be very strong even with the absence of additional financial services.

Another variable commonly used as an indicator of relationship strength is the number of simultaneous bank relationships that a firm has, or alternatively, an indicator variable for firms with an exclusive bank relationship. Maintaining an exclusive bank relationship provides the single informed bank with a monopoly of information *ex post* (Sharpe 1990, Rajan 1992) which promotes the development of close ties between the bank and the borrower. However, this measure is also subject to debate. As Elsas (2005) points out "exclusivity of a bank relationship is neither a necessary nor a sufficient condition for relationship lending (...) but a negative correlation between the number of banks and the incidence of relationship lending seems plausible". In chapters 4 and 5 of this thesis we rely on this measure, namely the number of lenders, as a proxy for the strength of bank-firm relationships.

Some authors use other proxies like the share of the borrower's total debt provided by the main lender, the Herfindahl index of borrowing concentration computed as the sum square of the share of debt provided by each lender, etc. The motivation for these

proxies is similar to the idea of using the number of bank relationships but allowing for asymmetric financing among the various lenders. Finally, some studies use the self-assessment of the lender or the bank as having a relationship, or measures of trust. In this thesis, the number of bank relationships is used as the proxy to measure the strength of bank-firm relationships.

2.4.3 Loan contract terms and availability of credit

A growing branch of the empirical literature on the value of relationship lending examines the role of lending relationships in determining the loan contract terms and the availability of credit to borrowing firms. As we describe below, there seems to be a wide consistency between studies that a close bank-firm relationship provides the borrower with greater availability of credit (even if the measure of credit availability is subject to controversy). However, there is little consensus about their impact on loan contract covenants, like interest rate or collateral requirements. We summarize the findings of the papers reported in this subsection in table 2.1.

Petersen and Rajan (1994) are among the first to examine empirically how bank-firm relationships affect the availability and cost of funds using a sample of small privately held firms. The data comes from the 1988 National Survey of Small Business Finance conducted by the U.S. Small Business Administration and the Federal Reserve.[6] The measure of strength of relationships is duration, the number of financial services (scope) and the number of lenders. They find a reduction of the interest rate among those enterprises that work with fewer institutions, although they didn't find a significant link between the duration and scope of the relationship and the price of debt. There is evidence of a lesser dependence on trade credit by firms with longer banking relationships, with additional financial services purchased from the lending bank and with a fewer number of bank relationships.

Berger and Udell (1995) use the same dataset as Petersen and Rajan (1994) but restrict the sample of loans to lines of credit. The reason is that lines of credit are more

[6]http://www.federalreserve.gov/pubs/oss/oss3/nssbftoc.htm

likely to be relationship loans than other types of loans. They find that borrowers with longer banking relationships pay lower interest rates and are less likely to pledge collateral.

Angelini, Di Salvo and Ferri (1998) use a dataset of 1095 Italian firms in the year 1995 and find evidence in favour of bank capture theories. With banks other than cooperative banks, lending rates in Italy tend to increase with the duration of the relationship. Cooperative banks also charge higher interest rates with duration except to members of the cooperative. Italian companies working with fewer financial entities bore higher interest rates. Availability of credit is measured from a survey question that asked firms whether they would like more credit at the current market rate. Duration of relationship turned out to be non significant, but with a dummy variable equal to one for relationships shorter than three years the coefficient is positive and significant. Therefore, firms with short relationships are more likely to have credit constraints. They also find that Italian companies working with fewer financial entities achieved better credit availability.

Elsas and Krahnen (1998) use credit-file data of 200 medium-sized German firms. For each loan relationship, they know the bank's own assessment of its status as a housebank or not. They find that loan pricing is alike for housebanks and normal banks, that is, there is no evidence for intra or intertemporal price differentiation related to housebanking. As a measure of availability of credit they use the total debt amount supplied by the particular bank divided by the amount of non-equity financing of the firm. To estimate this equation the authors make use of the panel structure of the dataset and report random-effects estimations. They show that housebanks provide liquidity insurance for small shocks to borrower ratings. However, if the deterioration in borrower quality is large they do not find housebanks providing additional credit. Therefore, long-term relationships increase availability of credit in temporal negative shocks.

Harhoff and Körting (1998) use survey data on 1509 German SMEs to examine the role of lending relationships in determining the costs and collateral requirements for

external funds as well as the availability of credit, measured as the percentage of early discounts on trade credit taken. The proxies of strength of relationship are duration, the number of lenders and qualitative response in which firm managers indicate to what extent they consider their bank relationship as being characterized by mutual trust. First, interest rate is not significantly affected by duration or the number of lenders, and it decreases with trust. Second, collateral requirements decrease with duration and trust and increase with the number of lenders. Finally, availability of credit is lower for firms with more lenders; duration and trust are not significant.

Cole (1998) examines the effect of the existence of a bank-firm relationship on the probability of being granted a loan using a U.S. sample of small businesses. He finds that financial intermediaries are more likely to extend credit to firms with which they have a pre-existing relationship as a source of financial services, but that the duration of the relationship is unimportant. He also finds that the likelihood to grant credit is inversely proportional to the number of credit entities with which companies work.

D'Auria, Foglia and Marullo-Reedtz (1999) examine a panel dataset of Italian bank-firm relationships during the period 1987-1994, corresponding to 2300 large and medium-sized firms. They find that a main bank (measured as percentage of loans from main bank over total firm loans) provides credit at a lower interest rate and that increasing the number of bank relationships decreases the interest rate. Cosci and Meliciani (2002) also provide evidence from Italy. They find that the number of bank relationships has a positive effect on credit availability but has no effect on interest rates.

With data of 18,000 loans supplied by one of the largest Belgian banks, Degryse and Van Cayseele (2000) find an increase in the interest rate and a decrease of collateral with the duration of relationship. Firms that contract more financial products from the same intermediary, benefited from reduced costs but were asked for more guarantees.

Machauer and Weber (2000), using a sample of German firms, find that loan rate spreads are not effected by the number of bank relationships or housebank status.

However, borrowers with a small number of bank relationships provide more collateral and get more credit, where credit availability is the total credit line relative to the borrower's total assets. These two effects are amplified by a housebank relationship. Another German study is that of Lehmann and Neuberger (2001). They use bank survey data and find that the relationship's duration increases credit availability and decreases collateral, but has no effect on interest rates. They also look at the impact of the social interactions between the loan officer and the firm manager. Using four survey questions to measure trust, they find a positive impact on credit availability and negative on collateral requirements, but not effect loan interest rates.

Chakraborty, Fernando and Mallick (2002) adopt a different approach to measure how bank-borrower relationships affect availability of credit. For each firm, they compare the credit limit in lines of credit from different banks with which they have a different duration of relationship. This way, they can control for firm fixed unobserved heterogeneity. They find that the credit limit extended to U.S. small business increases with the length of the borrower-lender relationship. They also find that the credit limit increases with non-loan services and decreases with loan services. Using the same dataset, Chakraborty and Hu (2006) investigate how the duration and scope of the bank-borrower relationship affect the decision to secure a loan. They find that the likelihood of collateralizing a line of credit decreases with the length of the bank-borrower relationship and with the number of lenders.

From an historical perspective, Bodenhorn (2003) shows that relationships are valuable. He analyses contract-specific loan records of a U.S. bank from 1855. He measures the intensity of the relationship as the natural logarithm of one plus the number of times the firm has borrowed from the financial institution before. Firms with an extended relationship with a bank obtained a reduction in both the cost and the use of personal guarantees. In addition, these firms are more likely to have loan terms renegotiated during a credit crunch.

Using a quite different dataset, Athavale and Edmister (2004) examine the pricing of a sequence of loans provided by the same bank in the U.S. This way they avoid

using proxies for relationship strength. They find that the interest in the second loan decreases with respect to the first loan. This result supports that lending relationships resolve information asymmetries between the bank and the borrower. They do not find evidence of incumbent banks exploiting their monopoly power (hold-up).

By using a survey of 296 firms conducted in 2000 in Belgium, De Bodt, Lobez and Statnik (2005) examine the determinants of credit rationing probability. They find a positive relationship between credit availability and the duration of the lending relationship. An increase in the number of banks leads to an increase in the probability of credit rationing; however, this effect is stronger or weaker depending on the size of the lender and of the borrower.

Hernández and Martínez (2006) examine the effect of bank relationships on debt terms of 184 Spanish firms in year 1999. The measures of relationships used are duration and number of lenders. SMEs that work with fewer financial intermediaries obtain debt at a lower cost. Additionally, financial institutions show a clear tendency towards raising the use of personal guarantees as the relationship progresses.

Generally, credit rationing refers to the quantity of credit, but it may as well refer to rationing of the term of credit. That is, banks provide financing of a shorter maturity than borrowers' demand. Two recent works address this issue empirically. Cardone, Casasola and Samartín (2005) use a sample of 386 Spanish firms. They find that duration increases availability and the maturity of debt, but has no effect on interest rate or collateral requirements. The number of bank relationships only affects significantly and positively the availability of credit. Scope (number of financial products) reduces interest rate and decreases collateral requirements.

A second study by Ortiz-Molina and Peñas (2005) explores the determinants of the maturity of lines of credit in the U.S. They do not find any relation between maturity and stronger borrower-lender relationships, where strength of relationships is measured by the length of the relationship, the number of institutions from which the firm borrows, scope of the relationship -a dummy variable indicating whether the firm uses a checking account a savings account, or other financial services from the

lending institution- and distance between the borrower and lender.

Joint determination of loan contract terms

The empirical contributions reviewed so far assume that the determination of the interest rate is made independently of the decision on collateral requirement or the bank decision to make more credit available to the firm. However, it is likely that relationship lending shapes the overall lending decision to the firm. Some recent papers examine the effect of relationship lending on the simultaneous determination of various loan contract covenants. This approach allows incorporating the interdependencies between contract terms. Although a very appealing research direction, all of these studies are subject to an identification problem; which requires for instance, identifying instrumental variables that affect the determination of the interest rate but not collateral.

Dennis, Nandy and Sharpe (2000) propose a four equation model for the interest rate, collateral, fees and maturity that is estimated for a sample of 2634 bank revolving contracts. Data comes from LPC Dealscan database. The proxy for relationship strength is loan concentration, defined as the amount of borrowings in the deal relative to the borrower's total debt. They find that interest rate increases as a relationship develops.

Hanley and Crook (2005) explicitly consider the substitution between interest rate and collateral in loan contracts using a dataset for 1409 commercial loans in year 1998 provided for a UK retail banks. They propose a two equation model for the joint determination of collateral and interest rate. They find a higher interest rate for follow-up loans, that is, when there is an on-going relationship with the lender. This result can be interpreted as evidence of a lock-in effect. The authors also propose an alternative interpretation: given an amount of collateral, having an extra loan dilutes the value of collateral. Thus, the bank increases interest rate to compensate for additional risk.

Brick and Palia (2005) use a simultaneous equation approach to account for the

fact that collateral requirement is endogenously determined with interest rate. They find that the length of the relationship does impact upon both the probability of posting collateral and the level of the loan interest rates; however, the economic impact is relatively small. The results also show strong evidence for jointness in the terms of lending since collateral has a statistically significant economic impact on loan interest rates.

Firm financial constraints

Some related contributions examine the value of having a close bank relationship by using a different approach, which consists of testing whether financial constraints vary systematically between firms with close bank relationships and those without such relationships. If close bank relationships are valuable they should lessen the financial constraints that firms face. The first contribution of Hoshi, Kashyap and Scharfstein (1990) examines Japanese firms that are in financial distress. Firms are classified as having a close bank relationship if they are in the same industrial group (*keiretsu*) as the lender. They find that firms with close financial relationships invest more and have higher sales growth after a period of financial distress than non-group firms. In a follow-up study, Hoshi, Kashyap and Scharfstein (1991) compare the investment sensitivity to the cash flow of firms with a close relationship with respect to those that do not belong to a *keiretsu*.[7] They find that firms with close bank relationships appear to be less liquidity constrained than firms without close bank ties, i.e. investment is less sensitive to cash flow for firms that are members of a *keiretsu*. Nevertheless, it is worth mentioning the paper of Weinstein and Yafeh (1998) that shows that most of the benefits of those relationships are appropriated by the banks. In particular, they find that Japanese firms with close ties to their lenders exhibit slow growth rates and lower profitability.

[7]Since the seminal work of Fazzari, Hubbard and Petersen (1988) many empirical papers investigate financing constraints by measuring the sensitivity of investment decisions to firms' cash flow. The idea is that the most constrained firms should display a higher sensitivity, as they are forced to use internal funds to undertake investment projects. Recently, this approach has raised a number of criticisms on theoretical grounds by Alti (2003), Gomes (2001), Kaplan and Zingales (1997, 2000). Its empirical findings are also questioned by Cleary (1999, 2006).

Using a similar approach, Houston and James (1996) examine a sample of 250 publicly traded U.S. firms and find that those firms that rely on a single bank show a negative relation between bank debt and growth opportunities. On the contrary, firms that maintain multiple bank relationships or that borrow in public debt markets are significantly less cash flow constrained. In a more recent study, Houston and James (2001) expand the sample period to 1980-1993 and examine investment-cash flows sensitivity depending on the number of bank relationships. They find that firms that rely on a single bank show greater cash flow sensitivity of investment than firms that have multiple lending relationships or have public debt outstanding. Moreover, they find greater sensitivity for bank-dependent firms (those with at least 80 percent bank debt and no public debt). However, this effect is driven by firms with large capital expenditures. When examining firms with lowest level of capital expenditure, they find that bank-dependent firms are less cash-flow constrained.

By taking an historical perspective, Fohlin (1998) analyzes the formation of German universal banks (1903-1913). He finds that investment is more sensitive to cash flow for firms with close ties with banks than unattached firms.

Lender identity

Not all types of financial institutions are equally likely to offer relationship loans. The identity of the financial intermediary has an effect on how relationships are built and how the value generated through these relationships is shared between the bank and the firm. Therefore, characteristics of banks should have an independent impact on lending relationships and hence, on loan contract covenants. For instance, the organizational form of the bank may affect the kinds of activities that the bank can efficiently undertake (Berger and Udell 2002; Berger *et al.* 2005). The size of the lender can also matter; small banks have a comparative advantage in evaluating investment projects of the most informationally opaque borrowers, in comparison to large banks (Stein 2002). The capital structure and financial strength of the bank are other potential determinants of the lending policy.

Many authors have examined the impact of bank size on lending relationships from different perspectives. A branch of the literature analyzes the loan portfolio of banks by lender and borrower size. These studies typically find that large banks allocate lower proportions of their assets to small business loans than do small banks, that is, small banks lend a higher proportion of their assets to small firms. Since small firms are usually the most informationally opaque borrowers, these results are consistent with the idea that small banks are more efficient in building relationships (Peek and Rosengren 1996, 1998, Strahan and Weston 1998, Berger, Kashyap and Scalise 1995).[8]

Cole, Goldberg and White (2004) use U.S. survey data to look at the loan approval process across banks of different sizes. They find that large banks base their decisions on standard criteria obtained from financial statements - what the authors call a "cookie cutter" approach. In contrast, hard information has less explanatory power for the approval decisions of small banks. This is consistent with small banks basing their decisions more heavily on soft information. With a different approach, Berger *et al.* (2005) examine the effect of bank size on the characteristics of the bank-borrower relationship, such as duration and distance between the borrower and the lender among others. They show that small banks, because of their organizational structure, have a comparative advantage in collecting soft information with respect to large banks. Since soft information is a more important input for lending to informationally opaque borrowers, the authors argue that small banks are better suited for lending to small businesses.

Other contributions explicitly examine the impact of bank characteristics on loan contract terms. For example, Hubbard, Kuttner and Palia (2002) show that borrowing costs are significantly related to bank lender characteristics. The lower the bank capitalization the higher the interest rate. The effect is stronger for firms with more information costs. Therefore, lender identity does affect loan contract covenants.

By taking the perspective of banks, Berlin and Mester (1998) measure the increase

[8]This literature is related with the effect of mergers and acquisitions of banks that we review in section 2.4.4.

in profitability of banks that engage in loan rate smoothing. They argue that lending relationships are valuable because of the ability to smooth out loan pricing over multiple loans.[9] They find a positive relation between bank profits and smoothing of interest rate of loans as a response to interest-rate shocks. In contrast, they find that interest rate smoothing in response to a credit risk shock is not an optimal strategy for the bank since bank profits decrease.

A related branch of the literature examines the different behavior of foreign owned financial intermediaries. The reason is that foreign-owned banks may come from a very different market environment, with a different language, culture, supervisory and regulatory structure; therefore, they can face more difficulties when trying to build close relationships with their client firms (e.g. Fok, Chang and Lee 2004).

2.4.4 Relationship lending and banking competition

How to measure banking market competition from an empirical point of view is subject to controversy. The structure-conduct-performance (SCP) hypothesis justifies the use of credit market concentration as a proxy for the degree of competition in the banking market. Following this approach, the most widely used measure of competition is the Herfindahl - Hirschman Index (HHI) and is defined as the sum of squares of the market share of each bank operating in the market. We start this subsection by reviewing the studies that use an index of concentration to analyze the impact of competition on lending relationships. Another possibility is to exploit the exogenous change in the degree of concentration that results from a merger or acquisition in the banking market. We review these contributions afterwards.

[9]The model of Fried and Howitt (1980) provides theoretical foundations for such a hypothesis. They present a model of risk sharing in which bank-firm customer relationships lead the bank to smooth interest rate shocks on to the borrowers. A bank may be willing to insure the customer against part of the risk associated to interest rate fluctuation by a policy of keeping interest rates less variable, in return for which the customers may be willing to compensate the bank in the form of a higher average interest rate.

Degree of concentration in the credit market

With U.S. data, Petersen and Rajan (1995) test their relationship lending theory. Using the Herfindahl index of concentration in the deposit market as an indication of market power, they find that young firms receive more and cheaper credit in concentrated markets than do similar firms in less-concentrated banking markets; they also find that creditors in concentrated markets seem to smooth interest rates over the life cycle of the firm, charging lower-than-competitive rates when the firm is young, and higher-than-competitive rates when the firm is mature. The authors conclude that competition and lending relationships are not compatible.

Some studies analyze the direct impact of competition on bank orientation, i.e. the bank choice of relationship versus transaction lending. Degryse and Ongena (2004) use a sample of 13,098 loans to Belgian firms. The novelty of this contribution is to use as dependent variable a dummy variable equal to one if the bank considers itself the main bank to proxy for relationship lending orientation. They find that an increase in interbank competition induces banks to be more relationship oriented. Using a similar approach, Elsas (2005) finds a non-monotonic relationship between market concentration and housebank relationships. For low and intermediate values of concentration, housebank relationships become more likely as competition increases. These findings contradict the conjecture that relation lending requires monopolistic market structures. Nevertheless, in highly concentrated markets, less competition fosters housebank relationships.

Many papers include a measure of market concentration on the regressions of interest rate, collateral requirements, etc. However, the conclusions that can be drawn from these studies in terms of the impact of competition on lending relationships are limited. The reason is that they test the direct effect of competition on loan contract covenants, which does not allow inferring whether banking market concentration inhibits or fosters lending relationships. A proper test should include the interaction effects, to account, for instance, for the different effect of the duration of the relationship on interest rate depending on market concentration. Having in mind

this limitation, we briefly enumerate some results. Hannan (1991), D'Auria, Foglia and Marullo-Reedtz (1999), Berger, Rosen and Udell (2001) find that the impact of concentration on the loan rate is mostly positive. However, Kim, Kristiansen and Vale (2005) find an insignificant effect. Angelini, Di Salvo and Ferri (1998) find a no significant effect of banking market concentration neither on interest rate nor in credit availability.

By means of a different methodology, Farinha and Santos (2002) study the switching from single to multiple bank relationships by Portuguese firms. They do not find that bank competition in the region where the firm is located - measured by the number of banks - plays any role in its decision to switch from single to multiple relationships. However, the arrival of new banks nationwide, potentially leading to less concentrated and more competitive banking markets, increases switching rates.

Finally, it is worth mentioning the cross-country study of Cetorelli and Gambera (2001). They use a cross-industry panel dataset to test the average effect of bank concentration on growth in different industries. They find that concentration has an overall negative effect on growth, but that the effect is heterogeneous across firms. Industries where young firms are more dependent on external (bank) finance grow faster in countries that have a more concentrated banking sector, which supports the idea that banking concentration fosters relationship lending.

Bank mergers and acquisitions

Does banking consolidation affect the incentives of new consolidated banks to offer relationship loans? Several papers have analyzed the impact of bank mergers and acquisitions on credit availability to SMEs. Their main objective is to investigate how banking consolidation affects small business lending. Since small business are thought to be the type of borrowers that mostly benefit from relationship lending, these studies can provide some insight on how M&A affect relationship lending. Berger and Udell (2002, p.45) provide a review of the main findings of this literature. In short, many studies find that mergers and acquisitions involving large banking organisations

reduced small business lending substantially (Sapienza 2002). However, this effect is generally compensated by the reaction of other banks in the same local market, which increase the supply of relationship loans (Berger *et al.* 1998). Therefore, the overall effect of M&A on lending relationships is still unresolved.

In a recent contribution, Degryse *et al.* (2005) study the impact of mergers on the probability of discontinuing a lending relationship. They find that borrowers of acquiring banks are less likely to lose their lending relationship, while borrowers of target banks are more likely to discontinue the relationship. This suggests that mergers have an heterogeneous impact on lending relationships, that is: some bank-firm relationships may weaken as a result of a merger while others may be reinforced.

2.4.5 Determinants of the number of bank relationships

In this section we review the contributions that empirically examine the determinants of the number of bank relationships. Some of these papers include a theoretical model (see section 2.3.3 for details). The big bulk of papers use data from a single country, but some studies make use of cross-country data.

Harhoff and Körting (1998) explain the number of bank lending relationships chosen by German firms. They find that the number of relationships increases with the firm's age, size, and leverage and that innovative firms have more relationships. They also find that firms in financial distress increase the number of lenders.

Detragiache, Garella and Guiso (2000) examine matched bank-firm data in Italy. They find that firms tend to work with more than one bank when (i) they establish relationships with smaller banks, and (ii) there is a high probability that these banks will become insolvent. Additionally, firms tend to work with only one bank when they are very small and when they develop very profitable projects. Also provide evidence from Italy Cosci and Meliciani (2002). They find that the number of bank relationships increases with a firm's leverage and with the riskiness of the sector in which the firm operates.

Berger, Klapper and Udell (2001), using a rich data set on Argentinean loans

to 61,295 firms in 1998, test hypotheses about borrowing from a single bank versus multiple banks. They find that firms tend to borrow from multiple banks when their primary bank is in financial distress. Informationally opaque firms (measured by size) are more likely to have a single lender.

Machauer and Weber (2000), using a sample of German firms, find that the number of bank relationships has a positive relationship between company size and a negative relation with the existence of a housebank relationship. Borrower quality, even combined with the existence of a housebank, has no effect on the number of bank relationships.

Farinha and Santos (2002) examine the factors which determine Portuguese companies to increase the number of financial entities with which they work. They identify two main reasons why firms substitute single for multiple bank relationships. The first explanation is adequate for firms with high levels of investment, which increase the number of bank relationships to avoid the hold-up cost. The second reason applies mostly to firms with poor performance, which increase the number of bank relationships because they are denied credit from their incumbent bank.

Guiso and Minetti (2004) empirically test the implications of their model concerning the firm's decision on how to distribute the information among lenders. They use the 1993 and 1998 NSSBF datasets of US firms. The main results are that firms with more valuable and more redeployable assets tend to differentiate information rights more sharply, that is, they borrow from multiple lenders.

Hernández and Martínez (2005) examine the determinants of the number of banks of Spanish firms and finds that large, old and most leveraged firms tend to work with more financial institutions.

Neuberger and Schacht (2005) describe the number of lenders in Switzerland. The average number of relationships is 2.1 which indicates that housebank relationships are dominant in the SME loan market of Switzerland.

Few contributions study the determinants of the number of bank relationships across countries. Ongena and Smith (2000b) analyze a survey of treasury and cash

managers conducted in 1996 across 20 European countries comprising 1079 firms (*GlobalCash-Europe96*). They provide an interesting cross-country comparison of the number of bank relationships. In the regression analysis, they find that the number of financial institutions is determined by the characteristics of the financial system, the existing legal framework, the size of the companies and their levels of debt. In a related study, Volpin (2000) finds a negative correlation between shareholder protection and the average number of banks used by firms.

2.4.6 Related issues

This final subsection briefly addresses some issues related to relationship lending that have recently attracted the attention of researchers. Although they are not directly linked with the research in this thesis, we report them for completeness of this review of the literature.

Distance

Since the traditional location differentiation model of Salop (1979) distance has been though to play an important role in banking. The physical distance between the bank and the borrower may play an important role in providing the incentives to build long-term relationships. For example, the monitoring effort by banks may decrease with borrower-lender distance because of extra communication costs or transportation costs incurred by banks visiting the borrowers' premises. On the other hand, one can argue that technological change has improved communication and information technologies and consequently, distance no longer plays a role any more in relationship lending. However, the literature on relationship lending regarding this issue is scant and has only been addressed marginally in some papers. For example, Petersen and Rajan (2002) document an increase in distance and new modes of communication between small firms and lenders in the US. Degryse and Ongena (2005) find that the firm-lender distance in Europe has not changed significantly during 1975-1997. Buch (2005) finds that during the period 1983-1999 distance became less important

for international bank lending by U.S. banks, in stark contrast to European banks for which distance remained of the same importance.

Relationships in investment banking

Relationship banking is not exclusive of commercial bank lending. Relationships play a crucial role in investment banking as well as in the activities of non-bank financial intermediaries and private equity and debt markets (Boot 2000). Schenone (2004) shows that firms that have an existing relationship with their IPO underwriter face lower under pricing than firms without such banking relationships. Some recent contributions examine the impact of previous relationships on fees paid for debt and equity underwriting business and find that past lending relationships significantly reduce fees (e.g. Yasuda 2005; Drucker and Puri 2005; Burch, Nanda and Warther 2005).

Relationship banking and the transmission of monetary policy

A considerable body of literature has explored the effects of monetary policy on bank lending in a framework of imperfect information. Two main channels are identified for the transmission of the monetary policy to small businesses. First, the bank lending channel: a monetary contraction reduces bank reserves, which obliges banks to reduce their supply of credit. As a result, small businesses more dependent on bank finance are more likely to be credit constrained. Second, the balance sheet channel: a monetary contraction raises interest rates, which weakens the financial ratios and the balance sheets of borrowers. This deterioration of the financial health of borrowers may especially affect small businesses that rely on transaction lending. Borrowers that have a close relationship with their bank may be less affected by these external shocks because lending decisions are based on soft information. Therefore, relationship lending constitutes a mean to lessen the effects of monetary policy on small businesses (see Berger and Udell 2002, for a more detailed discussion).

Chapter 3

Relationship Lending and Banking Competition: Are They Compatible?

3.1 Introduction

Banks can employ a variety of technologies for their lending activity, which includes several transaction technologies plus relationship lending. Previous research emphasizes that banks need some degree of market power to have the incentives to invest in long-term relationships with their borrowers. A consequence is that relationship lending technologies are likely to be used in the most concentrated banking markets while transaction technologies would be preferred to relationship lending as the degree of banking competition increases (Petersen and Rajan 1995). This implication raises a major concern because the most informationally opaque firms, which depend on relationship lending to finance their projects, would be the most adversely affected by increases in banking competition.

In this paper we challenge the traditional view that banking competition and relationship lending are incompatible. The bank's incentives to build a relationship with the firm are determined by the bank's anticipated degree of bargaining power over the firm's cash flows, once projects have begun. We acknowledge that in a concentrated banking market the bank's *ex post* bargaining power is granted exogenously by the market power that the bank may have. We argue that even in a perfectly competitive market, banks may be willing to invest in relationship lending because bargaining power arises endogenously in the relationship. Sharpe (1990) and Rajan (1992) show that a bank that lends to a firm learns more about that borrower than other banks do. The informed lender acquires an informational monopoly with respect to other potential lenders, which later on gives to the informed bank the ability to extract monopoly rents from its borrower (hold-up problem). Clearly, the larger the number of banks that become informed about a firm's creditworthiness, the lower the value of the information for each single bank. In consequence, we expect that firms borrowing from several banks will not incur hold-up costs; however, they will not take advantage of lending relationships. That is, borrowing from multiple lenders generates "too much" competition *ex post* among informed lenders which reduces the *ex ante* incentives of each bank to engage in relationship lending. On the other hand, firms with a

single banking relationship are likely to receive relationship loans because the lender anticipates some degree of bargaining power over the firm's cash flows later on in the relationship.

We emphasize that both the degree of banking market competition and the number of lenders will determine the *ex post* bargaining power of banks, and thus, the prevailing lending technology and the borrowing conditions for firms.[1] The rationale is that what matters is not only the competitive pressure from potential banks in the banking market (*exogenous competition*) but also the actual number of lenders that acquire inside information about the firm (*endogenous competition*). We investigate this issue empirically using a survey of small firms in the United States. The empirical analysis consists on examining the availability of credit and the loan interest rate over the course of the relationship between the bank and the firm, depending on the degree of banking market competition and the number of lenders. We show that credit availability and loan interest rates are determined by the interaction of these two types of competition. We find that when both types of competition are in place, that is, when a firm is located in the competitive market and borrows from multiple lenders, then banks use transaction lending technologies. If a firm has a single bank relationship then the bank will be relationship oriented. The extent to which the bank makes firm-specific investments depends on its expected capacity to extract rents in the future, which is determined by the degree of banking market competition. Therefore, relationship lending technologies are used in the most competitive banking markets as long as firms confer monopoly power to the lender by borrowing exclusively from it.

Our paper is related to a strand of the literature that focuses on relationships and competition in banking markets. In the seminal work of Petersen and Rajan (1995) it is shown that the extent of banking market competition plays a prominent role

[1]Berger and Udell (2006) emphasize a causal chain in which the financial institution structure determines the feasibility and profitability of the different lending technologies that can be deployed to fund SMEs. In turn, the choice of lending technology has important effects on the availability and cost of funds for SMEs. Here, we focus on one aspect of the financial institution structure, namely the degree of competition in the banking market.

on the incentives of banks to engage in relationship lending, and thus, on the firms' availability of credit and on the determination of the loan pricing scheme. Banking competition inhibits lending relationships. The reason is that competitive pressure may threaten the relationship in the future because firms might switch banks or substitute bank finance with other financial sources. In contrast, when banking markets are concentrated, it is more credible that the firm will not switch to a competitor and the bank anticipates that it will benefit from lending to the firm again in the future. Therefore, banks are more willing to engage in relationship lending in concentrated markets, which usually involves offering credit in early periods at a subsidized rate. As a consequence, Petersen and Rajan (1995) argue that especially young and lower quality firms may be negatively affected by banking competition. However, it is not obvious which will be the role of competition once we also take into account the number of banks from which the firm is actually borrowing and share inside information about the firm. As mentioned before, in our paper we want to analyze the effect of the joint interaction of these two types of competition on relationship lending.

In a later theoretical contribution, Boot and Thakor (2000) present a model with opposite predictions. In their model, they allow banks to engage in both relationship and transaction lending. As competition among banks increases, banks have greater incentives to offer relationship loans because a bank's profits in transaction lending decrease more than its relationship lending profits. Therefore, to obtain positive profits, banks in competitive credit markets become more client-driven and make more relationship loans.

The findings in our paper are related to Anand and Galetovic (2006). They examine how the tension between relationships and competition is resolved in the investment banking market. Investment banks and firms are able to establish relationships without either local monopoly power (firms usually have multiple relationships) or aggregate monopoly power (investment banking market is highly competitive). They show that relationships in investment banking are protected thanks to soft price competition. As the authors acknowledge, the characteristics of the investment banking

industry that guarantee that competition and relationships are compatible are not present in the commercial banking structure. Therefore, other mechanisms have to be in place in the commercial banking market to make competition and relationships compatible.

It is worth noting that the results presented in our paper are directly comparable to the results of Petersen and Rajan (1995) since the dataset is the same, namely the National Survey of Small Business Finance (1988). Even though it can seem outdated, the 1988 survey is particularly suited for our analysis. Since then there has been a huge increase in mergers and acquisitions in banking in the U.S. which would challenge a crucial assumption of the empirical test, namely that the relevant market where banks compete is the county or MSA[2] where the firm is located.

The rest of the paper is organized as follows. In the next section we describe the empirical strategy. In section 3.3 we describe the database used, we define the main variables used in the empirical analysis and we provide some descriptive statistics of the sample. Section 3.4 presents the empirical analysis on the availability of credit and the results on the borrowing costs can be found in section 3.5. Finally, the last section concludes.

3.2 Empirical strategy

The main objective of the analysis presented in this paper is to answer the following question: Can lending relationships and banking competition be compatible? The model in Petersen and Rajan (1995) provides the basis to empirically test this hypothesis. The model predicts that when relationship lending is the prevailing lending technology we should observe (1) increased availability of credit, especially for young and small firms, and (2) cross-subsidies of interest rates over the duration of the relationship. The reason is that relationship lending reduces information problems inherent to small firms finance and permits the funding of projects that using other

[2]Metropolitan Statistical Area.

lending technologies could not be undertaken. For instance, consider a young and small firm that has an investment project that is profitable from a long-term perspective but it is not in the short term. With transaction lending, this firm may be unable to raise the funds needed to undertake the project because it has to break even with the bank in every period. However, a long-term relationship with the lender may overcome this problem by establishing a loan contract in which the bank subsidizes the firm in the initial periods, and then in future periods the firm shares the cash-flows from the project with the bank.

From the borrower point of view, lending relationships entail many benefits in terms of increased credit availability and subsidized interest rates, especially in the initial periods of the relationships. Therefore, young firms would be eager to engage in relationship lending. Thus, the relevant question in this context is: When banks will have the incentives to engage in relationship lending? The answer is that lenders need to anticipate that they will have some degree of bargaining power *ex post* over the firm's cash flows in order to be willing to make the required initial investment in gathering and generating firm-specific information and to provide funds at a subsidized interest rate. We distinguish two different sources of bargaining power. On the one hand, in a concentrated banking market, lenders enjoy some degree of market power. While on the other hand, bargaining power arises endogenously in the relationship. Therefore, we expect that both the degree of banking market concentration and the number of lenders will determine the *ex post* bargaining power of banks, and thus, the prevailing lending technology and the borrowing conditions for firms.

The empirical strategy consists of comparing the availability of credit and the interest rate on loans depending on the degree of banking market concentration and depending on the number of lenders. We start with an exhaustive descriptive analysis. We examine the main summary statistics of key variables reflecting firm quality, credit availability, loan contract terms and characteristics of the bank-firm relationships.

We then proceed with an econometric analysis. We estimate the differential effect of the relationship's duration on the availability of credit and on the cost of credit de-

pending on the degree of banking market concentration and depending on the number of lenders. Our estimation strategy consists of two steps. First, we will estimate the level effects, that is, we will estimate the effect of banking market competition and number of lenders on credit availability and interest rate, controlling for different aspects of the bank-firm relationships. To allow for sufficient flexibility in the intercept we include six dummy variables for the different degrees of market concentration[3]: competitive; intermediate and concentrated; and number of lenders - one or more than one.[4] When banks grant a loan to a firm they gather information about those firms to assess the credit risk of their projects. In the regression analysis, we control for observable firm characteristics and relationship characteristics. The specification of the model is as follows:

$$\begin{aligned} Y_i &= \sum_{j=0}^{1}\sum_{k=1}^{3} \beta_{jk} I_{NLender=j} I_{Herfindahl=k} + \\ &+ \lambda\ Firm\,Characteristics_i + \\ &+ \pi\ Relationship\,Characteristics_i + u_i \end{aligned}$$

where Y_i denotes the dependent variable (credit availability or loan interest rate), β_{jk} are the coefficients of the intercepts, the dummy variable $NLender$ equals zero when the firm has a single lender and one for multiple lenders, the indicator variable $I_{variable=j}$ equals one when the condition in the subindex is satisfied and zero otherwise. For instance, $I_{NLender=1}$ is a dummy variable equal to zero when the firm receives the most recent loan from the single lender it has a relationship with and one when the firm has multiple lenders. The $Herfindahl$ variable takes values 1, 2 and 3 for the

[3]We measure market concentration by the Herfindahl index of commercial bank deposit concentration in the county or MSA where the firm is headquartered. The survey does not provide the actual Herfindahl index but only three categories of the index in the local credit market. The competitive banking market corresponds to the Herfindahl index below 0.1, the intermediate market between 0.1 and 0.18 and the concentrated market greater than 0.18.

[4]In the models estimated we include a constant term and five dummy variables. The reference group is "one lender and competitive market".

different degrees of market concentration, and the three dummy variables $I_{Herfindahl=k}$ are defined accordingly. This model allows comparing the average value of Y_i (credit availability or interest rate) depending on market concentration and number of lending relationships, while we control for observable characteristics.

The second approach estimates the slope effects. We want to estimate the evolution of the availability of credit and the evolution of the interest rate over the duration of the bank-firm relationship depending on the banking market concentration where the firm is located and depending on the number of lenders. In addition to the set of dummies that allow for different intercepts, we interact the length of the relationship with these dummies so that we can estimate the evolution of the interest rate with relationship length in each setting.[5] The specification of the model is as follows:

$$\begin{aligned} Y_i &= \sum_{j=0}^{1}\sum_{k=1}^{3}[\beta_{jk} + \gamma_{jk} log(length)][I_{NLender=j} I_{Herfindahl=k}] + \\ &+ \lambda\ Firm\,Characteristics_i + \\ &+ \pi\ Relationship\,Characteristics_i + u_i \end{aligned}$$

The intercepts β_{jk} can be interpreted as the average value of Y_i (credit availability or interest rate) at the beginning of a relationship (length of relationship equals zero), given a degree of market concentration and a given number of lending relationships. The slopes γ_{jk} estimate whether Y_i increases or decreases over the duration of the relationship in each setting.

Finally, we estimate this model using the age of the firm instead of the length of the relationship. As Berger and Udell (1995) argued, the length of the relationship proxies for the information that remains confidential between the bank and the firm - the information that is not disclosed. In contrast, the age of the firm proxies for the

[5]Given that our data is a cross-section, for the validity of this approach we need to make the same assumption as Petersen and Rajan (1995), that is, that the survival process is stationary. Under this assumption, even though the dataset is a cross section of firms, we can infer the changes in credit availability and interest rates with length.

information on firm quality that is revealed to the market as a whole. By comparing the estimations with each variable we can infer which type of information is passed on, that then is used to improve the finance terms of loan contracts.

According to the model of Petersen and Rajan (1995), when relationship lending is the prevailing lending technology we expect to observe (1) increased availability of credit, especially for young firms, and (2) cross-subsidies of interest rates over the duration of the relationship. We start with an analysis of credit availability (Y_i = measure of the firm's credit availability). With relationship lending, we expect that young firms will have greater credit availability (β_{jk} positive). The slopes (γ_{jk}) estimate whether availability of credit increases or decreases over the duration of the relationship - there is no *a priori* prediction of the model.

Next, we analyze the cost of credit (Y_i = loan interest rate). If relationship lending is the main lending technology we expect to observe cross-subsidies of interest rates over the duration of the relationship. That is, at the beginning of the relationship we should have lower-than-competitive interest rates because firms obtain credit at subsidized rates (β_{jk} negative). Later, banks will compensate this subsidy by demanding an interest rate above the competitive one (γ_{jk} positive). In the absence of these long-term relationships between banks and firms we expect the interest rate to be high at the beginning (β_{jk} positive) and fall more rapidly (γ_{jk} negative).

3.3 Dataset and descriptive analysis

3.3.1 Data

The dataset used in this study is the 1988 National Survey of Small Business Finances conducted by the Board of Governors of the Federal Reserve and the U.S. Small Business Administration. The survey collected information on the use of financial services and institutions by a nationally representative sample of U.S. firms. The target population was all non-financial, non-farm small business firms with fewer than

500 employees. The major advantage to using this survey is that it has been utilized extensively to analyze the financing patterns of small firms and in particular, some of the most detailed empirical analyses of relationship lending have been done using this dataset.[6] The survey contains a description of the firms' general characteristics (size, age, industry, location, ownership structure, etc.), a detailed description of the sources of finance (bank credit, trade credit, leases, etc.), the use of financial services, and the balance sheet and income statements. In our analysis we use the information on trade credit usage, the variables on the terms of the most recent loan obtained by the firm (interest rate, fix or floating rate, collateral requirements, amount, maturity) as well as information regarding the relationship between the bank and the firm (duration of the relationship). The full sample size is 3224 firms. For the analysis of credit availability, we select those firms that have information on the percentage of trade credit discounts taken (our measure of availability of credit) and after deleting observations that are missing in some crucial variables we end up with 1321 firms. For the analysis of the cost of credit, we select those firms that completed the part of the questionnaire referring to their most recent loan. After eliminating the loans granted by government agencies and because of missing values we end up with 1294 firms.

3.3.2 Variables

The dependent variable used to measure availability of credit is the percentage of trade credit discounts offered to the firm that were taken (*Trade credit discounts*) Petersen and Rajan (1994, 1995) propose this variable as a preferred measure of credit constraints.[7] The argument is as follows: trade credit is the credit provided by suppliers. Extensive empirical work on trade credit shows that the decision to offer discounts for early payment is sector specific and does not depend on firm quality.

[6] Petersen and Rajan (1994, 1995), Berger and Udell (1995), Cavalluzzo and Cavalluzzo (1998), Uzzi (1999) among others.

[7] Harhoff and Körting (1998) also use the fast payments discounts taken as an inverse measure of the availability of credit.

Moreover, the terms of these early payment discounts are quite substantial because they are placed to give incentives to firms to pay on time.[8] Thus, not taking them is an expensive borrowing. In sum, the percentage of trade credit discounts that were taken over the amount offered can be used as an inverse measure of firm credit constraints, i.e., a measure of credit availability. A firm that is not credit constrained by their financial sources will be able to take more discounts. A firm that is credit constrained by their institutional financial sources will rely on alternative, more expensive sources such as trade creditors, and thus, take a lower percentage of trade credit discounts. Another variable we use to measure credit availability is the proportion of trade credit paid after the due date (*Trade credit paid late*). An analogous argument is made: the higher the proportion of trade credit paid after the due date the lower the credit availability. The results obtained with both measures are qualitatively similar; we choose to report the ones obtained with the percentage of trade credit discounts taken.

The dependent variable used in the analysis of the cost of credit is the interest rate quoted on the firm most recent loan (*Interest rate*). When banks take the decision to grant a loan to a firm they gather information about the firm to assess the credit risk of their projects. Lenders will charge an interest rate equal to the underlying cost of funds plus a premium that will depend on the quality of the firm. In the regression analysis, we will control for observable firm characteristics and the prevailing conditions in the market when the loan was made.

Together with the dependent variables, there are three fundamental variables in the study. The first one is the length of the bank-firm relationship. For the analysis of credit availability, we use the longest relationship with a financial institution that the firm has (*Longest length*). For the cost of credit regressions, we use the relationship's duration with the financial institution that granted the most recent loan (*Length relationship*). The second variable is the banks' market power, which is measured by three dummies depending on the value of the Herfindahl index of the market

[8] Petersen and Rajan (1997), Cuñat (2006)

for deposits in the county or MSA where the firm is headquartered (*Competitive, Intermediate, Concentrated*).[9] The third variable is the number of institutions from which a firm is borrowing (*Number of lenders*). This variable is recoded as two dummy variables for *One lender* and *More lenders*. Table 3.1 provides the definition of the remaining variables used in the regression analysis, with their mean and standard deviation.

3.3.3 Firm characteristics by market structure and number of lenders

Table 3.2 provides the mean (panel A) and the median (panel B) for several variables measuring the quality of the firms in the sample as well as some measures of credit availability.[10] We classify the firms in sixteen subsamples depending on their age (firms younger than the median age on the sample - 10 years - and older firms), the degree of market concentration where they are located (most competitive and most concentrated)[11] and the number of lenders (one or more than one). For each variable, we test the equality of the means and the medians - using the Wilcoxon Rank-Sum test - for young and old firms, for the competitive and concentrated market and for the firms with a single lender and the firms with multiple lenders. All these tests are not reported, however, the main findings are commented on below. Overall, we have 1294 firms from which 689 are younger and 605 are older than 10 years. 101 firms are located in the most competitive market, 823 in the most concentrated market and the rest in the middle market. 36 percent of the firms in the sample (463 firms) have a single bank relationship (see seventh column, table 3.2).

In the first column of table 3.2 we report the mean and the median of *Total assets* in order to see whether there exist differences in the size of firms. Not surprisingly,

[9] See Petersen and Rajan (1995) for a justification that this is a good measure of local credit market competition.

[10] We use the sample of firms that have information on its most recent loan to compute these statistics, except for the trade credit variables where we use the sample of firms with information on trade credit usage.

[11] For reasons of brevity, the summary statistics for the middle market (markets with Herfindahl index between 0.10 and 0.18) are not reported.

older firms are bigger than young firms. The difference in book value of assets between young and old firms is significant in the concentrated market (in mean and median) but not in the competitive market. When we control by age and number of bank relationships, we can see that firms in the competitive market are bigger than those in the concentrated market - except for old firms borrowing from more than one bank that are bigger in the concentrated market - but none of these differences are statistically significant. Thus, the size distribution of firms applying for credit is similar in all markets. Finally, we notice that firms that have more than one bank relationship are bigger than firms with only one bank relationship, and this difference is significant in the concentrated market (young: t=3.66 and old: t=5.03) but it is not significant in the competitive market (young: t=1.47 and old t=0.47).

The summary statistics for the ratio of *Operating profits over assets* can be found in the second column of table 3.2. We observe that young firms have larger ratios of profits over assets than old firms. The biggest differences are shown by firms with a single lender. The smallest differences are for firms with more than one lender, which have similar profitability ratios when young and when old. Controlling by age and the number of bank relationships, firms in the competitive market are more profitable but the difference is not statistically significant. More interestingly, young firms with a single bank relationship are more profitable that those that have more than one bank relationship (in mean but not in median). On the contrary, old firms that borrow from a single bank are less profitable than those borrowing from two or more banks.

In the next column we report the *Sales growth*. Young firms grow faster than old firms in similar markets and with the same number of bank relationships. The differences in sales growth by the degree of market concentration are not significant. Note that in the concentrated market, for both young and old firms, sales grow faster for firms with more than one bank relationship than those with only one bank (the difference in the median is significant, young: z=1.61 and old z=2.07).

In light of these results we can conclude that the quality of firms is similar across market structures. In particular we note that young firms in the competitive market

with multiple bank relationships have similar if not better quality than the remaining young firms. Firms borrowing from more than one bank appear as good as the ones with a single bank relationship. Thus, we can conclude that neither the number of lenders nor the market structure is a proxy for the quality of the firms.

3.4 Availability of credit

3.4.1 Availability of credit by market structure and number of lenders

Various variables are used to measure availability of credit. In the fourth column of table 3.2, firm leverage provides a measure of the actual use of bank debt (*Debt over assets*). This measure is not absent of criticism because it does not control for firm investment opportunities and for those firms that are financially constrained it does not reflect the amount of debt demanded. Nevertheless, the debt ratio gives a first insight into the credit that is available to the firm. We observe that young firms are more leveraged than old firms. The reason could be that younger firms tend to have fewer internal sources of funds and good investment opportunities. For older firms it may be easier to finance new projects with internal sources. The most significant difference on debt ratios by age is for firms in the competitive market with a single bank relationship - the decrease on the median of the debt ratio is 40 percentage points (z=1.654). On the contrary, firms that are located in the competitive market that borrow from more than one bank have similar debt ratios when young and when old. Moreover, these firms have the lowest debt ratios among the young firms (average of 0.52). In the concentrated market, for both young and old firms, those firms with multiple lenders are more indebted than firms with one lender (difference in mean and median is highly significant).

We measure credit availability with two other variables reflecting the use of trade credit: the percentage of trade credit discounts offered to the firm that were taken (*Trade credit discounts*) and the proportion of trade credit paid after the due date

(*Trade credit paid late*). By looking at the descriptive statistics of these variables (fifth and sixth columns of table 3.2) we can see that credit availability increases with firm age. Older firms are taking on average 15 percentage points more trade credit discounts and tend to pay less trade credit after the due date than younger firms - for all degrees of market concentration and number of lenders. This observation reflects the fact that as firms get older they have access to more sources of finance which allows them to rely less on expensive financial sources such as trade credit. To have a single lender increases credit availability, especially among young firms. The difference in the median percentage of discounts taken by young firms with one lender with respect to firms with multiple lenders is 52 percentage points in the competitive market and 35 percentage points in the concentrated market. Comparing the trade credit usage in most competitive and most concentrated markets (controlling by age and number of lenders) we observe firms in the competitive market taking less discounts and paying more trade credit late than firms in the concentrated market, although these differences are not significant at 10 percent.

These descriptive statistics of trade credit usage provide evidence of the significant variation on the availability of credit depending on the degree of banking market competition and the number of lenders that a firm has. We next turn to the regression analysis to further explore the differences in credit availability, controlling for observable firm quality and characteristics of the bank-firm relationships.

3.4.2 Regression analysis of credit availability

The dependent variable is the percentage of early payment discounts in trade credit offered to the firm that were taken (*Trade credit discounts*). Since this variable is censored at 0 and 100 percent we estimate the model with a tobit regression with two-sided limits (15 percent of the observations are censored at zero percent and 48 percent are censored at 100 percent). As explanatory variables, we first include a set of firm characteristics: the log of book value of assets to control for size, the ratio of operating profits over assets, the age of the firm, a dummy for corporations, a

dummy for urban location, dummies for firm industry and dummies for the region where the firm is located. We next add three variables that proxy for the strength of the relationships between the firm and its lenders: the fraction of institutional debt from close institutions[12], the number of institutions with at least 10 percent of institutional debt and the log of the length of the longest relationship.[13]

The estimated models can be found in table 3.3. In the first column we run the same regression as Petersen and Rajan (1995) in order to facilitate comparison of our analysis with theirs. The explanatory variables of this regression are the firm characteristics and the relationship variables described above. It also includes the concentrated market dummy variable in order to test whether firms in the concentrated credit market can take, on average, a higher amount of trade credit discounts than other firms. The coefficient estimated is 14.05 meaning that firms in the most concentrated market take on average 14 percentage points more trade credit discounts than do firms in the most competitive credit market (t=2.38).[14] In light of this result and many robustness checks, Petersen and Rajan (1995) conclude that firms in the most concentrated credit market are the least credit rationed. The remaining variables show the expected sign: larger, more profitable and older firms have greater availability of credit. We also find that firms that have longer relationships with financial institutions have greater availability of credit. Increasing the number of lenders has a negative effect on availability of credit.

As a first attempt to test the hypothesis that banking competition and lending relationships are compatible provided that the firm only borrows from one lender, we add in to the regression a dummy variable that takes value one if the firm is located in the competitive market and is borrowing from a single lender. The results can be found in the second column of table 3.3. The coefficient estimated for the concentrated market dummy is 16.8 (t=2.78) and the coefficient for the competitive

[12]An institution is considered to be close to the firm when the firm has also a checking account, a saving account or another informational service with that institution.

[13]The control variables in this analysis are the same used by Petersen and Rajan (1995) to facilitate the comparability of results.

[14]Petersen and Rajan (1995) estimate a coefficient of 16.54 (t=2.9).

market and singe lender dummy is 26.7 (t=2.07). On average, firms in the competitive market borrowing from a single lender have more credit availability than firms in the concentrated market.

Next, we run the two regression models proposed in section 3.2. These models allow for sufficient flexibility in the intercept and slopes; this way we can test whether the differences in availability of credit depend on both, the degree of banking market competition and number of lenders. The regression in the third column of table 3.3 estimates differences in intercepts by including five dummy variables plus a constant term (the reference category is more than one lender in the competitive market). The largest coefficient is for firms in the competitive market with a single lender. In the competitive market it makes a big difference to borrow from a single lender or multiple lenders: firms with only one lender take 35 percentage points more trade credit discounts than firms with more than one lender (coefficient significant at 5 percent). In the concentrated market the difference is smaller but it is still significant: firms with one lender take 16 percentage points more trade credit discounts than firms with multiple lenders (test of equality of intercepts in the concentrated market: p-value=0.0136). We next tested the equality of the intercepts for firms with one lender in the competitive and concentrated market and failed to reject the hypothesis (p-value=0.5599). The intercepts for firms with multiple lenders are statistically equal in the concentrated and in the competitive market (p-value=0.4540).

The regression in the fourth column of table 3.3 gives estimates of intercepts and slopes by market structure and number of lenders. We find that among the firms that start a relationship (length=0), the ones that can take more trade credit discounts are firms in the competitive market that borrow from a single lender. The difference with firms in the competitive market that start multiple relationships is huge: 82 percentage points (p-value=0.0545). The remaining intercepts are all positive but are not statistically different from zero. As the duration of the relationship increases, the availability of credit increases. The largest increase is for firms in the competitive market with multiple lenders and the smallest is for firms in the competitive market

with a single lender. We test the equality of the slopes in the different markets and by number of lenders and in all cases we cannot reject the hypothesis of equality among them.

To summarize, we find that young firms in the competitive market borrowing from a single lender have greater availability of credit than other firms. The evidence is consistent with the use of relationship lending technologies in competitive markets, provided that the firm confers an informational monopoly to the lender by borrowing exclusively from it. The availability of credit is higher for firms in competitive markets with a single lender than in concentrated markets, in which we also expect lending relationships to be prevalent. The reason for that difference could be that in the competitive markets the lender faces greater competition from potential entrants (contestability) and is forced to share with the borrower a larger proportion of the value generated with relationship lending.

3.5 Cost of capital

3.5.1 Cost of capital by market structure and number of lenders

In table 3.4 we compute the mean (panel A) and the median (panel B) of the loan contract terms by firm age, banking market structure and number of lenders. The first column reports the dependent variable used in the analysis of the cost of capital, namely the interest rate charged on the firm's most recent loan (*Interest rate*). For the overall sample of 1294 firms, the average interest rate is 11.10 percentage points (standard deviation of 2.32). The first interesting thing to note is that the interest rate decreases with firm age. Young firms are paying higher average rates than old firms, and that happens for all degrees of market concentration and independently of the number of bank relationships. This observation is consistent with the model of Boot and Thakor (1994) that shows that improved knowledge of the borrower may lead to a reduction in costs to the bank which are partly shared with the borrower,

and thus, loan rates are expected to decline as the relationship matures. Notice that the larger decrease in interest rate with age, is for those firms in the most competitive markets and with multiple lenders: young firms pay on average 141 basis points more than old firms (t=2.26).

To have a single bank relationship is expensive. Controlling by age and the degree of market concentration, the average interest rate paid by firms with one bank relationship is higher than that paid by firms that have two or more bank relationships. The biggest difference is for old firms in competitive markets (92 basis points, t=1.48) and the most significant difference is for young firms in concentrated markets (39 basis points, t=1.78). The only exception are young firms in the competitive market: those with a single lender pay lower interest rates on average than firms that have more than one bank relationship, although this difference is not statistically significant (30 basis points less if one bank, t=0.49).

Comparing the average interest rate in the most competitive and in the most concentrated markets (controlling by age and number of lenders) we do not observe significant differences at 10 percent. This is in contrast with the findings of Petersen and Rajan (1995) using the same dataset. In particular, dividing the firms by market concentration they found that the interest rate starts higher and ends lower in the competitive market. We find that this is true only for firms having more than one lender in the competitive market. Those firms located in competitive markets that borrow from a single bank will benefit from low interest rates when young because banks can internalize the future benefit of dealing with that firm.

In the second column of table 3.4 we report the percentage of loans that have a floating interest rate as opposed to a fixed rate (*Floating rate*). None of the differences in mean and median are statistically significant. The same applies for the *Collateral* requirements (third column) and *Maturity* of the loan (fourth column). We observe that loans to young firms in the competitive markets with multiple lenders are the ones of shorter maturity. In the fifth and sixth column we report the *Loan amount* and the *Loan amount over institutional debt* (before the most recent loan is granted).

Loans granted to firms in concentrated markets tend to be bigger than those in competitive markets. Firms with multiple lenders obtain larger loans than those with a single lender. However, when looking at relative size we cannot find a clear pattern. The *Length of the relationship* the firm has with the lender (seventh column) is obviously larger for old firms than for young firms. Duration of the relationship is statistically equal in concentrated and competitive markets. Thus, the duration of these relationships is independent of the market structure. Finally, it is interesting to note that firms with a single bank relationship tend to have longer relationships, the difference being statistically significant in the concentrated market but not in the competitive market.

In sum, we find differences in interest rate and duration of the relationship, mostly between young and old firms; but we do not find systematic differences for the other loan contract terms. These results are indicative that both variables, namely the degree of banking market competition and the number of lenders, are relevant to determine the interest rate of loans. In order to be able to estimate the loan pricing scheme over the firm's life and be more conclusive on these results, in the next section we will control for observable firm quality and loan characteristics.

3.5.2 Regression analysis of cost of capital

The dependent variable used in the analysis is the interest rate quoted on the firm most recent loan (*Interest rate*). When banks grant a loan to a firm they gather information about those firms to assess the credit risk of their projects. Lenders will charge an interest rate equal to the underlying cost of funds plus a premium that will depend on the quality of the firm. In the regression analysis, we control for observable firm characteristics that proxy for firm quality and the prevailing conditions in the market when the loan was made.[15] First, we include variables reflecting the main characteristics of the firm: total assets to control for size, debt ratio, age of the firm,

[15]The control variables in this analysis are the same used by Petersen and Rajan (1995) to facilitate the comparability of results.

a dummy for corporations, a dummy for urban location, dummies for firm industry and dummies for the region where the firm is located. Then, we add some controls for the main features of the loan: whether the loan rate is variable or fixed, the type of collateral required and the type of institution that is granting the loan (a bank, another type of financial firm or a non-financial company). To control for variation in the loan rate due to market conditions, we include (1) the prime rate when the loan was made to control for the underlying cost of capital, (2) the default spread to control for the average variations in the default premium, and (3) the term structure spread to control for interest rate differences due to different loan maturities. Finally, to measure the strength of the relationship with the institution granting the most recent loan, we include the log of the length of the relationship with this institution when loan was made.

The regressions estimated by OLS can be found in table 3.5. Before estimating the models proposed in section 3.2, we estimate five preliminary regressions. In the first column, we report a basic regression without measures of market concentration and number of lenders. We observe that the variable log of age of the firm has a negative sign, meaning that older firms pay lower interest rates. Additionally, we observe that the variable log of relationship length is not significant. Thus, we do not find evidence that the information disclosed over the course of the relationship has an effect on the interest rate on loans. We will precede our analysis by using age of the firm as a proxy for information disclosed to the market as a whole and that has an effect on the interest rate. The remaining variables show the expected sign. The loan rate control variables are significant showing the importance of controlling for the underlying cost of capital in the economy when loan was made. Larger firms, incorporated, and located in MSA county pay lower interest rates on loans. Bank loans are expensive and loans to non-financial institutions are cheaper.

In the second column we add a dummy variable for concentrated markets. We find that firms in the concentrated credit market pay on average 32 basis points more than similar firms in competitive markets (t=2.24). The coefficient estimates of the

control variables are similar than in the previous regression. In the third column we add a dummy that equals one for firms that borrow exclusively from a single lender. We find that these firms pay on average 36 basis points less in interest rates than firms with multiple lenders (t=2.68). In the fourth column we add the two dummies: the concentrated market and single lender; the signs of the coefficients and magnitudes are maintained. In the fifth column we run the same regression as Petersen and Rajan (1995) in order to facilitate comparison of our analysis with theirs. We estimate the interest rate as a function of market structure, allowing for different intercepts and slopes of age in each market. We find that young firms in the competitive market pay higher interest rates than firms in the concentrated market, but as age increases, the interest rate decreases more rapidly in the competitive market.

In the last two columns of table 3.5, we estimate the models proposed in section 3.2. We want to test whether the cost of capital is a function of the market structure and the number of lenders. The regression in the sixth column estimates differences in intercepts by including five dummy variables (the reference category is one lender in a competitive market). None of these coefficients are significantly different from zero, thus, we cannot identify differences in levels in the interest rate on the most recent loan by these two variables. Finally, in the seventh column, we estimate the model with different intercepts and slopes of age by market structure and by number of lenders. First of all, it is interesting to check whether the intercepts and slopes are the same within a market regardless of the number of lenders. If this is so, then, the number of lenders will not matter when determining the loan rates. We reject the equality of the intercepts and the slopes in the competitive market (test of equality of intercepts: p-value=0.08 and test of equality of slopes: p-value=0.06) and we accept the equality of them in the concentrated market (test of equality of intercepts: p-value=0.63 and test of equality of slopes: p-value=0.76). Thus, disregarding the number of bank relationships when making an analysis of firms in the competitive market would give misleading results.

The intercept and the coefficients of the dummy variables measure the interest

rate paid by new firms (age equal zero). We observe that the coefficient for firms in the competitive market with multiple bank relationships is the only one significantly different from zero. We test the equality of each coefficient with this one and we find that the difference is statistically significant. Thus, the interest rate paid by young firms in the competitive market with multiple lenders is on average 211 basis points more than firms in the competitive market with a single lender, 163 basis points more than firms in a concentrated market with more than one lender and 142 basis points more than firms in a concentrated market with one lender. Moreover, the interest rate falls very rapidly for the firms located in the competitive market that have multiple lenders. The coefficient of the interaction of dummies with age is the largest and significant at 1 percent for these firms (t=2.68). The average decrease on interest rate for a firm that ages from new to the average median age of ten years would be about 210 basis points. As a comparison, in a concentrated market with a single bank relationship the decrease is 50 basis points and with multiple bank relationships it is 37 basis points. Finally, in the competitive market with a single bank relationship the average interest rate will tend to increase about 14 basis points. In sum, we observe that the evolution on interest rate in the competitive market depends very strongly on the number of lenders that the firm has: there is a steep decrease with multiple lenders and a slight increase with a single relationship.

In figure 3.1, using these estimates, we draw the curves describing the evolution of interest rate with the firms' age by degree of market concentration and number of bank relationships. All variables, except the firm's age and the dummies of market concentration and number of bank relationships, have been set to the conditional mean by number of lenders and market structure. We can distinguish very clearly the different evolution of interest rate of those firms located in the competitive market that borrow from more than one bank. The reason is that this is the more adverse setting for banks and firms to be able to establish long-term relationships and define an intertemporal loan pricing scheme. Banks are reluctant to subsidize firms in early stages because they anticipate that they will not have any bargaining power over the

firm's cash flows in the future. Banks anticipate high competition due to pressures in the market and because the other lenders acquire private information of the firm. In this case, each bank will offer transaction lending rather than relationship lending. Thus, the interest rate will decrease only when the creditworthiness of the firm is proven, but not before, because of the impossibility to commit in a long relationship.

The evolution of the interest rate in the other three settings is statistically equal (both in intercepts and in slopes). It is likely that firms in the concentrated market (independently of the number of bank relationships) and firms in the competitive market which are faithful to a single bank establish long-term relationships with their banks. For these firms, we find that interest rates are lower-than-competitive when firms are young. Later on, banks will compensate this subsidy by demanding an interest rate above the competitive one. For this reason, the evolution of the interest rate is much more flat, reflecting the cross-subsidies of interest rate over the firm's life.

The control variables in the regression show the expected sign. Other things equal, large firms and corporations pay lower interest rates reflecting lower informational asymmetries for that kind of firms. The urban or rural location does not make a difference on loan rates. Loan obtained from banks are expensive and those obtained from non-financial firms are cheaper. The variables controlling for prevailing market conditions are statistically significant and with the expected sign. The R-squared of the regression is 18 percent, which is quite good for cross-sectional data.

An alternative explanation for the difference in slopes is that the survival rate of bad firms is different for firms in competitive markets that borrow from multiple lenders with respect to the rest of the firms. If this were true, the relatively bigger decline on interest rate that we have obtained would be the result of the selection of better quality firms instead of being due to the absence of relationship lending in this setting. In order to test whether this is true, we compare the firm quality of old firms in the competitive market with more than one lender with the other firms (see table 3.2). We observe that both the mean and median profitability are

bigger compared to the other firms, but if we compare the profitability of firms with more than one bank relationship in the competitive and in the concentrated market (which have similar size) the difference is not statistically significant. Moreover, the difference in sales growth is not statistically significant compared to the other firms. A particularly interesting thing to note is that the firms in competitive markets with multiple bank relationships are the ones with higher debt ratios among the old firms and are the ones that the debt ratio does not diminish with firm age (and on average it increases from 0.52 to 0.56 although the difference is not statistically significant). One plausible explanation is that they take advantage of the decrease in interest rates and finance their projects with external borrowing (bank loans) at competitive interest rates. On the contrary, the firms which are more likely to have long term relationships with banks face high interest rates when old, and thus, they may prefer to use less external financing with age. The larger decrease in the debt ratio is for firms in the competitive market with a single bank relationship (difference in median debt ratio of young and old firms is 40 percentage points, z=1.654). In consequence, it seems that there is not enough evidence of different quality of firms to explain the different evolutions of interest rates. Additionally, the borrowing patterns measured by the debt ratio reinforce our interpretation that the existence or absence of relationship lending is the reason for the different evolution of interest rates.

In order to further check on this alternative explanation of the differences in slopes, we run a regression adding three more control variables that proxy for the quality of firm, namely the sales growth, profits over assets and profits over interest expense (results not shown). We observe that only the profits to interest ratio is significant at 10 percent. The slope of age in the competitive market with more than one bank increases (coefficient=-1.21 significant at 1 percent). Thus, controlling for observable firm quality intensifies rather that weakens the negative slope for these firms. In consequence, we disregard the different survivorship of bad firms as an explanation to the observed differences in the evolution of the interest rates. The most plausible explanation is that banks will engage in relationship lending in competitive markets

only when they are the single bank lending to the firm. When the firm borrows from multiple lenders, none of the banks subsidizes the interest rate in early periods because they anticipate that they will not have any bargaining power in the future.

3.5.3 Robustness checks on cost of capital

In table 3.6 we perform several additional regressions as robustness checks. First, we run the same regression restricting the sample of loans to lines of credit. Berger and Udell (1995) also used the NSSBF data source to analyze the effect of the length of a banking relationship on interest rate and collateral requirements. They restrict their analysis on lines of credit because for the other types of loans (mortgages, equipment loans, motor vehicle loans and other spot loans) reputation and relationship effects may be substantially less important than those associated with the forward commitment to provide working capital financing under pre-specified terms like in a line of credit.[16] In the first column of table 3.6 we can find the results for the subsample of lines of credit. Note that the R-squared increases to 32 percent and the number of observation decreases to 355. The slope for firms in competitive markets borrowing from more than one bank is not statistically different from zero but still it is the largest one (coefficient=-0.792, t=1.05).

In the second column we restrict the sample to small firms: firms with assets below the median size, that is, total assets of less than $195599. We prove our hypothesis that the importance of relationship lending is even bigger for the smallest firms. The intercept for the firms in the most competitive market with more than one bank relationship increases to 2.94 meaning that new firms in the competitive market that borrow from more than one lender will pay on average almost 3 percentage points more than similar firms that borrow from a single lender. The slope of age is -0.887, meaning that the average decrease on interest rate for a firm that ages from new to ten years would be of 204 basis points. The slopes for the other firms are not

[16]Other empirical papers that only use lines of credit in the regressions are Brick and Palia (2005) and Claessens and Laeven (2005).

statistically different from zero.

The information-based literature on financial intermediation suggests that it is the banks, rather than other institutions, that are specialized in acquiring information on the borrower over time by establishing a relationship and monitoring the borrower performance. We want to test whether the evolution of the interest rates depends on the fact that the institution granting the loan is a bank. Thus, we restrict the sample only to those loans granted by a bank. In the third column of table 3.6 we can see that the coefficient estimates follow the same pattern for this subsample of loans.

Next we check that the obtained results are not due to differences in the physical distance between the bank and the firm across market structure and number of lenders. Recent papers on relationship banking, such as Petersen and Rajan (2002) and Degryse and Ongena (2005) show that the distance between the bank and the firm can be crucial for relationship banking to exist. Additionally, it is important to limit the distance because we use the Herfindahl index in the deposit market where the firm is located as a measure of competition, and thus, we need to assure that the relevant market where banks compete for firms is the MSA or county where the firm is located. Thus, focusing on those loans made to close firms we ensure that banks are competing in this area. We restrict the sample to those firms that are at less than 15 miles of their bank.[17] Results are reported in the fourth column of table 3.6. We observe that the findings are robust because they are not due to differences in the distance between banks and firms across the different settings.

A close relationship with a bank can be translated in more advantageous loan contract terms and in greater availability of credit. We have shown in section 3.4 that firms borrowing from a single lender in a competitive market are less credit constrained. We need to check that the interest rate regressions are not capturing differences between the proportion of credit constrained and credit unconstrained firms across market structure and number of lenders. We select a subsample of unconstrained firms and estimate the regression in order to check whether the results

[17]Robustness checks are performed with thresholds of 1, 2, 5, 10 and 20 miles with similar results.

obtained so far still hold for firms without problems of credit availability. We select firms that took more than 90 percent of the trade credit discounts offered to them. The estimation with this subsample of credit unconstrained firms can be found in the fifth column of table 3.6. We observe the same pattern of results, meaning that young firms that are credit unconstrained in the competitive market with multiple bank relationships do not benefit from relationship lending either through a subsidized interest rate or from credit availability.

3.6 Conclusion

This chapter analyzes the effect of banking competition on relationship lending. Previous studies suggested that competition may be inimical to the formation of mutually beneficial long-term relationships between banks and firms (Petersen and Rajan 1995). The reason is that banks need some bargaining power to engage in relationship lending and competitive pressures from the market inhibit the formation of such long-term relationships. This paper emphasizes that the relationship lending technology itself is the mechanism that confers the bargaining power to the lender. We show that lending relationships are prevalent in the competitive banking markets as long as firms commit to borrow from a single lender. Consistent with existing research, we confirm that banks need to anticipate some degree of bargaining power *ex post* to have the incentives *ex ante* to engage in relationship lending. Our findings suggest that the bargaining power needed can be granted exogenously by a concentrated banking market or endogenously in the relationship when firms borrow from a single lender.

This research is particularly relevant due to the recent changes in the market structure of the banking industry. After a process of deregulation of the banking industry and the incorporation of new information technologies in banking which had presumably increased competition in the banking market, the current wave of bank mergers in Europe and in the United States, and the expectation of a continued or even accelerating consolidation process, have raised concerns as to the competitive conditions in the banking markets. Ultimately, the concerns refer mainly to whether

changes in the banking market structure may affect the conduct of banks, and in turn, affect credit availability and credit terms. Small and young firms, highly dependent on banking finance to undertake their projects, would be most directly affected. As for the policy implications, the convenience of restricting credit market competition to promote relationships does not seem justified by our findings.

Chapter 4

Relationship Lending in Spain: Empirical Analysis of Cost of Capital and Credit Rationing

4.1 Introduction

There are both benefits and costs associated to exclusive bank-firm relationships. On the one hand, exclusive bank-firm relationships enhance investment in information gathering and they avoid cost duplication in monitoring which may entail many benefits for the borrowers (relationship hypothesis). On the other hand, an exclusive bank-firm relationship gives a monopoly of information to the lender which may impose costs on the borrower (hold-up hypothesis). In this paper we disentangle these two hypotheses by investigating the role of banking market concentration on the banks' incentives to invest on the relationship and on the banks' ability to exploit the monopoly of information.

The traditional theory of financial intermediation regards banks as delegated monitors that mitigate informational asymmetries between the borrower and the lender (Diamond 1984). Firms can lessen information problems by establishing close relationships with their lender. Closer relationships may encourage lenders to invest in generating information from their client firms while borrowers are more inclined to disclose information about their future prospects (Boot 2000). Such proximity and repeated interaction between the bank and the borrower through time can be beneficial from the borrower point of view by means of increased credit availability and better loan contract terms. Many empirical studies provide evidence of such benefits of relationship lending: easier access to credit (Angelini *et al.* 1998, Cole 1998), lower cost of credit (Petersen and Rajan 1994), lower collateral requirements (Berger and Udell 1995, Degryse and Van Cayseele 2000), positive signals for the stock market (Preece and Mullineaux 1996) and support from banks when the firm is under financial distress (Edwards and Fischer 1994).

On the other hand, as Sharpe (1990) and Rajan (1992) first pointed out, the informed bank can behave opportunistically at the cost of the other party. That is, improved knowledge of the borrower gives to the bank an informational monopoly over its competitors; this enables the bank to extract some rents, for instance, by charging higher interest rates (hold-up problem). The threat of being locked-in by

the bank may make the borrower reluctant to borrow from a single bank. Therefore, firms may opt for multiple bank relationships. Sharpe (1990) and Rajan (1992) show that competition from an additional informed bank eliminates such "hold-up" costs. The implication is that a firm should maintain at least two bank relationships. This may reduce the informational monopoly of any one bank, but possibly at a cost. First, the presence of multiple relationships causes "too much" competition *ex post* that can reduce the value of information acquisition to any one individual bank. The reason is that building a relationship requires bank investment in screening, monitoring, sector specialization and other costly activities. The value of this investment is diluted when other banks are also lending to the firm. For instance, in a case of firm financial distress, a single bank may be inclined to rescue the firm because with recovery the bank will get its financial stakes back from the firm. When multiple banks lend to the firm, a free-rider problem may arise since each bank expects the others to refinance the firm and, in case of recovery, benefit from that without a cost. Therefore, the benefits of close relationships are diluted with multiple banking which may lead to worse loan conditions (Petersen and Rajan 1994, Ongena and Smith 2000). Second, when a firm switches to an outside bank, the outside bank may charge a higher interest rate because it takes into account the winner's curse effect. That is, under asymmetric information about the quality of a firm, the fact that a firm accepts a loan contract contains information about its quality. In particular, the lower the interest rate offered by a single lender, the higher is the probability that the firm quality is estimated by others banks to be lower. Therefore, outside banks in such a situation must not only take individual private information into account, but also the information that would be revealed by the fact that their contract is accepted over the others (Von Thadden 2004).

In sum, exclusive bank relationships enhance investment in information gathering and avoid cost duplication which maximizes the value of relationship lending (relationship hypothesis). However, at the same time, a single relationship facilitates the bank's opportunistic behavior, i.e. the exploitation of its monopoly of information

(hold-up hypothesis). The other side of the same coin is that multiple banking avoids the hold-up problem but, at the same time, it decreases the incentives to invest in the relationship for each individual bank.

Some authors emphasize the crucial importance of market concentration on the banks' incentives to invest on the relationship. However, the theoretical predictions are ambiguous. In the model of Petersen and Rajan (1995) a monopolistic creditor subsidizes the interest rate and increases availability of credit to young firms because the bank anticipates that in the future it will benefit from rents generated by the firm. Competitive pressure may threaten the relationship in the future because firms might switch banks or substitute bank finance with other financial sources. Therefore, banks in competitive credit markets anticipate firms leaving in future periods and decide to not subsidize the interest rate of young and opaque firms in early periods. On the other hand, Boot and Thakor (2000) show that increased competition between banks would drive bank profits to zero, so banks will decide to invest in building relationships with borrowers so to differentiate its products from competitors. Therefore, banks in competitive credit markets become more client-driven and make more relationship loans to foster its profitability.

The aim of this paper is to discriminate between the above-mentioned "relationship hypothesis" and the "hold-up hypothesis". We claim that the degree of competition in the banking market determines the banks' incentives to invest on the relationship and the banks' ability to exploit the monopoly of information. Therefore, the empirical strategy consists on investigating how the number of banks affects the cost and availability of credit of firms, focusing on differential effects related to banking market concentration. We use a large panel dataset of 73,809 small and medium sized Spanish firms in period 1993-2004. We focus on small firms for various reasons. First, small firms are more likely to suffer information problems in the capital markets. The value of relationship lending, which is based on bank gathering soft information, is likely to be higher for the smallest, youngest and opaque firms because of their lack of credit history, the impossibility of a credible dissemination of

their quality, and the lack of separation between ownership and management, which increases the asymmetric information between insiders and outsiders. Second, small firms are typically restricted to obtain external finance only from financial institutions. Public debt markets are only accessible for large firms. While little more than 500 Spanish companies access the organized capital market, more than 2.5 million of SMEs rely on financial intermediaries to finance their investment projects. In our sample, the average bank debt over liabilities is 35 percent and three quarters of the firms have a ratio bigger than 50 percent. Third, small firms are extremely important for the Spanish economy: roughly 50 percent of the 3 million Spanish firms do not have employees and 1.3 million have between one and ten employees. Only 1,700 Spanish firms have more than 500 employees.

The main findings are the following. From the analysis of the cost of capital, we find that the effect of the number of banks on the cost of capital depends on the degree of banking market concentration. In concentrated banking markets, firms with one bank have a higher cost of capital than multiple banking firms. The opposite applies in less concentrated markets, that is, firms with one bank enjoy a lower cost of capital than multiple banking firms. We conclude that the hold-up problem dominates in concentrated markets while in less concentrated markets the relationship effect dominates. Next, we proceed to examine credit availability by following two different approaches. First, we examine the amount and the maturity of bank credit. The most interesting result is that firms increase their number of bank relationships to raise bank credit. However, we do not find a significant effect of the number of banks on the maturity of bank credit. Second, we estimate the investment-cash flow sensitivity in order to find evidence on credit rationing. We divide the observations into six sub-samples by the number of lenders (one lender and more than one lender) and by banking market concentration (less concentrated, intermediate, more concentrated). We find that firms in concentrated markets with multiple banks display the larger sensitivity, suggesting that those firms are the most financially rationed.

We then divide the sample into three groups by firm size (micro, small and

medium). For small and medium firms we observe the same pattern of results. However, micro firms demonstrate quite different behavior: the number of lenders has a negative effect on the cost of capital while it is insignificant for bank credit availability and maturity. Moreover, banking market concentration does not play any role. These findings suggest that micro firms are particularly susceptible to hold-up problems when they have a single bank relationship. Taken together, our results indicate that banking market concentration is harmful to firms. Even when accounting for the potential benefits of relationship lending, in the most concentrated banking markets banks exploit their monopoly of information when they are the single lender, and banks ration credit to firms when there are multiple lenders. A key result from the Spanish credit markets is that some degree of banking competition is necessary to induce banks to share the value created by relationship lending with the borrowing firms.

Previous empirical studies have examined the effect of banking relationships on the cost and availability of credit. Our contribution to the literature is twofold. First, based on a novel and large panel dataset of firms we provide descriptive evidence on the nature of lending relationships for Spanish SMEs, and in particular on the degree of exclusivity in lending relationships. Given the scarcity of works dedicated to study relationship lending in Spain, research in this area is needed for a better understanding of small business financing; this is crucial for business activity and growth strategy of SMEs and ultimately it is essential for economic growth. Second, we contribute to the debate of the effect of banking market consolidation on relationship lending by means of a multivariate analysis of the determinants of the cost of capital and the availability of external finance. The novelty of this study is to analyze the interrelationship of the number of lenders and the degree of banking market concentration. Existing literature has analyzed each variable separately. We prove that it is the interaction of both variables that determines the banks incentives to invest on the relationship and their ability to hold-up the borrowers, and thus, both variables taken together determine the borrowing conditions for firms. Compared to other studies, our data

does not specify the amount and terms of the loan (or loans) extended by the bank to the firm. For this reason, we cannot use information on such matters as the amount granted, the interest rate charged and the collateral required over the life of the firm's relationship with the bank. We use instead, the average cost of capital, the proportion of bank credit and the sensitivity of investment to cash flow to identify credit rationing. Our dataset has the advantage of focusing on the overall firm quality rather than the creditworthiness of each loan.

As stated above, the data is for Spanish firms in period 1993-2004. It is interesting to analyze this country because the relationship lending technology is widely used in Spanish credit markets, compared to other countries like the U.S. The period analyzed is sufficiently large to capture variations in the degree of concentration in banking markets due to two main reasons: First, the implantation of the Single European Market in 1992 and the culmination of the process of deregulation, with the special incidence of the liberalization of cross-province branching for savings banks which allowed them to open branches in any province or region since 1988; second, the large number of mergers and acquisitions that have taken place during this period.

The remainder of the paper is organized as follows. In section 4.2 we describe the dataset and define the variables. In section 4.3 we extensively present descriptive statistics on the number of bank relationships by firm characteristics. We present the analysis on the cost of capital in section 4.4. In section 4.5 we study bank credit availability and firm rationing. The last section concludes.

4.2 Data

The primary source of firm-level information is the SABI (Sistema de Análisis de Balances Ibéricos) database, elaborated by Bureau Van Dijk.[1] This database includes accounting and financial information for more than 600,000 Spanish firms for the period 1990 to 2004 that was obtained from the annual financial statements deposited

[1]The majority of the data is drawn from the CD dated March 2005 - update 67.

at the Registry of Companies. The number of firms included in the database has been increasing with time as a result of increased effort to compile a comprehensive database. To be included in the database the firm must have at least one employee. Even though it is not a stratified sample, the included firms are representative of the whole population of Spanish firms. Apart from accounting data, there is also some complementary information about the firms, like headquarters location, date of constitution, firm industry, number of employees, legal form of the business, the opinion of the auditor, number of banks with whom the firm usually operates, and whether the firm quotes in the stock exchange.

The SABI database is updated regularly. The historical series are not available for some variables, such as the number of bank relationships (only the current observation of the variable is kept in the database). In order to have a complete panel dataset on the number of bank relationships we recovered this variable from previous updates of the database, one per year, from 1993 to 2004. A data limitation is due to the fact that the database does not distinguish between zero banks and missing value in that variable (cell is empty).

We use three additional sources of data: the Annual Statistics of the Spanish Banking Association (AEB), the Annual Statistics of the Spanish Savings Banks Confederation (CECA) and the Bank of Spain Registry of Financial Entities (Renbe). From these data sources we record information on the number of bank branches for each financial institution by province and year.

4.2.1 Sample selection

We selected active firms with positive sales, not listed in the stock exchange, with information on the number of bank relationships, in all industrial sectors except banking[2] that during the period of analysis (1993-2004) complied with the SME

[2]In particular, we drop firms in the following industry sectors: Depository Institutions, Non-depository Credit Institutions, Security and Commodity Brokers, Dealers, Exchanges, and Services (SIC codes 60, 61 and 62).

condition according to the requirements established by the European Commission recommendation 2003/361/EC on the definition of small and medium-sized firms.[3] If both consolidated and non consolidated accounts are available, we choose the non consolidated ones.

The final sample consists of an unbalanced panel of 73,809 firms in the period 1993-2004, with a total of 603,350 firm-year observations. The average number of observations per firm is 8.2, ranging from a maximum of 10 observations for almost half of the sample and just one observation for 561 firms (0.76 percent of the sample). The estimated regressions are robust to the problem of unbalanced panel data. The maximum number of firms is achieved in year 2002 with 72,665 observations in the sample, which represents 9.5 percent of the total population of Spanish SME in that year.[4] In the regression analysis the number of firm-year observations is 510,846 corresponding to 66,452 firms, because of missing values on some key variables and because we drop firms in the provinces of Ceuta and Melilla, and those firms with minimum age greater than 20 years.

4.2.2 Variables

Table 4.1 defines the variables used in this study with their mean and standard deviation. Data on observable firm characteristics are used to reduce the impact of heterogeneity of firms in our sample. In particular, we use the logarithm of total assets (*Log(asset)*), of sales (*Log(sales)*) and of number of employees (*Log(employees)*)

[3]Specifically, the sample of firms is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million. A micro enterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

[4]There were 778,093 firms with at least one employee in Spain at year 2002, from which 773,603 had between one and 200 employees. Of the whole population of Spanish SME, the sample contains 28 percent of the joint stock companies, 8 percent of the limited liability companies and less than 1 percent of the companies with other legal forms (mostly partnerships with employees and cooperatives).

as measures of firm size. A firm's access and cost of capital may depend upon the liquidity and the tangibility of its assets. The former is proxied by the proportion of current assets over current liabilities (*Liquidity*) and the later by the proportion of total assets that are tangible and fixed, which controls for the firm capability to pledge collateral (*Tangibility*). We alternatively use the variable *Free collateral*, defined as fixed assets over liabilities, to reflect the proportion of fixed assets that could be used as collateral to obtain new credit under the most conservative assumption that all current liabilities are collateralized. We use the logarithm of age (*Log(age)*) to capture the effect of firm life cycle and the fact that firms become more informationally transparent with age.

We also include additional financial characteristics and balance sheet indicators of the firm because the banks usually take them into account when screening and monitoring the firm to make credit risk analysis. The ratios included are measures of firm profitability (*EBIT on assets*), firm liabilities scaled by total assets (*Leverage*) and the ratio of stocks over total assets as a measure of the firm current *Activity*. We additionally included the *Altman Z-score* as independent variable in the regression to capture the firm credit risk.[5] This is a compound measure built from accounting ratios that helps to predict how close a firm is to bankruptcy (Altman 1968). A higher Z-score implies a lower default risk. We further computed the Z-score proposed by García, Calvo and Arqués (1997) (*García Z-score*) because it is based on the estimation of a bankruptcy model for a sample of small and medium sized firms of the Spanish manufacturing sector.[6]

Since project risk and collateral availability is likely to differ across industries, we also include a set of two-digit SIC codes industry dummy variables. The control

[5]The *Altman Z-score* is calculated as: Z = 0.012 [working capital/assets] + 0.014 [retained earnings/assets] + 0.033 [EBIT/assets] + 0.006 [equity /liabilities] + 1 [sales/assets]. Although in the original model the fourth ratio is calculated by market value of capital / book value of debt, here we have used the alternative proposed by Scherr and Hulburt (2001): the book value (and not the market value) of equity. This is because the market value is not available in the case of SMEs.

[6]According to this model, the values used as proxies of the firm financial strength will be computed as: ZG = -0,835 + 0,950*((receivable+cash)/current liability)+ 0,272*((fixed asset+current asset)/(fixed liabilitiy+current liability) - 11,848*(financial expense/sales) + 2,422*(annual depreciation/(intangible fixed asset+tangible fixed asset)) + 6,976*(earnings before taxes/total liabilities).

variables include a set of dummy variables for province of location and dummy variables indicating legal form. These variables are removed when models are estimated with firm fixed effects because they are time invariant. All specifications include year dummies.

Dependent variables

In the first part of the study, the dependent variable is the average cost of capital firms pay for external finance (*Cost of capital*). For a given firm and year, it is calculated by dividing the financial expenses by the amount of debt. Since we use the debt at the end of the year to approximate the *average* amount of debt *during* the year, this computation generates some extreme values in the cost of capital. This would be the case, for instance, of firms heavily indebted during the year that repay a high proportion of their outstanding debt before the end of the year (big numerator with respect to denominator). Therefore, we winsorize this variable at the 99.5 percentile, which corresponds to a cost of capital of 30.52 percentage points (this procedure affects 2975 firm-year observations).

To conduct the second part of the study, i.e. test whether relationships lessen credit rationing, we need a measure of credit rationing. We use two different approaches. First of all, we use a measure of availability of credit. We compute the proportion of debt supplied by banks, i.e. we divide the amount of bank credit over total liabilities for a particular firm and year (*Bank credit/Liabilities*). There are two limitations to this approach. The computation of this measure requires a detailed balance sheet, where the sub-accounts are specified. Since Spanish accounting requirements do not oblige SMEs to report such detailed accounts, we can compute this measure only for 9,829 firms, corresponding to 28,690 observations. A second limitation comes from the fact that by using the actual bank credit we underestimate credit availability. Since the seminal work of Stiglitz and Weiss (1981), it is known that under asymmetric information in the credit markets banks may choose to ration borrowers instead of raising the interest rate to clear the market. Therefore, firms

may have low debt ratios because they have little need of external capital or alternatively because they are liquidity constrained. We are also interested in analyzing the term of bank credit in order to test whether relationship lending provides access to long term financing. We use the ratio of short term bank credit (debt due in less than one year) over total bank credit (*Short term bank credit/Bank credit*).

The second approach consists of an analysis of investment-cash flow sensitivity. We use as dependent variable the ratio of capital expenditures (investment) on fixed assets (I/K). Capital expenditures are computed as the variation on fixed assets of two consecutive years, plus amortization and depreciation and plus the variation in working capital.

Empirical measure of relationship lending

We use three alternative measures of bank relationships: (1) the *Number of banks* of firm i (N_i); (2) the indicator variable *One bank* for one relationship versus multiple bank-relationships (*One bank*=1 if $N_i = 1$ and *One bank*=0 if $N_i > 1$); and (3) the *Share by bank* variable, which is computed as $(1/N_i)$ for each firm i. As Elsas (2005) argues, using the number of bank relationships as an indicator for the presence of relationship lending is based on the premise that maintaining an exclusive bank relationship promotes the development of close ties between bank and borrower. Exclusivity induces a lower degree of direct competition between banks, allows for unique access to valuable information, and eases the realization of the economic benefits associated with relationship lending. Many empirical papers use the number of bank relationships as a proxy for relationship lending, like Elsas (2005) and Houston and James (2001).

The third variable, namely *Share by bank*, can be interpreted as the share of business that corresponds to each bank (assuming symmetry among banks). The inverse of the *Number of banks* captures a decreasing effect of the number of bank relationships. For instance, a firm with a single bank relationship that increases to two banks will experience a strong effect, as predicted by models such as in Sharpe

(1990) and Rajan (1992), because competition from an additional bank will avoid the hold-up problem that may suffer firms with a single bank relationship where the bank has an informational monopoly. Thus, the *Share by bank* variable accounts for the differential effect that each additional bank relationship may have depending on the existing number of bank relationships.

Measure of banking market structure

The empirical measurement of banking market competition presents some conceptual and methodological problems. Many empirical works use measures of market concentration like the sum of the deposit (or loan or asset) market shares of the 3 largest banks, or the 5 largest banks, or use a Herfindahl-Hirschman Index (*HHI*). These three measures are typically highly correlated and thus yield very similar results. A particular feature of the *HHI* measure is that it falls when market shares are more equal, suggesting a less concentrated market when competitors are of a similar size. The use of these concentration measures as indicators of market competition is justified by the structure-conduct-performance (SCP) paradigm, which presumes that less concentrated markets are likely to be more competitive. Some recent work in the context of the new industrial organization, has proposed other empirical measures of competition, like the Lerner index or the Panzar-Rosse H-statistic, that are though to better reflect the effective competition in the market without the need to rely on the SCP assumption.[7] Nevertheless, we will use the more traditional concentration measures in our analysis because of data availability at the regional level and because they are widely used in academic research and by antitrust authorities. Therefore, we concentrate our discussion in terms of banking market structure and any inferences to banking competition should be taken with this assumption in mind. [8]

[7]Carbó, López and Rodríguez (2003) argue that market concentration measures such as *HHI* may not strongly reflect the expected market conduct/pricing response posited by the SCP paradigm. They find that lower financial market concentration is insignificantly associated with more favourable loan and deposit pricing in Spanish regions.

[8]Bikker and Haaf (2002) perform a test for that assumption in the banking markets of 23 industrialized countries inside and outside Europe over approximately 10 years. The Panzar-Rosse approach has been applied to obtain a measure of competitive conditions. The coefficient of the

We use the Herfindahl-Hirschman Index (*HHI*) of bank branches by province and year as a measure of banking market concentration.[9] The *HHI* is a market concentration measure computed as the sum of the squares of each bank's market share for all banks in a market. The next issue we need to address is the choice of relevant market where banks compete for clients. It is sensible to assume that competition among banks takes place at a regional level because usually small firms only operate at a local level. Additionally, some research in other countries shows that the distance between the firm and its lenders is very low and it has not increased significantly with the implantation of the new information technologies. Therefore, we choose the province where the firm is located as the relevant market where banks compete for borrowers, as in previous Spanish studies (e.g. Maudos 1998). We choose the number of branches that each bank has in each province by year to compute the *HHI* because no information currently exists concerning the regional distribution of the representative variables of banking output (deposits, loans). Only regional branch distribution data are available. Therefore, market shares are calculated using regional branch distribution data which proxies for deposit distribution.[10]

Banking market concentration in Spain over 1993-2004

The time pattern from 1993 to 2004 of the *HHI* for some selected provinces and the simple average across provinces is shown in figure 4.1. We can distinguish two sub-periods. In the first one (1993-1998) the time pattern of branch bank market concentration in Spain is decreasing. The main reason for that decline in concentration is due to branching liberalization in 1989 that permitted the entry of savings banks in any Spanish province. Nevertheless, in the first part of the nineties many mergers took place between Spanish savings banks. These mergers usually involved

Herfindahl index of concentration shows the expected negative sign, indicating that competition is decreasing with increasing market concentration.

[9]We use the density of bank branches as an alternative measure of the banking market structure as a robustness check.

[10]The Herfindahl-Hirschman Index in province m and year t is $HHI_{t,m} = \Sigma_i (MS_{i,t,m})^2$ where $MS_{i,t,m}$ is the market share of the ith bank in the mth market at time t. Specifically, $MS_{i,t,m} = branches_{i,t,m} / \Sigma_j (branches_{j,t,m})$ $\forall i,j,t$ for the mth market containing the i,j banks during year t.

saving banks that before the merger were operating in different local markets which then pursued branching expansion in new provinces by means of the merger. This is why the impact on the provincial *HHI* due to this consolidation process is not strong and the effect of entry of new financial entities in the local markets dominates.

The branching expansion process culminates in years 1997-1998 and the *HHI* reaches its minimum value in many provinces. The lowest value of *HHI* is in Madrid in year 1997 (*HHI*=884). In 1999, as a consequence of the mergers involving four main Spanish banks that lead to the formation of BBVA and BSCH, the concentration index increases. Since these banks were operating in all Spanish provinces before the mergers, the effect on the provincial *HHI*s is generalized. The average increase is of 182 points, with a maximum of 620 points in Guadalajara. After 2000, the provincial *HHI* tend to decrease again. By 2004, it reached the levels of 1998 in some provinces. However, for two thirds of provinces the *HHI* in 2004 is still above the minimum levels of 1997-1998.

Comparing 1993 levels to 2004, 60 percent of the provinces experienced a reduction in concentration, and the remaining provinces experienced relatively small increases in *HHI*. On average, concentration fell by 21 percent. It decreased more than 40 percent in three regions (Castellón, Almeria and Guipúzcoa) while in five regions it rose by more than 20 percent (Segovia, Pontevedra, Navarra, Orense and Lleida). Over all regions, the deposit *HHI* fell from around 2,081 in 1993 to around 1,644 in 2004, reaching its minimum of 1,527 in 1998. The reduction in concentration suggests that banking market competition may have increased over this time period. As noted, there is a large variation across provinces and years.

Carbó, López and Rodríguez (2003) use alternative empirical measures of competition, like the Lerner Index and H-statistic, and find that most regional banking markets became more competitive in Spain after deregulation (1986-1998). Therefore, it seems that market structure is correlated with competitive conditions in the banking market.

4.3 Descriptive statistics

4.3.1 Description of the sample

There are 73,809 SME in the sample, of which 11,461 (16 percent of the sample) are micro-enterprises, 32,503 (44 percent) small enterprises and 29,845 (40 percent) medium enterprises. Concerning the legal form, 61 percent of the sample firms are limited liability companies, 38 percent are joint stock companies and the remaining one percent are partnerships and cooperatives. As to industrial coverage, our sample encompasses firms from all sectors of the economy. In table 4.2 we can observe that over one quarter of the firms belong to Whole Sale Trade and a similar number to Manufacturing. The industrial sectors Construction, Services and Retail Trade account for about 10 percent of the sample each. Agriculture and Mining have the lowest percentages which are consistent with the population distribution. The average (median) firm size measured by the book value of assets is about 2.5 (1.1) millions and the average (median) age is 12 (10) years. The largest firms in the sample belong to the Insurance and Real Estate sector, with an average asset value of more than 6 millions. Mining and Manufacturing have the oldest firms. As is typical for SME samples, the smallest and youngest firms correspond to the Retail Trade sector, with a median asset size of 0.6 million and median age of 9 years. Table 4.3 provides the distribution of size and legal form of firms across industrial sectors.

4.3.2 Number of bank lending relationships in Spain

Table 4.4 summarizes the number of bank relationships by some firm characteristics for the 603,350 firm-year observations. For the continuous variables (firm age, assets and leverage), the observations have been classified in six groups by computing the 10, 25, 50, 75 and 90 percentiles for each variable. On average, Spanish SMEs maintain 1.95 bank relationships and 51 percent of the firms maintain a single bank relationship, 24 percent have two, 13 percent have three and the remaining 12 percent have between

four and ten bank relationships.[11]

It is worth comparing Spanish firms' choices of the number of bank-lending relationships with similar choices by firms in other countries. Two common patterns that researchers have found in this regard are that the average number of bank-lending relationships increases with firm age and size (see for example Petersen and Rajan 1994, Harhoff and Körting 1998, and Detragiache *et al.* 2000). Table 4.4 shows that these patterns also apply to Spanish firms. Considering panel A of table 4.4, it is evident that borrowing by young firms is considerably more concentrated than borrowing by older firms. The mean and median number of borrowing relationships increases with firm age and the percentage of firms with a single bank relationship decreases with firm age. The group of firms with more than 25 years since they were founded (top age decile) have on average one additional bank than the group of firms of less than 2 years old (bottom age decile). Panels B and C show that, with respect to firm size, similar results can be obtained. Small firms generally display more concentrated borrowing patterns than larger firms. The number of different borrowing relationships increases even more strongly with firm size that with firm age: the group of firms with more than 6.4 million assets (top size decile) have on average 3 bank relationships and the group of firms with less than 255,000 assets (bottom age decile) have on average just 1.5 bank relationships. Researchers have also found that in some countries the majority of firms have single bank lending relationships. Petersen and Rajan (1994)

[11] Comparing these figures to those obtained in other studies conducted in Spain, we can observe that our statistics are somewhat smaller. Hernández and Martínez (2005) use a sample of 705 SME obtained from the SABI database in years 1996-1998 and report that only 15 percent of the firms in the sample have a single bank. The reason for such discrepancy could be that the authors need very detailed accounting data and in consequence the sample selected to satisfy these data requirements contains the largest and oldest firms (for instance, the median age in their sample is 19 years compared to 10 years in our sample). Cardone, Casasola and Samartín (2005) conduct a survey of 386 Spanish firms and find that the average number of financial entities with which companies work is 2.8 for micro enterprises, 4.6 for small enterprises and 6.3 for medium enterprises. Illueca and Maudos (2006) use the SABI database and report an average number of bank relationships of 2.93. Finally, Ongena and Smith (2002) provide a European comparison on the number of bank relationships. There are 68 Spanish firms in the survey and only one of them has one bank relationship. The median is 7 and there is a Spanish firm with 60 banks. The reason for these discrepancies is that the firms in their sample are much larger (their median firm reports sales of between $1 billion and $2 billion while the median sales of the firms in our sample is 1.7 millions).

and Harhoff and Körting (1998a), for example, report that single relationships dominate among small U.S. and German firms. In contrast, Detragiache *et al.* (2000) find that single relationships are uncommon even among small Italian firms.[12] Table 4.4 shows that single relationships also dominate among small and young Spanish firms. However, single relationships become less prevalent as firms get larger and older.

Panel D presents the number of bank relationships by leverage percentiles. It is worth noting that for low levels of debt, leverage has a positive effect on the number of bank relationships. However, when the firm is highly indebted, this relationship is reversed. Finally, in panel E we can observe the summary statistics of the number of bank relationships by industrial sector (one digit SIC codes). Retail Trade display the lowest number of bank relationships with an average of 1.64 and 60 percent of the firms with a single bank, which is not surprising since this sector comprises the youngest and smallest firms. Firms in the Services industry also have a similar low number of banks. On the other extreme, Manufacturing firms have the largest number of bank relationships with a median of two and 15 percent of the firms having more than three banks. We can observe a relationship between the industries with more tangible assets and the number of banks of firms in those industries.

Some variation is found in the number of bank relationships by region where the firm is located. On average, firms in the province of Castellón tend to have more bank relationships than firms in Cuenca (2.15 compared to 1.77). In Santa Cruz de Tenerife only 43 percent of the firms have one bank, a percentage that increases to 60 percent in Soria. With respect to the legal form of the firm, joint stock companies have an average of 2.25 bank relationships and 44 percent have a single bank compared to limited liability companies that have an average of 1.73 banks and 57 percent have just one bank relationship.

In recent years, financial institutions operating in Spain have been following a strategy of expansion of their branching network mainly leaded by savings banks. Therefore, one could expect that the number of bank relationships has increased

[12]For an international comparison of the number of bank relationships see Ongena and Smith (2000).

with the number of branches available. Figure 4.2 shows that the percentage of firms having a single bank relationship has increased slightly over the sample period: 48.5 percent of the firms in 1994 to 52.5 percent in 2003. The average number of bank relationships that a firm maintains remains fairly stable over the time period of analysis at around 2 (the minimum average is achieved in 1998 with 1.91 banks and the maximum average in 1994 with 2.06 banks). Hence, the increased number of bank branches has not been translated in a significant increase on the number of bank relationships that firms maintain. It is also interesting to note that firms in the sample rarely change the number of bank relationships.[13] Only 18 percent of the firms in the sample change the number of lenders during the period of observation

4.3.3 Firm characteristics and lending relationships

We next explore whether firms that employ a single bank differ in terms of observable characteristics from firms borrowing from a larger number of institutions. Table 4.5 presents some summary statistics of firm characteristics and some financial variables for groups of firms with one, two, three or more than three lenders. We estimate simple ANOVA models which test for significant differences of the means across the four groups. All differences are statistically significant to any conventional significance level (p-value=0.0000 for all tests).

We can observe that firms with multiple banks tend to be large (in terms of assets, sales and employees) and older. Firms do not appear to differ much in terms of leverage, liquidity, tangibility of the assets, activity, profitability or credit quality (measured by Altman and García Z-scores). Firms with a single bank relationship tend to be growing faster than firms with multiple banks. Speaking in broad terms, there is no convincing evidence that firms with less concentrated borrowing (i.e. with a relatively large number of lenders) appear superior in terms of observable characteristics.

[13]Due to data limitations, we cannot record firms switching banks that do not change the total number of bank relationships.

4.4 Cost of capital, number of lenders and banking market concentration

4.4.1 Theoretical background

Although the theoretical literature agrees that, through the relationship, information about the firm's quality is revealed, distinct theories generate conflicting predictions about the effect of relationship lending on interest rates. On the one hand, improved knowledge of the borrower may lead to a reduction in screening and monitoring costs to the bank which are partly shared with the borrower. Thus, loan rates are expected to decline as the relationship matures (Boot and Thakor 1994). On the other hand, improved knowledge of the borrower gives to the bank an informational monopoly. This may lock the borrower into the relationship enabling the bank to charge higher-than-competitive interest rates (Greenbaum, Kanatas and Venezia 1989, Sharpe 1990, Rajan 1992, Freixas 2005).

Regarding the impact of banking competition, we find again that different theoretical contributions offer opposite results on the relation between banking market competition and the incentives of lenders and borrowers to engage in relationship banking. A first set of theories argues that competition and relationship banking are incompatible. The reasoning is that with competition, borrowers might be tempted to switch to other banks or to the financial market. When banks anticipate shorter relationships, they may respond by reducing their relationship-specific investments and thus diminishing the value of relationships (Chan, Greenbaum and Thakor 1986, Petersen and Rajan 1995).

Some recent theories argue that competition and relationship banking are compatible. The intuition is that relationship loans may constitute a factor of differentiation from competitors which operates as protection from competition (Boot and Thakor 2000, Freixas 2005). Finally, some models do not predict a single direction effect of competition on relationship banking. Dell'Ariccia (2001) develops a theoretical model of spatial differentiation to demonstrate how asymmetric information can affect both

bank competitive conduct and market structure. He obtains ambiguous results regarding the effect of competition on relationship banking. Dinç (2000), Yafeh and Yosha (2001) and Anand and Galetovic (2006) propose models where relationship lending is more likely to occur when the degree of competition is not too low or too high, leading to a non-monotonic relationship between the degree of concentration in banking markets and lending relationships.

All these papers suggest that loan interest rates depend on two crucial aspects: (1) banks investing in the relationship and sharing the benefits with the borrowers through decreased interest rates (relationship hypothesis), and (2) on the ability of banks to exploit the informational monopoly they acquire (hold-up hypothesis). In order to discriminate between the "relationship hypothesis" and the "hold-up hypothesis", we look at the differential effect that exclusive relationships may have on the cost of capital and on the availability of credit depending on the degree of banking market concentration.

4.4.2 Descriptive statistics of the cost of capital

The dependent variable used in this analysis is the *Cost of capital* computed as the interest expenses over total liabilities. The summary statistics for this variable can be found in table 4.6 where observations are divided by firm age (young firms with age less or equal than ten years and old firms), by the degree of market concentration where the firm is located (most competitive, intermediate and most concentrated) and by the number of bank relationships (one bank or more than one).[14] The average cost of capital is 4.17 percentage points (standard deviation of 4.30). In figure 4.3, we plot kernel density estimates of the distribution of the cost of capital for four subgroups in our sample, defined by the degree of concentration in the banking market where the firm is located and by the number of bank relationships.

To have multiple bank relationships is expensive. Controlling by age and degree

[14]We performed tests of differences in means (t-test) and of differences in medians based on a non-parametric Wilcoxon signed rank test (z-test).

of market concentration, the average cost of capital paid by firms with more than one bank relationship is higher than firms with one bank relationship. The difference is bigger for young firms (mean difference around 65 basis points) than for old firms (mean difference between 21-35 basis points). Young firms are expected to benefit from relationship lending because they are mostly informationally opaque firms that are likely to be affected by information problems in credit markets. Having an exclusive relationship may signal banks to invest in the relationship, which lessens information problems and gives a further incentive to banks to share the benefits with borrowing firms. On the other hand, young firms borrowing from multiple banks inhibits the investment each bank makes in gathering information on the firm; lending in this case is assimilated to a transaction type of lending rather than relationship lending. For old firms, the difference in cost of capital by number of banks is smaller; that is, the value of exclusive relationships decreases with age because they suffer less information problems and because of the hold-up problem.

Comparing the cost of capital in most competitive and most concentrated markets (controlling by age and number of banks) we do not observe big differences. The only significant mean difference is for old firms with one bank relationship: in the less concentrated banking market the capital is on average 10 basis points more expensive than in most concentrated markets (t=2.66).

When we compare the average cost of capital by firm age, we observe that for firms with one bank relationship, the cost of capital is larger for old firms compared to young firms. However, the opposite is true for firms with more than one bank, i.e., young firms are paying lower average rates than old firms. This happens for all degrees of market concentration. Therefore, regardless of banking market concentration, it seems that old firms in Spain that maintain exclusive relationships are suffering a hold-up problem meaning that banks exploit the informational monopoly by increasing loan rates with the duration of a bank-firm relationship (Sharpe 1990). Notice that the bigger increase on premium with age is for firms in the less concentrated market that are borrowing from one bank: old firms pay on average 19 basis points more than

young firms (t=9.20) (difference in median is 29 basis points, z=18.47).

These results are indicative that both variables, namely the degree of banking market concentration and the number of bank relationships that a firm maintains, are relevant to determine the cost of capital that firms bear. In order to be able to analyze the determinants of the cost of capital, in the next section we perform regression analysis to control for observable firm quality and other characteristics.

4.4.3 Regression analysis of the cost of capital

To assess the impact of bank relationships and banking market concentration on cost of capital, controlling for firm-specific fixed-effects, firm age, size and other financial characteristics of the firm, we estimate the following model:

$$\begin{aligned} Cost\,of\,Capital_{it} &= \beta_0 + \beta_1 Bank\,Relationships_{it} + \beta_2 Herfindahl_{pt} + \\ &+ \beta_3 (Bank\,Relationships_{it} * Herfindahl_{pt}) + \\ &+ \beta\ Firm\,Characteristics_{it} + \\ &+ \alpha_i + d_t + u_{it} \end{aligned}$$

where i denotes the firms, t time and p the province where the firm is located; α_i are firm fixed-effects, d_t are year fixed-effects and u_{it} is the error term. Given the large size of the sample and that on average each firm is observed during eight years, we estimate a fixed-effect model that controls for firm individual heterogeneity. That is, we control for any variable whose values differ among the firms but do not change over time. Additionally, the inclusion of year dummies further controls for aggregate time effects, that is, any variable that changes over time but does not differ among borrowers, such as inflation, underlying cost of capital in the economy, business cycle, etc. These year dummies will allow for separate intercepts for each time period. As explained in section 4.2.2, we use three alternative measures of *Bank Relationships*: the *Number of banks*, the indicator variable *One bank* for one relationship versus

multiple bank-relationships, and the *Share by bank* variable.

The results of the regressions with the variable *Number of banks* can be found in table 4.7. The estimation with the whole sample is reported in the first column, while the other three columns contain the estimations for the subsamples of micro, small and medium firms respectively. For the whole sample, the interaction effect between the *Herfindahl* index of banking market concentration and the *Number of banks* is significantly different from zero. This means that the effect of an increase of the number of banks on cost of capital depends on market concentration. Correspondingly, the effect of concentration on cost of capital depends on the actual number of bank relationships.

The coefficient of the *Herfindahl* index capturing the degree of concentration in the banking market is positive and highly significant. The cost of capital increases with banking market concentration, which is consistent with the traditional industrial organization result that firms with monopoly power can charge prices above marginal cost. The negative coefficient in the interaction term shows that this positive effect of concentration on cost decreases as we consider firms with a higher number of banks. The next example gives an estimate of the economic significance of these effects. For a firm with one bank, an increase in the *Herfindahl* index from its 25th percentile value (HHI=1,200) to 75th percentile value (HHI=1,900) implies an average increase on cost of capital of 22.5 basis points, i.e. almost a quarter of a percentage point. For firms with ten bank relationships (the maximum number in the dataset), the effect disappears.

As stated above, the effect of the variable *Number of banks* on the cost of capital depends on the degree of banking market concentration. In a perfectly competitive market (HHI=0), a firm that increases by one the number of bank relationships on average will pay 6.5 basis points more on its debt. In a market with a monopolist bank (HHI=1), a firm that increases by one the number of bank relationships will pay 30 basis points less. That is, the change on the cost of capital when a firm increases the number of banks can be positive or negative depending on the degree of banking

market concentration.

The evidence is consistent with the relationship hypothesis in less concentrated markets: firms with one bank enjoy lower cost of capital than multiple banking firms. Banks, even knowing that they are exclusively lending to these firms, do not exploit their informational advantage. The result could reflect a greater bargaining power on the part of these firms, which can credibly threaten to move to another bank. On the other hand, in more concentrated banking markets, firms with one bank relationship pay higher cost of capital than multiple banking firms. That is, the hold-up hypothesis dominates in the most concentrated banking markets. Because the "lemons problem" is more acute in concentrated markets, a firm's threat to switch to a bank's competitor may not be considered as credible.

Taken together, these results suggest that the market power that banks enjoy in concentrated markets can be substituted by the monopoly of information conferred by exclusive bank relationships. That is, for relationship lending to arise banks need some degree of bargaining power that can be granted either by the market structure or by being the unique lender.[15] Under these conditions, banks will invest in the relationship, and relationship lending will dominate over transaction lending. However, when there is "too much" competition, that is, when firms increase the number of banks in competitive markets, it is likely that transaction lending dominates and therefore neither effect (relationship or hold-up) is observed.

As far as the characteristics of the firm are concerned, size (measured by *Log(assets)*) displays the negative expected sign. Larger firms obtain cheaper external finance. Firms more indebted and with higher growth opportunities (measured by *Log(sales)*) have higher cost of capital. *Age* has a positive effect on cost of capital. Profitability (*EBIT on assets*), *Liquidity* and the availability of collateral (*Free collateral*) have a positive effect on cost of capital. Surprisingly, the *Z-score* variable that controls for firm creditworthiness has a positive sign; it does not confirm Rajan's (1992) theoretical prediction that firms with a higher probability of failure should suffer more from

[15]Elsas (2005) finds a similar result when estimating the determinants of housebank status in Germany.

informational hold-up problems.

4.4.4 Robustness checks

We divide the sample into three groups by firm size (micro, small and medium) and estimate the model presented above for each subsample. The results can be found in the last three columns of table 4.7. For small and medium firms we observed the same pattern of results as in the whole sample. However, micro firms have quite different results in terms of the sign and significance of the coefficients. Specifically, we obtain a negative coefficient for the *Number of banks*, while the *Herfindahl* index and the interaction term (*Herfindahl*Number of banks*) are not significantly different from zero. These findings suggest that micro firms are particularly susceptible to hold-up problems when they have a single bank relationship. That is, micro firms suffer acute information problems and even with relationship lending it can be difficult for these firms to raise external finance. Moreover, decreasing the degree of banking market concentration does not seem to alleviate the hold-up problem of micro firms. An alternative explanation for these differing results is that accounting data for the smallest firms may be less reliable because they are hardly audited. Therefore, we repeated the regression by dropping these firms and confirmed the main findings (results not reported).

We ran the set of regressions for the other two measures of bank relationships: the dummy variable *One bank* and the *Share by bank* variable. The results can be found in tables 4.8 and 4.9, respectively. The main findings documented above are confirmed. We performed an additional robustness check by replacing the Altman Z-score by the Z-score proposed by García, Calvo, A, and Arqués (1997) because it is based on the estimation of a bankruptcy model for a sample of small and middle sized firms of the Spanish manufacturing sector. The coefficient estimates for all variables remain virtually unchanged except for the Z-score itself. The *García Z-score* displays a negative and significant sign, confirming the theoretical prediction in Rajan (1992) that firms with a lower probability of failure have less informational problems (results

not reported).

As an additional robustness check, we consider the *Premium* (cost of capital minus interbank interest rate) as dependent variable. The results are virtually unchanged (not reported). Finally, we also estimated the models by random effects, that is, assuming that the firm-fixed effect is a random disturbance characterizing the $i-th$ observation that is constant trough time. The random effects estimates are efficient because they use both the within and the between information. However, in all specifications the Hausman test rejects that the individual effects are uncorrelated with the other regressors; hence, the random effects estimates are inconsistent (not reported).

4.5 Credit rationing, number of lenders and banking market concentration

4.5.1 Theoretical background

Stiglitz and Weiss (1981) show that under asymmetric information in the credit markets banks may choose to ration borrowers instead of raising the interest rate to clear the market. That is, firms applying for credit are denied credit even when they are willing to pay higher interest rates for this credit. The literature on relationship banking has long emphasized the role of banks in lessening information problems by means of screening and monitoring. Hence close relationships are thought to reduce credit rationing for borrowers. Many empirical papers provide evidence in favor of this prediction (e.g. Angelini *et al.* 1998, Cole 1998).

With respect to the impact of competition, Petersen and Rajan (1995) show that relationship lending permits the funding of loans that are not profitable for the bank from a short-term perspective but may be profitable if the relationship with the borrower lasts long enough. Their model predicts greater credit availability in more concentrated markets.

4.5.2 Regression analysis of bank credit availability and maturity of credit

As a first approach to measure credit availability we consider the ratio of bank credit over total liabilities. As explained in section 4.2, the number of observations drops considerably because we require more detailed balance sheets that record the amount of bank debt. This variable underestimates the availability of credit because some firms may have access to more bank finance but do not apply for it (firms not rationed). As long as the sample of non-rationed firms is not a random sample and the differing characteristics are changing over time, we will obtain inconsistent estimations. However, if the sample of non-rationed firms is random or the non-randomness is constant over time, by including firm-specific fixed-effects we obtain consistent estimates.

To assess the impact of bank relationships and banking market concentration on credit availability, controlling for firm-specific fixed-effects, firm age, size and other financial characteristics of the firm, we estimate the following model:

$$\begin{aligned} \frac{Bank\,Credit_{it}}{Total\,Liabilities_{it}} &= \beta_0 + \beta_1 Bank\,Relationships_{it} + \\ &+ \beta_2 Herfindahl_{pt} + \\ &+ \beta\ Firm\,Characteristics_{it} + \\ &+ \alpha_i + d_t + u_{it} \end{aligned}$$

where i denotes the firms, t time and p the province where the firm is located; α_i are firm fixed-effects, d_t are year fixed-effects and u_{it} is the error term.

Cardone, Casasola and Samartín (2005) propose an additional hypothesis related to credit rationing, namely rationing of the term of credit. Firms get financing for a shorter term than they would like. Relationships are by definition expected to last for a long time, therefore, banks with close relationships with their borrowers should be more inclined to offer long term credits. Hence firms with close relationships should

have on average a higher proportion of long term debt. To test this hypothesis we propose the following model:

$$\begin{aligned}\frac{Short\,Term\,Bank\,Credit_{it}}{Bank\,Credit_{it}} &= \beta_0 + \beta_1 Bank\,Relationships_{it} + \\ &+ \beta_2 Herfindahl_{pt} + \\ &+ \beta\ Firm\,Characteristics_{it} + \\ &+ \alpha_i + d_t + u_{it}\end{aligned}$$

where i denotes the firms, t time and p the province where the firm is located; α_i are firm fixed-effects, d_t are year fixed-effects and u_{it} is the error term. As explained in section 4.2.2, we use three alternative measures of *Bank Relationships*: the *Number of banks*, the indicator variable *One bank* for one relationship versus multiple bank-relationships, and the *Share by bank* variable.

Table 4.10 presents the main regression results with the variable *Number of banks*. In columns one to four we can find the availability of credit regressions (dependent variable is *Bank credit/Liabilities*), and in columns five to eight the term of credit regressions (dependent variable is *Short term bank credit/Bank credit*).[16] The estimations with the whole sample are reported in the first and fifth column, while the other columns contain the estimations for the subsamples of micro, small and medium firms respectively. Looking at the availability of credit regressions, we find a positive and significant coefficient for the *Number of banks* variable and insignificant effect of the concentration index (first column, table 4.10).[17] This indicates that firms that increase the number of bank relationships achieve a higher proportion of bank debt. The result that multiple bank relationships are associated with higher credit availability has already been documented in previous studies conducted in Spain using other data sources (Cardone, Casasola and Samartín 2005).

[16] We did not consider the interaction effect between *Number of banks* and the *Herfindahl* index because it was insignificant in all specifications.

[17] Carbó, Rodríguez and Udell (2006) measure bank competition using the Lerner Index and find a negative effect of bank market power on credit availability.

Next, focusing on the term of credit regressions (fourth column, table 4.10) we can observe that the variable *Number of banks* does not affect maturity. This result coincides with Cardone, Casasola and Samartín (2005). The *Herfindahl* index has a positive and significant effect on the proportion of short term bank credit. Firms in less concentrated banking markets have better access to long-term financing.

The results presented in this section suggest that firms with exclusive relationships have lower availability of bank credit and that firms in the concentrated market suffer rationing of the term of credit. However, these results should be taken with prudence because we are observing the current amount of bank debt and short term debt. We do not know the *desired* amount of debt and hence any inference to credit rationing should be made with caution.

4.5.3 Robustness checks

We run the regressions for the other two measures of bank relationships: the dummy variable for one bank versus multiple banks and the *Share by bank* variable. The results can be found in tables 4.11 and 4.12 in the appendix, respectively. The main findings documented above are confirmed.

We removed the interaction effect between the *Bank relationship* variable and the *Herfindahl* index from the main regressions because it was insignificant in all specifications. We perform an additional robustness check in order to further explore whether there exist differential effects of exclusive relationships on credit availability depending on banking concentration. We constructed three dummy variables for the degree of concentration in the banking market where the firm is located: more concentrated, intermediate and less concentrated market.[18] We performed a regression with the interaction of the dummy variable *One bank* and these three dummy variables for the degree of banking concentration. The results can be found in table 4.13. We

[18]In a given year, we compute the percentile 33 and percentile 66 of the *Herfindahl* index of banking market concentration in the 52 Spanish provinces. Then, we classify the provinces below the 33 percentile as the less concentrated markets, provinces with an index between 33 and 66 percentile as intermediate markets and provinces above the 66 percentile as the most concentrated markets.

observe that the effect of the variable *One bank* on bank credit availability is similar in all banking markets. We conclude that the degree of banking market concentration does not play a significant role to determine bank credit availability and maturity.

4.5.4 Investment sensitivity to cash flow

The second approach to measure credit rationing consists on an analysis of investment-cash flow sensitivity. Since the seminal work of Fazzari, Hubbard and Petersen (1988) many empirical papers investigate financing constraints by measuring the sensitivity of investment decisions to firms' cash flow.[19] The central idea is that in the absence of financing constraints, all positive net-present-value investment projects are financed and there should be no relationship between cash flow and investment. With credit rationing, investment will depend on internal funds after controlling for the availability of positive net-present-value projects. The most credit rationed firms should display a higher sensitivity, as they are forced to use internal funds to undertake investment projects.[20]

Since firms in our sample are non-quoted SMEs, we cannot compute the Tobin's Q to control for the availability of positive net-present-value projects. We follow Bond and Meghir (1994) that propose an Euler equation to estimate cash-flow investment sensitivities:

$$\frac{I_t}{K_t} = \beta_0 + \beta_1 \frac{I_{t-1}}{K_{t-1}} + \beta_2 \frac{Cash_t}{K_t} + \beta_3 \frac{Sales_t}{K_t} + \beta_4 \frac{Debt_t}{Assets_t} + \alpha_i + d_t + u_{it}$$

where α_i are firm fixed-effects, d_t are year fixed-effects and u_{it} is the error term.

Estimation methodology

We divide the observations in the sample into six groups depending one the num-

[19] For a review of the literature see Hubbard (1998).

[20] Recently, this approach has raised a number of criticisms on theoretical grounds by Alti (2003), Gomes (2001), Kaplan and Zingales (1997, 2000). Its empirical findings are also questioned by Cleary (1999, 2006).

ber of bank relationships (one bank and more than one) and by the degree of banking market concentration (concentrated, intermediate and competitive). We run six regressions of investment on cash flows to see which group of firms is more sensitive, i.e. more credit constrained (like in Hoshi, Kashyap and Scharfstein 1991). If relationship lending lessens credit constraints of small firms, we should obtain a lower coefficient for firms with one bank relationship. There is a potential problem of endogeneity that could bias the results if firms in one of the groups are of higher quality and thus have less liquidity constraint. As some authors argue, "this approach is useful even if the estimated coefficients on liquidity are biased. This is because the difference in the estimated coefficients is an unbiased estimate of the true difference as long as the biases are the same for the two sets of firms".

Since the model has the lagged value of the dependent variable as an explanatory variable, the parameters will be estimated using dynamic panel methodology and specifically applying the General Method of Moment (GMM) on the equation in first differences suggested by Arellano and Bond (1991). We first take the first difference of the above equation and we get rid off the firm fixed-effects α_i. However, we need to use appropriate instruments to deal with the fact that the resulting error term $(u_{it} - u_{it-1})$ is correlated with the lagged dependent variable $(I/K)_{it-1} - (I/K)_{it-2}$. We additionally suspect the potential endogeneity of the explanatory variables. The GMM estimators use lagged variables as instruments under the assumption that the error term u_{it} is not serially correlated (there is no second-order serial correlation in the errors in first differences) and that the explanatory variables are weakly exogenous. In order to test the consistency of the estimations, we used the test for the absence of second-order serial correlation proposed by Arellano and Bond (1991). Likewise, we employed the Sargan (1958) test of over-identifying restrictions, which tests for the absence of correlation between the instruments and the error term. [21]

[21] The estimation is performed in Stata using the module xtabond2 for dynamic panel data estimator (Roodman 2005).

Results

The results for the six groups by number of bank relationships and degree of banking market concentration can be found in table 4.14. We additionally defined a dummy variable for each group and performed an additional regression with the interaction of the cash flow variable by each dummy. The results can be found in table 4.15. The first and second order autocorrelation tests and the Sargan test confirm the validity of the specified model and the set of instruments used. As is evident from these results, the only significant coefficient is for firms with multiple banks in concentrated markets. Therefore, firms with exclusive relationships do not appear to be credit rationed. Additionally, less concentration in the banking market lessens credit rationing.

Some empirical papers have analyzed the investment sensitivity to cash flow depending on whether firms have close relationships with their banks or not. Hoshi, Kashyap and Scharfstein (1991) compare the investment sensitivity to the cash flow of Japanese firms having a close relationship with respect to those that do not belong to a *keiretsu*. They find that firms with close bank relationships appear to be less liquidity constrained than firms without close bank ties, i.e. investment is less sensitive to cash flow for firms that are members of a *keiretsu*. Using a similar approach, Houston and James (2001) examine a sample of publicly traded U.S. firms and find that firms that rely on a single bank show greater cash flow sensitivity of investment than firms that have multiple lending relationships or have public debt outstanding.

4.6 Conclusion

Exclusive bank-firm relationships influence both the incentives of banks to invest in relationship lending as well as the bank's ability to exploit the monopoly of information. We empirically examine the cost of capital, the availability of credit and credit rationing for firms with exclusive relationships and firms with multiple relationships, while focusing on differential effects related to banking market concentration.

This paper adds to the growing literature on the impact of lending relationships on access to external finance and on loan terms offered to borrowers. We focus on small and medium firms because these firms are much more dependent on banks to finance their projects. The reference to Spain is particularly useful, since exclusive banking relationships are prevalent and relationship lending technology is widely used in credit markets. We use a panel dataset of 73,809 small and medium sized firms that covers the period 1993-2004, a period which is sufficiently large to capture variations in the degree of concentration in banking markets due to the culmination of the process of deregulation, and the consolidation through mergers and acquisitions that have taken place during this period.

Panel regressions on the cost of capital allow testing for the relative prevalence of the hold-up problem depending on the credit market structure. We find that a hold-up problem arises in the most concentrated banking markets. The magnitude of the effect is also important. A firm that decides to concentrate borrowing at a single bank can expect to pay an interest rate one percentage point higher than a firm with four banks. Next, we proceed to examine credit availability by following two different approaches. First, we examine the amount and the term of bank credit. The most interesting result is that firms increase their number of bank relationships to raise bank credit. Second, we estimate the investment-cash flow sensitivity in order to find evidence on credit rationing. We find that firms in concentrated markets with multiple banks display the larger sensitivity, suggesting that those firms are the most financially rationed.

We contribute to the debate of the effect of banking market consolidation on relationship lending. In recent years, the process of consolidation in many developed countries has raised a concern on the impact that banking market structure may have on access to external finance and overall economic growth (e.g., Rajan and Zingales 1998, Demirgüç-Kunt and Maksimovic 2002, Claessens and Laeven 2005). We find that excessive concentration in credit markets is harmful to firms even with relationship lending. The reason is that in concentrated markets firms with exclusive

relationships suffer the hold-up problem while firms with multiple banks appear to be the most credit rationed firms in our sample. On the other hand, firms in less concentrated markets with single bank relationships do benefit from relationship lending technology. Hence our evidence is not consistent with the view that banking competition is inimical to the establishment of close bank-firm relationships (Petersen and Rajan 1995). On the contrary, we find that to some extent competition helps to reinforce the commitment between the borrower and the bank (D'Auria *et al.* 1999).

Our study has some limitations, mainly concerning data availability. It is likely that some firms with multiple banks obtain relationship loans from one of them. However, we only know the number of banks and we are not able to compute the share of one firm's debt supplied by an individual bank in the case of multiple banking firms. Although we cannot test this hypothesis, our strategy is the most conservative in the sense that firms with a single lender are expected to receive relationship loans whereas firms with multiple lenders inhibit banks investment on relationships. Another concern refers to the measurement of credit market concentration and the definition of the relevant market itself. Nevertheless, our results seem robust to many specifications and they are consistent with previous Spanish studies (e.g. Cardone, Casasola and Samartín 2005; Carbó, Rodríguez and Udell 2006).

Chapter 5

The Effect of Relationship Lending on Firm Performance

5.1 Introduction

Long-term ties between main banks and their client firms generate value and increase economic efficiency. Little is known, though, on how this value is divided among the stakeholders involved in such relationships. The asymmetric role played by the lender and the borrower while building the relationship implies that the direct recipient of the benefits of close relationships is the lender. To the extent that the lender passes these benefits to the borrower, relationships will also be valuable from the borrower's point of view. In this paper we investigate whether banks are indeed sharing the benefits of lending relationships with their borrowers by examining the relative performance of firms with close bank relationships with respect to firms without those relationships with its lenders.

The modern literature on financial intermediation has long emphasized the value-creation function of lending relationships. In a context of asymmetric information in the credit markets, lending relationships facilitate the information exchange between the borrower and the lender through repeated interaction over the duration of the relationship and through the provision of multiple financial services. Lenders invest in generating information from their client firms and borrowers are more inclined to disclose information (Boot 2000). In consequence, the information asymmetries between the bank and the firm are lessened as time goes by. This enhances economic efficiency through many channels. First, having a long-term horizon permits the design of implicit credit contracts over the duration of the relationships that increase value. This is achieved, for instance, through reduction in welfare-dissipating collateral requirements (Berger and Udell 1995), through the deployment of welfare-enhancing intertemporal tax-subsidy schemes in loan pricing (Petersen and Rajan 1995), as well as through more flexible contracting terms (Boot, Greenbaum and Thakor 1993).[1] Second, the reusability of the information generated by the lender over repeated transactions and over time is also beneficial in terms of savings on the

[1] This greater flexibility of loan contracts could be welfare dissipating if the soft-budget constraint problem is acute.

fixed cost of screening and monitoring (Boot, Greenbaum and Thakor 1993). Third, it avoids the free-rider problem of monitoring since the bank internalizes the benefits of such investments. Higher monitoring levels increase value since, for instance, they help solve principal-agent problems of managerial behavior. Additionally, relationship banks develop sector-specific expertise that enhances the value of financed projects (Boot and Thakor 2000). What is more, relationship lending contributes greatly to economic growth by promoting the efficient allocation of capital as long as better informed banks provide credit to the most productive projects first (Northcott 2004).

At the same time, close bank-firm relationships entail some costs to the firm. The most significant cost is that having a single relationship gives an informational monopoly to the only informed bank, which can impose hold-up costs for the firm (Sharpe 1990, Rajan 1992). Additionally, the soft-budget constraint problem, that is inefficient loan renewal decisions, is more likely to happen when only one lender has to option to bail out the firm in case of distress (Dewatripont and Maskin 1995); managers are more inclined to default strategically to divert cash to themselves when there is only one creditor than when there are many creditors (Bolton and Scharfstein 1996). In spite of these problems, existing empirical research on relationship lending stresses that benefits outweigh the costs, that is, relationships generate value.

Only to the extent that such value created is passed on to or shared with the borrower, through lower cost of borrowing, more flexible contract terms, and so on, a relationship will also be valuable for a firm that borrows from its relationship lender. That is to say, a firm will benefit from relationship lending as long as the bank shares the value with the borrower. In consequence, if lending relationships are valuable, it should be reflected in the overall firm performance. However, whether firms that have a single bank relationship outperform firms with multiple bank relationships has not been investigated yet. We address this issue in this paper. We test whether the intensity of banking relationships, measured by the number of lenders, benefits firms in terms of their profitability and growth.

This hypothesis is tested using a panel dataset of small and medium sized Spanish

firms for the period 1993-2004. We focus on small firms for various reasons. First, small firms are more likely to suffer information problems in the capital markets. The value of relationship lending, which is based on a bank gathering soft information, is likely to be higher for the smallest, youngest and most opaque firms because of the lack of credit history, the impossibility to credibly disclose their quality, and the lack of separation between ownership and management, which increases the asymmetric information between insiders and outsiders (lenders). Second, small firms are typically restricted to obtaining external finance only from financial institutions. Public debt markets are only accessible to large firms. While little more than 500 Spanish companies access the organized capital market, more than 2.5 million small firms rely on financial intermediaries to finance their investment projects. Third, small firms are extremely important for the Spanish economy: roughly 50 percent of the 3 million Spanish firms do not have employees while 1.3 million have between one and nine employees; 180,000 firms have between 10 and 499 employees and only 1,700 Spanish firms have more than 500 employees.

Previous empirical literature has already investigated the real effects of close bank-firm relationships. Hoshi, Kashyap and Scharfstein (1990) focus on Japanese listed firms that are in financial distress. They find that firms that have close financial relationships to their banks (are in same industrial group and have a larger share of bank loans from the same lender) invest more and have a higher sales growth after a period of financial distress than nongroup firms. Degryse and Ongena (2001) use a panel dataset of 235 publicly listed Norwegian firms between 1979 and 1995 and find that firms with a bilateral relationship are more profitable. Fok, Chang and Lee (2004) examine 178 firms traded on the Taiwan Stock Exchange between 1994 and 1998. They find that the number of foreign-bank relationships is positively related to firm performance; however, the number of domestic-bank relationships is negatively related to firm performance. Since domestic-bank loans are more likely to be relationship loans, the results are interpreted as evidence that bilateral relationships are profitable. Some other papers find opposite results. Weinstein and Yafeh (1998) an-

alyze 6836 Japanese firms in the period 1977-1986 and find that firms with close ties to their lenders exhibit slow growth rates and lower profitability. That shows that in Japan most of the benefits of bank-firm relationships are appropriated by the banks. Agarwal and Elston (2001) use a sample of large listed and unlisted German firms in 1970-86 and find that bank-influenced firms do not have higher profitability or growth (bank influence is defined as financial institutions owning part of the firm.). They interpret these results as evidence that German universal banks engage in rent-seeking activities. Chirinco and Elston (2006) use data on 91 listed firms in Germany and find that bank influence is not associated with a reduction of finance costs nor a change in profitability. It is interesting to see that these three studies have been conducted in Japan and Germany, which are the economies that have been cited frequently as ideal to study bank-firm relationships. However, none of the existing papers has empirically examined this issue for small non-listed firms. As explained above, bank relationships are particularly important for small firms. This paper contributes to the existing literature by providing empirical evidence for small firms. Furthermore, we carefully design an empirical strategy to deal with identification problems inherent in this type of research. In particular, we use a very large panel and instrumental variables estimation in order to fully exploit the exogenous information of the data.

This paper is also related to a branch of empirical papers that search for evidence on the uniqueness of bank loans with respect to other sources of finance. Typically, these empirical papers measure the impact on a firm's stock price when information about a bank relationship is revealed. The starting point to this literature is the work of Fama (1985), who argues that bank-firm relationships are important since they affect a firm's ability to raise capital, from both within the bank and from other non-bank sources. Based on that observation, James (1987) compares the stock price reaction to announcements of private and public debt and bank loans. He finds that bank loan announcements are associated with positive and statistically significant stock price reactions, while announcements of private and public debt are not followed by such a response. Numerous event studies have expanded the results

in James (1987).[2] Our research question, namely to estimate the value of close bank relationships for the borrowers, is similar to this branch of the literature. However, since these analyses rely on the stock price reaction, this type of event study can only be implemented for large, listed firms. Given our interest in measuring the value of bank relationships for small firms, we need another methodology that will be presented in the next section. Section 5.3 describes the dataset. We present the regression results in section 5.4 and the robustness checks in section 5.5. The last section concludes.

5.2 Estimation procedure and identification strategy

To assess the impact of bank relationships on firm performance, we start by regressing a measure of firm performance on a bank relationships measure, controlling for firm-specific fixed-effects, firm age, size and other financial characteristics of the firm. The basic regression model has the following form:

$$\begin{aligned} Firm\,Performance\,Measure_{it} &= \beta_0 + \beta_1 Measure\,of\,Bank\,Relationships_{it} + \\ &+ \beta_2 Firm\,age_{it} + \beta_3 Firm\,size_{it} + \\ &+ \beta\ Financial\,Characteristics_{it} + \\ &+ \alpha_i + d_t + u_{it} \end{aligned}$$

where α_i are firm fixed-effects, d_t are year fixed-effects and u_{it} is the error term.

The model presented so far assumes that the firm's choice of the number of bank relationships does not depend on firm performance. A relevant contribution of this paper is to relax this assumption. Bank relationships are as likely to affect performance as performance is to affect the number of bank relationships. That is, the

[2] Slovin, Sushka and Hudson (1988), James and Wier (1990), Slovin and Young (1990), Billet *et al.* (1995) and Shockley and Thakor (1998) among others.

causality between firm performance and lending relationships can go either way. First of all, consider a firm that chooses the optimal number of bank relationships. On the one side, high quality firms may prefer borrowing from a single lender. Yosha (1995) argues that more profitable firms prefer bilateral financing to multilateral financing in order to minimize the disclosure of sensitive information to third parties. Additionally, firms with a single bank relationship that want to increase the number of bank relationships might face a winner's curse problem because non-relationship banks identify switching firms as non-performing firms (Von Thadden 1995). In consequence, better-performing firms may be reluctant to increase the number of bank relationships in order to avoid being perceived in the banking market as a non-performing firm. On the other hand, we can find arguments to explain why high quality firms may prefer borrowing from a single lender. For instance, firms with more growth opportunities have multiple lenders in order to reduce liquidity risks (Detraguiache, Garella and Guiso 2000); high quality firms borrow from multiple creditors in order to make strategic default less attractive (Bolton and Scharfstein 1996). Next, consider the decision on the number of lenders from the point of view of banks. On the one hand, firm performance could be partially observable to non-relationship banks who will then compete to gain them as a client. Thus, higher competition among banks for good performing firms can give rise to a positive relationship between performance and number of bank relationships. On the other hand, we can find inverted arguments. If banks want to diversify their portfolio risk, we should expect that low quality firms are obliged to borrow from multiple lenders (Farinha and Santos 2002).

We can conclude that bank relationships are potentially endogenous with firm performance, which would lead to inconsistent estimations for the model proposed above. We address this potential reverse causality problem through a simultaneous equations model that will be estimated using the Generalized Method of Moments (GMM). We first model the firm's decision on the number of bank relationships, and then, in a second stage, we use the fitted values of the first stage as our right-hand

side variable of interest.[3] We use three instrumental variables in the first stage, two of them are defined at the province level and one at the industry level: (1) the number of mergers in the past three years in the province where the firm is located (*Mergers*), (2) the Herfindahl-Hirschman index of branch banking market concentration in the province where the firm is located (*Herfindahl*)[4,5], and (3) the industry ratio of bank debt over total assets (*Bank credit over assets*).[6] As is well known, the instruments must satisfy two conditions: they must be uncorrelated with the error term and they must be partially correlated with the endogenous variable (*Measure of bank relationships*) once the effect of all the other explanatory variables has been netted out (Wooldridge 2001, p.84). First, mergers of financial institutions will directly affect those borrowers that have a relationship with each of the merging banks. We expect that these firms will react in the years following the merger by increasing their number of bank relationships. Second, the banking market structure affects the number of bank relationships because banking competition determines the banks' incentives to engage in relationship lending (Petersen and Rajan 1995). By using these two instruments, we are implicitly assuming that the distribution of bank branches across provinces is exogenous, in the sense that branching and mergers decisions of banks in other provinces are not based on the relative performance of firms in each province. It is typically the case that a bank's decision to increase its branch network is determined by its ability to collect deposits in that local market, and is less concerned with the small business activity or its ability to grant business loans. Even though empirical evidence on this issue is not available for Spain, studies for

[3]We follow a similar approach of Degryse and Ongena (2001) and Fok, Chang and Lee (2004).

[4]The *Herfindahl* index of branch banking market concentration is calculated at the province level using the number of bank branches that each commercial and savings bank has in each province. That is, the concentration index in each province and year is computed as the sum of the market shares squared for each financial institution operating in that province.

[5]Like many Spanish studies (Maudos 2001; Carbó, Humphrey and Rodríguez 2003; Carbó, López and Rodríguez 2003), we assume that the relevant market for measuring banking competition is the province, given that we do expect the small and medium firms that compose our sample to seek banking finance close to their location. A practical reason for this choice is that the only available information at a different level other than national is the branch distribution in each province.

[6]Industries are defined as two digit SIC codes. The average ratio is computed using the firms in our sample by industry and year.

other European countries show that business opportunities are just one of many other factors that explain bank branch expansion, such as past market structure, level and growth of GDP, bank mergers, political reasons, etc.[7] The last instrumental variable, namely industry average bank debt scaled by assets, measures industry dependence on external finance.[8] It is expected to be positively related to the number of bank relationships if the bank risk-diversification hypothesis applies. That is, if banks want to limit their exposure to a given borrower, then firms that need more external finance will approach more banks to obtain additional credit. This effect has been shown to be particularly important for lower-credit-quality firms (Farinha and Santos 2002). Thus, using the leverage ratio for each firm (need of external finance by firm) would not be a good instrument because it is correlated with firm performance. Instead, we use a measure of dependence on external finance at the industry level. We expect that, on average, firms in industries highly dependent on external finance will need more lenders to satisfy their credit needs. The validity of our instruments will be further assessed empirically with the F-test of excluded instruments and the Hansen J test of overidentifying restrictions.

In alternative specifications, we also consider additional instruments such as the variable *Density of bank branches* in the province where the firm is located.[9] The availability of bank branches in the vicinity of the firm may have an effect on the number of bank relationships due to transportation and information costs. However, this variable is highly correlated to the *Herfindahl* index and the test of validity of instruments exhibits a preference towards *Herfindahl*. Thus, the reported regressions do not include *Density* as an instrument.

A second estimation problem comes from the fact that it is possible that the relation between performance and strength of bank-firm relationships is neither a

[7]For studies of the determinants of banks' branching decisions see, for example, Calcagnini, *et al.* (1999) who provide Italian evidence, Kim and Vale (2001) which conducted an empirical analysis in Norway.

[8]Alternatively, we have defined the dependence of external finance of an industry as the ratio of bank debt over total liabilities and bank debt over creditors, and the results are virtually unaffected.

[9]The *Density of bank branches* is computed as the total number of branches of all banks operating in the province where the firm is located.

correlation running from relationships to performance nor a reverse correlation in which performance affects relationships, but rather a spurious relationship attributed to unobservable individual heterogeneity among firms. Suppose there is an unobservable individual characteristic, like managerial ownership or the initial wealth of the owner, that is positively related to both performance and relationships. If this individual characteristic is omitted from the specification, a regression of performance on the number of bank relationships will spuriously indicate a positive relationship because the number of banks is a positive proxy for a firm's characteristics. Using panel data methodology and assuming individual heterogeneity to be the fixed individual effect that does not vary through time is a way to solve the endogeneity caused by the spurious relationship.

The structural equations of the simultaneous model are:

$$\begin{aligned} Measure\,of\,Bank\,Relationships_{it} &= \gamma_0 + \gamma_1 Firm\,Performance\,Measure_{it} + \\ &+ \gamma_2 Mergers_{pt} + \gamma_3 Herfindahl_{pt} + \\ &+ \gamma_4 Bank\,Debt/Assets_{it} + \\ &+ \gamma_5 Firm\,age_{it} + \gamma_6 Firm\,size_{it} + \\ &+ \gamma\ Financial\,Characteristics_{it} + \\ &+ \alpha_i + d_t + u_{it} \end{aligned}$$

$$\begin{aligned} Firm\,Performance\,Measure_{it} &= \beta_0 + \beta_1 Measure\,of\,Bank\,Relationships_{it} + \\ &+ \beta_2 Firm\,age_{it} + \beta_3 Firm\,size_{it} + \\ &+ \beta\ Financial\,Characteristics_{it} + \\ &+ \eta_i + d_t + \upsilon_{it} \end{aligned}$$

where α_i and η_i are firm fixed-effects, d_t are year fixed-effects and u_{it} and υ_{it} are

the error terms.

The coefficient of interest is β_1.It measures the effect of the exogenous variation of the closeness of relationships on firm performance. When banks share the benefits of relationships with their client firms, we expect β_1 to be positive. On the contrary, a negative β_1 would be evidence that banks appropriate most of the benefits generated through the relationships.

To capture the multidimensional character of performance several indicators of firm performance have been used. We are going to focus on two firm performance measures specified as the dependent variable: *Return on assets* and *Sales growth*. As a robustness check five more measures are used: economic profitability, financial profitability, return on shareholders funds, asset turnover and value added growth. We use three alternative measures of bank relationships: (1) the *Number of banks* of firm i (N_i); (2) the indicator variable *One bank* for one relationship versus multiple bank-relationships (*One bank*=1 if $N_i = 1$ and *One bank*=0 if $N_i > 1$); and (3) the *Share by bank* variable, which is computed as $(1/N_i)$ for each firm i.

The empirical specification further includes the main factors that affect firm performance - such as age of the firm, size and financial structure - as independent variables. Firm age is measured by the log of the age of the firm relative to its founding date (*Log(age)*). We do not have *a priori* a prediction for the effect of age. On the one hand, firm age captures the length of the firm's track record. More profitable firms are more likely to survive. On the other hand, age can be a proxy for flexibility and management efficiency. Older firms are more likely to have a rigid administrative process and more bureaucracy. Firm size is measured by the log of the number of employees. We measure the capital structure of a firm by the debt to assets ratio (*Leverage*) and liquidity as the current assets over current liabilities ratio (*Liquidity*). We expect a negative effect of this variable on firm performance. We include the inventory over assets ratio to proxy for the quality of management (*Activity*). We also include the proportion of total assets that are tangible and fixed, (*Tangibility*), which is also a proxy for the ability to pledge collateral. In some specifications, the

Altman's Z-score is included as an independent variable in the regression to capture the firm credit risk.[10] This is a compound measure built from accounting ratios that helps to predict how close a firm is to bankruptcy (Altman 1968). A higher Z-score implies a lower default risk.[11] We further compute the Z-score proposed by García, Calvo and Arqués (1997) (*García Z-score*) because it is based on the estimation of a bankruptcy model for a sample of small and medium sized firms of the Spanish manufacturing sector.[12] Table 5.1 provides the definition of the dependent variables and the instrumental variables together with basic descriptive statistics. For the remaining explanatory variables see table 4.1.

5.3 Data

Our main source of data is the SABI database (for details on sample selection see section 4.2, and section 4.3 for descriptive statistics). We use two additional sources of data: the Annual Statistics of the Spanish Banking Association (AEB) and the Annual Statistics of the Spanish Savings Banks (CECA), to obtain the number of branches of each bank by province and to construct a chronology of banking mergers and acquisitions during the sample period 1993-2004 (see table 5.2). The final sample consists of 66,630 firms and 549,657 firm-year observations.

[10]The *Altman's Z-score* is calculated as: ZA = 0.012 [working capital/assets] + 0.014 [retained earnings/assets] + 0.033 [EBIT/assets] + 0.006 [equity/liabilities] + 1 [sales/assets]. Although in the original model the fourth ratio is calculated by market value of capital/book value of debt, here we have used the alternative proposed by Scherr and Hulburt (2001): the book value (and not the market value) of equity. This is because the market value is not available in the case of SMEs.

[11]We estimated the model without the *Altman's Z-score* as an explanatory variable because it is potentially endogenous. The results are virtually unaffected, thus, we decided to keep it because we judge it important to have a control of firm credit risk in the model.

[12]According to this model, the values used as proxies of the firm financial strength will be computed as: ZG = -0,835 + 0,950*((receivable+cash)/current liability)+ 0,272*((fixed asset+current asset)/(fixed liabilitiy+current liability) - 11,848*(financial expense/sales) + 2,422*(annual depreciation/(intangible fixed asset+tangible fixed asset)) + 6,976*(earnings before taxes/total liabilities).

5.4 Regression results

5.4.1 Second stage

The main results can be found in table 5.3. In the first three columns, we report the results when firm performance is measured by the variable *Return over assets*. In column four to six we report the results with the variable *Sales growth*. We obtain a positive relationship between the *Number of bank relationships* and the *Return on assets* and a negative relationship with *Sales growth*. The sign of these two relationships are validated when we use the dummy variable *One bank* and the continuous variable *Share by bank* as alternative measures of bank relationships. *Ceteris paribus*, increasing the predicted number of bank relationships from 25 percentile to 75 percentile increases *Return on assets* by 2.06 percentage points and decreases *Sales growth* by 12.5 percentage points (first and fourth columns, table 5.3). *Ceteris paribus*, increasing the predicted proportion of firms with one bank relationship from 25 percentile to 75 percentile decreases *Return on assets* by 2.69 percentage points and increases *Sales growth* by 13.6 percentage points (second and fifth columns, table 5.3). *Ceteris paribus*, increasing the predicted share by bank from 25 percentile to 75 percentile decreases *Return on assets* by 2.43 percentage points and increases *Sales growth* by 13.13 percentage points (third and sixth columns, table 5.3).

In the last row of table 5.3, we report the Hansen test for the validity of the excluded instruments. An excluded instrument refers to that used in the first-stage regression but not included in the second-stage regression. Included instruments refer to all other exogenous variables used to identify the endogenous variable. For the specifications with *Return on assets* as the dependent variable, we obtain Hansen p-values above 0.05, which suggest that we cannot reject the validity of the instruments at the 5 percent critical level. However, the validity of the instruments is not confirmed when the dependent variable is *Sales growth*. This means that the identification strategy is not valid for that dependent variable. Therefore, the results in columns four to six have to be taken with caution.

Looking at the other explanatory variables, in the regressions in the first to third columns of table 5.3, we can see that firm characteristics and financial ratios help explain the variation on the return over assets within the firm. We observe that as firms get older they are more profitable. Firm size is not significant. An increase in the ratio of debt over assets decreases profitability. Surprisingly, firms increasing their liquidity have lower performance that those than do not. Firms that increase the ratio of fixed assets over assets or increase the inventory to assets ratio have a lower profitability ratio. In the fourth to sixth columns of table 5.3, we can see that young and larger firms grow less. In terms of the financial ratios, the signs are the same as for the profitability ratio, except leverage: firms that increase the debt-to-assets ratio exhibit higher growth rate.

5.4.2 First stage

The first stage regressions can be found in table 5.4. In the last two rows we report the F-test and the associated p-value of the joint significance of the excluded instruments: the number of mergers in the past three years in the province where the firm is located (*Mergers*), the *Herfindahl* index of bank branches concentration in the province, and the ratio of bank credit over assets in the industry (*Bank credit over assets*). The test validates the joint significance of the instruments for the three measures of bank relationships, i.e., the *Number of banks*, the dummy variable *One bank* and the *Share by bank* variable. As expected, the higher the ratio of bank credit in the industry, the larger the number of banks held by the firms in that industry. *Ceteris paribus*, increasing the leverage in the industry by 10 percentage points increases the average number of bank relationships by one. We find a positive coefficient on the variable mergers. After a merger, firms react by increasing the number of bank relationships on average. This corroborates that the behavior of many firms in the sample can be described by models that derive an optimal number of bank relationships; when due to a merger some firms suffer an exogenous decrease in their number of bank relationships (because they were borrowing from the two merging banks), they react

by adding a new bank so that they restore the before-merger number of banks. The last instrument, namely the *Herfindahl* index of banking market concentration, is not significant in any of the three equations. However, we decided to keep it as an excluded instrument because the C test of exogeneity of subsets of instruments cannot reject the *Herfindahl* index as an instrument.

The remaining explanatory variables for the determinants of the number of bank relationships show the expected signs. As firms get larger, in terms of number of employees, they tend to increase their average number of bank relationships. *Age* has a negative sign, meaning that as firms get older they tend to decrease the number of banks. Firms that increase the *Leverage* also increase the number of banks. *Liquidity* and *Tangibility* have a negative sign, which denotes that firms that improve their quality in terms of liquidity and asset tangibility decrease the number of bank relationships.

5.4.3 Robustness checks

Several robustness checks have been performed to validate the results obtained thus far. We start by considering alternative dependent variables to measure firm performance. The results can be found in table 5.5 (*Number of banks*), table 5.6 (*One bank*) and table 5.7 (*Share by bank*). The results are qualitatively similar to those reported in section 5.4.1.

The next robustness check consists of eliminating the micro enterprises (less than ten employees) from our sample. The reason is that the quality of the accounting information of these firms is usually poor and most likely they have not been audited. The results in table 5.8 corroborate the findings in the main regressions. After that, we include the variable *Z-score* to further control for the credit quality of the firm. We choose not to include it in the main specification since it could be considered an endogenous variable that is jointly determined with firm performance. We consider two alternative definitions of the Z-score. First, the *Altman Z-score* corresponds to the original definition provided by Altman (1968). Second, the *García Z-score*

corresponds to a re-estimation of the model of Altman by García, Calvo and Arqués (1997). The results in table 5.9 and table 5.10 confirm the sign of the relationship between firm performance and bank relationships obtained so far. As expected, we obtain a positive coefficient for the variable *Z-score* in all specifications.

Finally, we are particularly careful in checking that our result is not driven by firm age. That is, our result could be capturing the life cycle of the firm (Berger and Udell 1998). We want to disentangle the two stories that move in the same direction, namely the firms' life cycle and building relationships with lenders. As we can see in figure 5.1, as a firm ages, the number of banks increases and profitability increases. Therefore, we run additional regressions including age of the firm measured in days since the firm was founded (instead of the number of years), age-squared and dummies of firm age for each year. In table 5.11 we report one of these specifications, in which we include dummies of firm age for each two years. After further controlling for firm age, our result of the effect of the number of bank relationships on firm performance is maintained.

We performed additional robustness checks (not reported) mainly referring to the instruments used. For instance, we included the variable *Density of bank branches* in each province. With the same approach used to compute the number of mergers, we also computed the number of new entries and exits of banks in each province and year. However, the Hansen J test and the C statistic showed that the three instruments used are the ones that best identify the exogenous variation of the bank relationships variables.

5.5 Conclusion

In this paper evidence is provided consistent with the view that information problems in the capital markets have an important effect on corporate performance. This evidence comes from the fact that firms with an exclusive relationship with a bank - those firms that we *a priori* believe can minimize these problems - are less profitable than firms having multiple lenders. A possible explanation could be that the informa-

tion acquired by the single bank remains proprietary - informational monopoly - and later on the bank is able to extract monopoly rents from the firm with an exclusive bank relationship.

The paper also provides some insights on how the benefits of relationship lending are shared between the bank and the firm. Using data from a large sample of Spanish firms, we find that although close ties to a bank improve firm access to capital, they are not necessarily accompanied by higher profits or growth rates. The results are consistent with models where banks appropriate a large part of the benefits generated through relationships with clients (Sharpe 1990, Rajan 1992). Empirical evidence in other countries is consistent with the findings of this paper (Weinstein and Yafeh 1998).

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Tables and Figures

Chapter 2
Tables

Table 2.1. Summary of findings in empirical papers

					Interest Rate					Availability					Collateral					Maturity		
Paper	**Country**	**Year**	**Dataset**	**N**	Duration	N.Banks	Scope	Competition	Trust	Duration	N.Banks	Scope	Competition	Trust	Duration	N.Banks	Scope	Competition	Trust	Duration	N.Banks	Scope
Petersen and Rajan (1994)	US	1988	NSSBF	1389	no	+	no	no		+	–	+	–									
Berger and Udell (1995)	US	1988	NSSBF	219	–										–							
Angelini, Di Salvo and Ferri (1998)	Italy	1995	survey	1095	+	–		no		+	–		no									
Elsas and Krahnen (1998)	Germany	1992-97	credit register	200	no			no	no					+								
Harhoff and Körting (1998)	Germany	1997	survey	1509	no	no			–	no	–			no	–	+			–			
Cole (1998)	US	1993	NSSBF	2007						no	–	+										
D'Auria, Foglia and Marullo (1999)	Italy	1987-94	credit register	2300	+	–		–	–													
Dennis, Nandy and Sharpe (2000)			Dealscan	2634	+																	
Degryse and Van Cayseele (2000)	Belgium	1997	credit register	17776	+		–								–		+					
Machauer and Weber (2000)	Germany	1992-96	credit register	260		no			no		–			–		–			–			
Lehmann and Neuberger (2001)	Germany	1997	bank survey	389	no				–	+				+	–				no			
Chakraborty, Fernando and Mallick (2002)	US	1993	NSSBF	226						+		+			–	–						
Cosci and Meliciani (2002)	Italy	1997	credit register	393		no					+											
Bodenhorn (2003)	US	1855	loan records	2616	–										–							
Athavale and Edmister (2004)	US	1990-96	credit register	3388	–																	
De Bodt, Lobez and Statnik (2005)	Belgium	2000	survey	296						+	–											
Cardone, Casasola and Samartín (2005)	Spain	2000	survey	386	no	no	–			+	+	no			no	no	–			+	no	–
Ortiz-Molina and Penas (2005)	US	1993	NSSBF	995																no	no	no
Hanley and Crook (2005)	UK	1998-99	credit register	1409	+																	
Brick and Palia (2005)	US	1993	NSSBF	766	–					–												
Hernández and Martínez (2006)	Spain	1999	SABI+survey	153	no	+			–						+	no			+			
Chakraborty and Hu (2006)	US	1993	NSSBF	1632											–	–						

This table summarizes the main findings in the empirical relationship lending literature. ***N*** is the sample size of the dataset. ***Year*** is the year of collection of the data. ***N.Banks*** is the number of bank relationships. We report the sign of the effect of the relationship lending measures on loan contract terms (+, – or no effect). For example, Petersen and Rajan (1994) do not find a significant effect of relationship duration on interest rate.

Chapter 3
Tables

Table 3.1. Definition of variables

Variable	Description	Mean	SD
Interest rate	Annual rate of interest quoted on firm's most recent loan	11.1	2.32
Trade credit discounts	Percent of trade credit discounts offered that were taken	64.09	41.9
Trade credit paid late	Percent of trade credit payments made after the due date	22.43	23.4
Firm age	Years under the current ownership	13.01	11.4
Assets	Book value of total assets ($1000)	1220	3510
Log(assets)	Log of book value of total assets	12.43	1.73
Firm is a corporation (0,1)	1 if S-corporation or corporation and 0 if proprietorship or partnership	0.59	0.49
Located in MSA county (0,1)	1 if located in Metropolitan Statistical Area (urban)	0.41	0.49
Sales growth	Sales growth between 1986 and 1987	0.11	0.27
Operating profits over assets	Sales minus total expenses over assets	0.37	1.21
Profits over assets	Gross profit over total assets	1.40	1.34
Profit over interest expense	Gross profit over interest expense	59.6	88.5
Debt over assets	Total liabilities over total assets	0.36	0.27
Debt from close institutions	Fraction of institutional debt borrowed from close institutions (provide another financial service)	0.63	0.43
Length relationship	Years dealing with the bank granting the most recent loan	10.29	11.6
Longest length	Longest length with a financial institution (years)	13.7	13.4
Number of lenders	Number of institutions that lend to the firm at least 10% of the firm's institutional debt	0.89	0.84
Floating rate loan (0,1)	1 if interest rate on most recent loan is variable	0.42	0.49
Loan is from a bank (0,1)	1 if most recent loan is from a commercial bank, saving and loan association, savings bank or credit union	0.84	0.37
Loan is from a nonfinancial firm (0,1)	1 if most recent loan is from a venture capital firm, other business firm, Small Business Administration, other government agency, American Express	0.03	0.18
Prime rate	Rate at the time the loan was made	9.15	1.93
Term structure spread	Difference between the ten-year government bond yield and the three-month T-bill yield at the time the loan was made	1.34	1.31
Default spread	Difference between the BAA corporate bond yield and the ten-year government bond yield at the time the loan was made	2.22	0.41
Sic1 (0,1)	1 if firm's principal activity is Mining	0.01	0.1
Sic2 (0,1)	1 if firm's principal activity is Construction	0.13	0.33
Sic3 (0,1)	1 if firm's principal activity is Manufacturing	0.13	0.34
Sic4 (0,1)	1 if firm's principal activity is Transportation, communication and public utilities	0.03	0.18
Sic5 (0,1)	1 if firm's principal activity is Wholesale trade	0.11	0.31
Sic6 (0,1)	1 if firm's principal activity is Retail trade	0.28	0.45
Sic7 (0,1)	1 if firm's principal activity is Insurance and real state	0.06	0.24
Sic8 (0,1)	1 if firm's principal activity is Services	0.25	0.43
Region1 (0,1)	1 if census region of firm's headquartes office is Northeast	0.25	0.43
Region2 (0,1)	1 if census region of firm's headquartes office is North Central	0.28	0.45
Region3 (0,1)	1 if census region of firm's headquartes office is South	0.28	0.45
Region4 (0,1)	1 if census region of firm's headquartes office is West	0.19	0.39
Collateral1 (0,1)	1 if collateral is Inventory or accounts receivable	0.75	0.44
Collateral2 (0,1)	1 if collateral is Equipment	0.50	0.50
Collateral3 (0,1)	1 if collateral is Business securities or deposits	0.01	0.10
Collateral4 (0,1)	1 if collateral is Business real estate	0.23	0.42
Collateral5 (0,1)	1 if collateral is Personal real estate	0.05	0.21
Collateral6 (0,1)	1 if collateral is Other personal assets	0.04	0.20
Collateral7 (0,1)	1 if collateral is Other assets	0.02	0.13

This table contains the definition of the variables in the 1988 NSSBF. We report the mean and the standard deviation of each variable.

Table 3.2. Summary statistics of firms classified by age, banking market structure and number of lenders

Panel A. Mean		Assets (book value in $1000)	Operating profits over assets	Sales growth	Debt over assets	Trade credit discounts	Trade credit paid late	N
Young firms								
Competitive market	One Lender	590	1.66	0.09	0.73	58	26	24
	More Lenders	1407	1.49	0.17	0.52	45	32	34
Concentrated market	One Lender	338	1.44	0.13	0.63	63	23	182
	More Lenders	974	1.37	0.15	0.72	55	27	260
Old firms								
Competitive market	One Lender	1405	1.04	0.09	0.49	75	16	13
	More Lenders	1852	1.62	0.07	0.56	60	17	30
Concentrated market	One Lender	524	1.14	0.07	0.49	77	17	131
	More Lenders	1891	1.35	0.12	0.56	72	21	250
Panel B. Median								
Young firms								
Competitive market	One Lender	156	1.21	0.09	0.68	93	19	24
	More Lenders	187	1.35	0.14	0.57	40	30	34
Concentrated market	One Lender	89	0.91	0.06	0.57	90	15	182
	More Lenders	178	0.94	0.1	0.69	55	20	260
Old firms								
Competitive market	One Lender	400	0.89	0.1	0.28	100	10	13
	More Lenders	315	1.26	0.06	0.57	100	13	30
Concentrated market	One Lender	156	0.85	0.03	0.44	100	10	131
	More Lenders	378	0.85	0.08	0.53	98	10	250

Young firms are less or equal than ten years old. Old firms are more than ten years old. The most competitive markets are those with a commercial bank deposit Herfindahl index where the firm is located of more than 0.18. The most competitive markets are those with Herfindahl index of less than 0.10. “One lender” refers to those firms that obtained their most recent loan from the single bank they have a relationship. “More lenders” refers to those firms that are borrowing from more banks apart from the one granting the most recent loan. The number of firms in each category is reported in the last column (except for the trade credit variables that correspond to a different sample)

Table 3.3. Availability of credit by banking market structure and number of lenders

Independent Variables	I	II	III	IV
Firm characteristics				
Log(assets)	6.200	6.203	6.494	6.402
	[3.46]***	[3.47]***	[3.59]***	[3.53]***
Operating profits over assets	5.548	5.247	5.116	5.056
	[2.27]**	[2.17]**	[2.12]**	[2.09]**
Firm is a corporation (0,1)	- 5.418	- 4.852	- 4.136	- 4.296
	[0.87]	[0.78]	[0.66]	[0.69]
Located in MSA county (0,1)	- 7.694	- 9.028	- 9.222	- 9.385
	[1.34]	[1.57]	[1.60]	[1.63]
Log(1+firm age)	8.831	9.225	9.005	9.106
	[2.36]**	[2.46]**	[2.40]**	[2.42]**
Relationship characteristics				
Debt from close institutions	2.634	3.211	4.624	4.806
	[0.42]	[0.52]	[0.76]	[0.79]
Log (longest length)	14.475	14.591	14.635	
	[4.07]***	[4.11]***	[4.12]***	
Number of lenders	- 12.83	- 11.70		
	[3.23]***	[2.92]***		
Intercept by number of lenders & market structure				
Herfindahl >0.18 - Concentrated market (0,1)	14.05	16.80		
	[2.38]**	[2.78]***		
One lender & competitive market (0,1)		26.66	35.23	82.94
		[2.07]**	[1.95]*	[1.92]*
One lender & intermediate market (0,1)			11.33	44.04
			[0.75]	[1.11]
One lender & concentrated market (0,1)			27.54	48.83
			[1.87]*	[1.31]
More lenders & intermediate market (0,1)			- 6.037	17.97
			[0.40]	[0.44]
More lenders & concentrated market (0,1)			11.00	42.89
			[0.75]	[1.13]
Slope by number of lenders & market structure				
Log(length) if one lender & competitive market				4.244
				[0.38]
Log(length) if one lender & intermediate market				12.30
				[1.65]
Log(length) if one lender & concentrated market				17.33
				[3.28]***
Log(length) if more lenders & competitive market				28.03
				[1.74]*
Log(length) if more lenders & intermediate market				16.15
				[1.92]*
Log(length) if more lenders & concentrated market				12.74
				[2.28]**
Constant	- 96.55	- 102.71	- 127.76	- 153.91
	[2.78]***	[2.95]***	[3.41]***	[3.13]***
Observations	1321	1321	1321	1321
R-squared	0.18	0.19	0.36	0.14

The dependent variable is the percent of trade credit cash discounts offered to the firm that were taken. The coefficient estimates are from a tobit regression with two-sided censoring, at zero and 100 percent. The regression also includes seven industry dummies, three regional dummies and a constant. Absolute value t-statistics in brackets. * significant at 10%; ** significant at 5%; ***

Table 3.4. Summary statistics of loan characteristics by firm age, banking market structure and number of lenders

Panel A. Mean

Young firms		Interest rate	Floating rate (0,1)	Collateral (0,1)	Maturity (months)	Loan amount ($1000)	Loan amount over debt before loan	Length of relationship	N
Competitive market	One Lender	11.36	0.38	0.88	81	110	0.80	6.2	24
	More Lenders	11.66	0.44	0.85	54	139	1.53	5.4	34
Concentrated market	One Lender	11.66	0.42	0.85	65	146	1.74	7.4	182
	More Lenders	11.27	0.41	0.86	60	259	1.10	6.5	260
Old firms									
Competitive market	One Lender	11.17	0.31	0.85	73	335	1.59	15.7	13
	More Lenders	10.25	0.43	0.90	64	385	1.62	13.1	30
Concentrated market	One Lender	11.20	0.40	0.78	60	215	1.66	16.4	131
	More Lenders	10.93	0.44	0.80	61	549	1.76	14.2	250

Panel B. Median

Young firms									
Competitive market	One Lender	11.50	0	1.00	48	34	0.45	5.0	24
	More Lenders	11.25	0	1.00	48	38	1.00	3.0	34
Concentrated market	One Lender	11.50	0	1.00	48	25	1.11	5.0	182
	More Lenders	11.00	0	1.00	48	25	0.45	4.0	260
Old firms									
Competitive market	One Lender	11.00	0	1.00	36	75	1.33	10.0	13
	More Lenders	10.50	0	1.00	36	24	0.47	13.5	30
Concentrated market	One Lender	11.00	0	1.00	36	25	1.07	15.0	131
	More Lenders	10.88	0	1.00	36	50	0.46	11.0	250

Young firms are less or equal than ten years old. Old firms are more than ten years old. The most competitive markets are those with a commercial bank deposit Herfindahl index where the firm is located of more than 0.18. The most competitive markets are those with Herfindahl index of less than 0.10. “One lender” refers to those firms that obtained their most recent loan from the single bank they have a relationship. “More lenders” refers to those firms that are borrowing from more banks apart from the one granting the most recent loan. The number of firms in each category is reported in the last column.

Table 3.5. Evolution of the loan interest rate by banking market structure and number of lenders

Independent variables	I	II	III	IV	V	VI	VII
Firm characteristics							
Log(assets)	- 0.226	- 0.219	- 0.256	- 0.249	- 0.223	- 0.220	- 0.219
	[5.14]***	[4.98]***	[5.65]***	[5.50]***	[5.07]***	[4.86]***	[4.84]***
Debt over assets	0.190	0.177	0.033	0.021	0.176	0.190	0.211
	[0.81]	[0.75]	[0.14]	[0.09]	[0.75]	[0.80]	[0.89]
Firm is a corporation (0,1)	- 0.321	- 0.327	- 0.340	- 0.346	- 0.312	- 0.316	- 0.311
	[2.28]**	[2.33]**	[2.42]**	[2.47]**	[2.20]**	[2.24]**	[2.20]**
Located in MSA county (0,1)	- 0.217	- 0.097	- 0.192	- 0.074	- 0.108	- 0.112	- 0.095
	[1.74]*	[0.71]	[1.54]	[0.54]	[0.79]	[0.82]	[0.70]
Log(1+firm age)	- 0.204	- 0.201	- 0.218	- 0.214		- 0.198	
	[2.52]**	[2.48]**	[2.68]***	[2.65]***		[2.42]**	
Interest rate variables							
Floating rate loan (0,1)	0.184	0.188	0.188	0.192	0.174	0.187	0.163
	[0.72]	[0.74]	[0.74]	[0.76]	[0.69]	[0.74]	[0.64]
Prime rate	0.307	0.313	0.314	0.319	0.313	0.314	0.315
	[9.57]***	[9.73]***	[9.76]***	[9.92]***	[9.72]***	[9.73]***	[9.74]***
Term structure spread	0.243	0.242	0.243	0.243	0.239	0.241	0.234
	[2.57]**	[2.58]**	[2.59]***	[2.59]***	[2.54]**	[2.56]**	[2.48]**
Default spread	0.341	0.329	0.343	0.331	0.333	0.329	0.328
	[2.27]**	[2.19]**	[2.29]**	[2.21]**	[2.22]**	[2.19]**	[2.18]**
Relationship characteristics							
Loan is from a bank (0,1)	0.454	0.430	0.482	0.458	0.420	0.416	0.424
	[2.37]**	[2.24]**	[2.52]**	[2.39]**	[2.19]**	[2.14]**	[2.18]**
Loan is from a nonfinancial firm (0,1)	- 0.811	- 0.791	- 0.830	- 0.810	- 0.793	- 0.794	- 0.793
	[2.13]**	[2.08]**	[2.19]**	[2.14]**	[2.09]**	[2.09]**	[2.08]**
Log(1+relationship length)	0.021	0.015	0.043	0.037	0.023	0.014	0.015
	[0.27]	[0.19]	[0.54]	[0.47]	[0.29]	[0.17]	[0.19]
Intercept by number of lenders & market structure							
Concentrated market (0,1)		0.316		0.313	- 0.575		
		[2.24]**		[2.22]**	[0.89]		
Intermediate market (0,1)					- 1.064		
					[1.53]		
One lender (0,1)			- 0.356	- 0.354			
			[2.68]***	[2.66]***			
One lender & intermediate market (0,1)						- 0.425	- 0.490
						[1.04]	[0.46]
One lender & concentrated market (0,1)						0.091	0.691
						[0.24]	[0.73]
More lenders & competitive market (0,1)						- 0.130	2.112
						[0.29]	[1.74]*
More lenders & intermediate market (0,1)						- 0.280	0.349
						[0.73]	[0.36]
More lenders & concentrated market (0,1)						0.010	0.478
						[0.03]	[0.52]
Slope by number of lenders & market structure							
Log(Age) in competitive market					- 0.499		
					[1.96]*		
Log(Age) in intermediate market					- 0.139		
					[1.01]		
Log(Age) in concentrated market					- 0.191		
					[1.96]*		
Log(Age) if one lender & competitive market							0.063
							[0.16]
Log(Age) if one lender & intermediate market							0.079
							[0.31]
Log(Age) if one lender & concentrated market							- 0.218
							[1.41]
Log(Age) if more lenders & competitive market							- 0.911
							[2.68]***
Log(Age) if more lenders & intermediate market							- 0.232
							[1.44]
Log(Age) if more lenders & concentrated market							- 0.163
							[1.38]
Observations	1294	1294	1294	1294	1294	1294	1294
R-squared	0.17	0.17	0.17	0.17	0.17	0.17	0.18

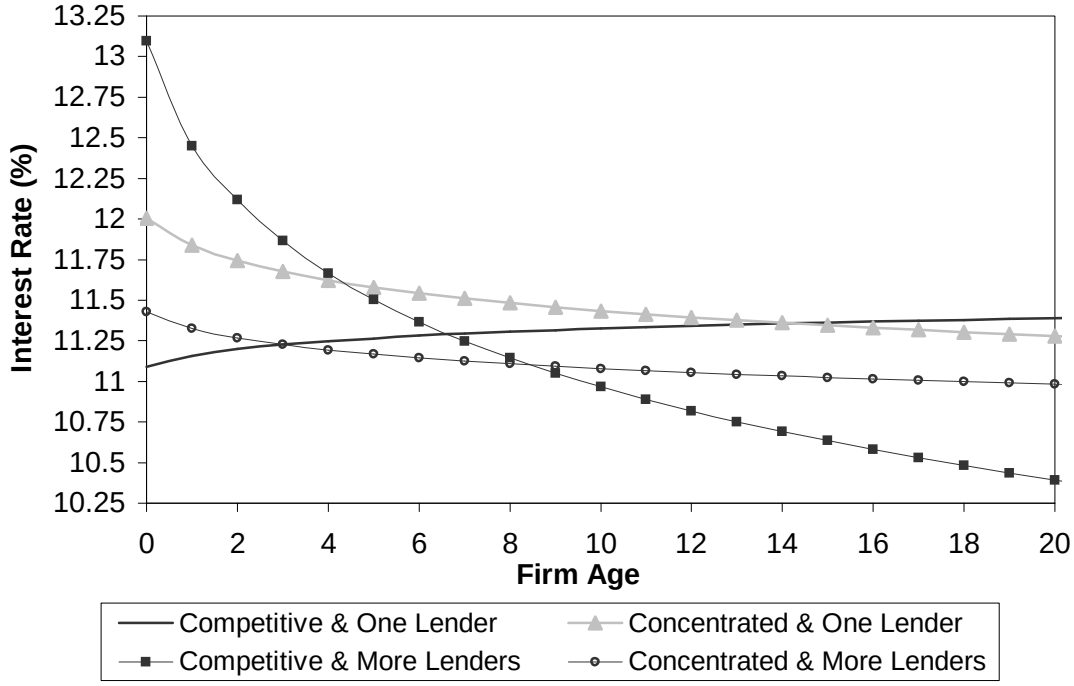
The dependent variable is the interest rate on the firm's most recent loan. The regressions also include seven industry dummies, three regional dummies, six dummy variables for the type of assets with which the loan is collateralized and an intercept. Absolute value t-statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3.6. Evolution of the loan interest rate by banking market structure and number of lenders
Robustness checks

Independent variables	I	II	III	IV	V
Firm characteristics					
Log(assets)	-0.183	-0.241	-0.260	-0.352	-0.258
	[2.36]**	[1.98]**	[5.85]***	[6.83]***	[3.42]***
Debt over assets	0.307	-0.054	0.165	-0.350	0.290
	[0.72]	[0.15]	[0.68]	[1.24]	[0.69]
Firm is a corporation (0,1)	-0.716	-0.453	-0.290	-0.084	-0.443
	[2.85]***	[2.22]**	[2.05]**	[0.53]	[1.79]*
Located in MSA county (0,1)	-0.346	0.068	-0.074	-0.060	0.271
	[1.48]	[0.32]	[0.53]	[0.38]	[1.16]
Interest rate variables					
Floating rate loan (0,1)	0.777	0.246	0.265	0.409	1.372
	[1.55]	[0.68]	[1.05]	[1.41]	[3.26]***
Prime rate	0.394	0.295	0.326	0.355	0.363
	[6.96]***	[6.27]***	[10.59]***	[10.34]***	[6.18]***
Term structure spread	0.579	0.164	0.274	0.292	0.651
	[2.88]***	[1.24]	[2.87]***	[2.69]***	[4.12]***
Default spread	0.263	0.438	0.305	0.340	0.584
	[1.05]	[1.87]*	[2.05]**	[2.05]**	[2.34]**
Relationship characteristics					
Loan is from a bank (0,1)	0.378	0.758		-0.299	1.028
	[0.71]	[2.43]**		[0.28]	[3.29]***
Loan is from a nonfinancial firm (0,1)	0.266	-0.209			1.104
	[0.21]	[0.38]			[1.61]
Log(1+relationship length)	-0.043	0.053	-0.002	0.031	0.066
	[0.34]	[0.40]	[0.03]	[0.32]	[0.54]
Intercept by number of lenders & market structure					
One lender & intermediate market (0,1)	-0.083	-0.209	-0.556	-1.119	-1.567
	[0.05]	[0.13]	[0.53]	[0.96]	[0.88]
One lender & concentrated market (0,1)	-0.349	1.216	0.869	0.940	0.448
	[0.27]	[0.86]	[0.95]	[0.92]	[0.27]
More lenders & competitive market (0,1)	1.455	2.936	1.737	2.600	1.760
	[0.68]	[1.53]	[1.47]	[1.88]*	[0.92]
More lenders & intermediate market (0,1)	-0.227	1.202	0.701	0.368	-0.503
	[0.17]	[0.81]	[0.74]	[0.33]	[0.31]
More lenders & concentrated market (0,1)	0.541	0.946	0.447	0.355	0.116
	[0.44]	[0.67]	[0.50]	[0.35]	[0.07]
Slope by number of lenders & market structure					
Log(Age) if one lender & competitive market	-0.203	0.061	-0.005	-0.110	-0.317
	[0.37]	[0.09]	[0.01]	[0.26]	[0.47]
Log(Age) if one lender & intermediate market	0.210	0.154	0.349	0.477	0.487
	[0.42]	[0.41]	[1.27]	[1.70]*	[1.12]
Log(Age) if one lender & concentrated market	0.063	-0.146	-0.169	-0.275	-0.301
	[0.25]	[0.65]	[1.11]	[1.75]*	[1.08]
Log(Age) if more lenders & competitive market	-0.792	-0.887	-0.691	-0.995	-1.207
	[1.05]	[1.50]	[2.08]**	[2.46]**	[2.43]**
Log(Age) if more lenders & intermediate market	-0.045	-0.525	-0.284	-0.196	-0.212
	[0.17]	[1.90]*	[1.68]*	[0.87]	[0.84]
Log(Age) if more lenders & concentrated market	-0.399	-0.088	-0.066	-0.090	-0.331
	[1.91]*	[0.46]	[0.57]	[0.61]	[1.76]*
Observations	355	653	1081	763	443
R-squared	0.32	0.15	0.23	0.27	0.28

The dependent variable is the interest rate on the firm's most recent loan. The regressions also include seven industry dummies, three regional dummies, six dummy variables for the type of assets with which the loan is collateralized and an intercept. Absolute value t-statistics in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 3.1. Predicted interest rate by banking market structure and number of lenders



The figure shows the predicted loan interest rate based on the estimates from column VII of table 3.5. All variables, except the firm's age and the dummies of market concentration and number of lenders, have been set to the conditional mean by number of lenders and banking market structure.

Chapter 4
Tables

Table 4.1. Definition of variables

Dependent Variables		**Mean**	**SD**
Cost of capital	Financial expenses over debt (in percentage points)	4.17	4.30
Bank credit/Liabilities	Bank credit over total liabilities	0.35	0.23
Short term bank credit/Bank credit	Short term bank credit over total bank credit	0.71	0.30
(I/K)t	Investment over capital	2.59	11.80
Bank Relationship Measures			
Number of banks	Number of banks (N)	1.95	1.34
One bank	1 if one bank (N=1), 0 otherwise (N>1)	0.51	0.50
Share by bank	Inverse of number of banks (1/N)	0.70	0.32
Banking Market Structure Variables			
Herfindahl or *HHI*	Herfindahl-Hirschman index of bank branch concentration, by province. Three dummy variables are constructed from based on HHI. By year, we compute the percentiles 33 and 66 of HHI.	1303	384
Competitive market	1 if firm is located in a province with HHI above the 66 percentile	0.63	0.48
Intermediate market	1 if firm is located in a province with HHI between 33 and 66 percentile	0.25	0.43
Concentrated market	1 if firm is located in a province with HHI below the 33 percentile	0.12	0.32
Density of bank branches	Total number of bank branches (commercial and saving banks), by province	2.11	1.93
Firm Characteristics			
Age	Number of years since firm was founded	12.34	10.23
Log (age)	Log of one plus age since firm was founded	8.13	0.90
Employees	Number of employees	23.50	29.26
Log (employees)	Log of number of employees	2.59	1.09
Log(asset)	Log of one plus total assets (book value)	13.96	1.28
Log(sales)	Log of one plus sales	14.40	1.18
Financial Characteristics			
Leverage	Liabilities over assets	70.44	23.42
Liquidity	Current assets over current liabilities	1.49	1.14
Tangibility	Fixed assets over assets	0.22	0.20
Free collateral	Fixed assets over liabilities	0.39	0.48
Activity	Inventory over assets	0.23	0.22
EBIT on assets	EBIT over assets	0.07	0.09
Altman Z-score	***ZA*** = 1.2 [working capital/assets] + 1.4 [retained earnings/assets] + 3.3 [EBIT/assets] + 0.6 [equity /liabilities] + 1 [sales/assets]	3.50	2.23
García Z-score	**ZG** = -0,835 + 0,950*[(receivable+cash)/ current liability]+ 0,272*[(fixed asset+ current asset)/(fixed liabilitiy+current liability)] – 11,848*[financial expense/sales] + 2,422*[annual depreciation/ (intangible fixed asset+tangible fixed asset)] + 6,976*[earnings before taxes/ total liabilities]	1.04	3.02
Cash / Capital	Cash flow over fixed assets	0.60	1.53
Sales / Capital	Sales over fixed assets	24.9	63.6
Control Variables			
Industry dummies	69 dummy varaibles for two-digit SIC codes		
Province dummies	52 dummy variables for each province		
Legal form dummies	4 dummies of legal form		
Year dummies	12 dummy variables for years 1993-2004		

This table contains the definition of the variables in the SABI dataset and the variables of the banking market structure, which are computed from the Annual Statistics of the Spanish Banking Association (AEB), the Annual Statistics of the Spanish Savings Banks Confederation (CECA) and the Bank of Spain Registry of Financial Entities (Renbe). We report the mean and the standard deviation of each variable (N=603,350).

Table 4.2. Descriptive statistics. Firm size and age by industry sector

Industry Sector	Number of firms	Number of obs	% firms	Assets (in €1000)		Age (in years)	
				mean	median	mean	median
Agriculture and forestry	885	6,902	1.2	2,837	1,493	13.1	11
Mining	382	3,274	0.5	4,236	2,043	16.5	13
Construction	8,334	66,846	11.3	2,136	890	10.6	9
Manufacturing	20,020	172,880	27.1	3,073	1,338	14.5	12
Transportation	3,341	26,629	4.5	3,000	1,328	13.3	10
Whole sale trade	20,973	171,516	28.4	2,104	1,026	11.6	10
Retail trade	6,845	52,218	9.3	1,257	628	10.3	9
Insurance and real state	2,357	18,629	3.2	6,101	3,327	11.7	9
Services	5,282	41,378	7.2	3,059	1,200	11.6	10
Non-classified	5,390	43,078	7.3	2,229	968	11.7	10
Total	**73,809**	**603,350**	**100**	**2,569**	**1,098**	**12.3**	**10**

This table contains the distribution of firms in the sample by the one-digit SIC code. We report the mean and the median of total assets and firm age. Dataset: SABI (1993-2004)

Table 4.3. Descriptive statistics. Firm size and legal form by industry sector

	Firm size			Firm legal form				
Industry Sector	**Micro Firm**	**Small Firm**	**Medium Firm**	**Joint Stock Company**	**Limited Liability**	**Partner ship**	**Total**	**%**
Agriculture and forestry	116	322	447	343	485	57	**885**	**1.2**
Mining	22	164	196	180	201	1	**382**	**0.5**
Construction	859	4,473	3,002	2,545	5,739	50	**8,334**	**11.3**
Manufacturing	1,623	10,855	7,542	9,229	10,632	159	**20,020**	**27.1**
Transportation	442	1,410	1,489	1,437	1,854	50	**3,341**	**4.5**
Whole sale trade	4,528	7,279	9,166	7,502	13,249	222	**20,973**	**28.4**
Retail trade	2,167	2,984	1,694	1,716	5,095	34	**6,845**	**9.3**
Insurance and real state	107	347	1,903	998	1,344	15	**2,357**	**3.2**
Services	725	2,116	2,441	2,403	2,822	57	**5,282**	**7.2**
Non-classified	872	2,553	1,965	1,779	3,534	77	**5,390**	**7.3**
Total	**11,461**	**32,503**	**29,845**	**28,132**	**44,955**	**722**	**73,809**	**100%**
%	**15.5**	**44.0**	**40.4**	**38.1**	**60.9**	**1.0**	**100%**	

This table contains the distribution of firms in the sample by size, legal form and the one-digit SIC code. Dataset: SABI (1993-2004)

Table 4.4. Number of bank relationships by age, size, leverage and industry

Panel A. Age	**Percentile**	**Number Obs**	**Mean**	**Median**	**% one bank**	**% two banks**	**% three banks**	**% 4-10 banks**
0-2 years	0-10	60421	1.58	1	0.63	0.23	0.09	0.05
3-5 years	10-25	90523	1.66	1	0.60	0.24	0.10	0.06
6-10 years	25-50	150781	1.80	1	0.55	0.25	0.12	0.08
11-16 years	50-75	150813	2.00	2	0.49	0.25	0.14	0.12
17-24 years	75-90	90474	2.27	2	0.42	0.24	0.15	0.18
more than 25 years	90-100	60338	2.57	2	0.36	0.24	0.16	0.24
Panel B. Assets (book value in €1000)								
less than 255	0-10	60336	1.46	1	0.68	0.22	0.07	0.03
255-497	10-25	90501	1.55	1	0.63	0.24	0.10	0.04
497-1098	25-50	150837	1.69	1	0.57	0.25	0.12	0.06
1098-2656	50-75	150837	1.92	2	0.49	0.26	0.14	0.10
2656-6413	75-90	90503	2.46	2	0.38	0.24	0.16	0.22
6413-43000	90-100	60336	3.03	3	0.29	0.21	0.16	0.34
Panel C. Size Categories								
Micro		154887	1.53	1	0.64	0.23	0.09	0.04
Small		302234	1.92	1	0.50	0.25	0.14	0.11
Medium		146229	2.46	2	0.40	0.23	0.15	0.22
Panel D. Leverage								
less than 36	0-10	60355	1.86	1	0.53	0.25	0.12	0.10
36-56	10-25	90461	1.99	2	0.50	0.25	0.13	0.12
56-74	25-50	150828	2.06	2	0.48	0.24	0.14	0.14
74-88	50-75	150837	2.02	2	0.50	0.24	0.13	0.13
88-96	75-90	90519	1.87	1	0.54	0.24	0.12	0.10
more than 96	90-100	60350	1.66	1	0.60	0.23	0.10	0.06
Panel E. Industry								
Agriculture and forestry		6902	1.86	1	0.54	0.25	0.11	0.10
Mining		3274	2.01	1	0.53	0.21	0.11	0.15
Construction		66846	1.88	1	0.53	0.24	0.12	0.10
Manufacturing		172880	2.16	2	0.45	0.25	0.15	0.15
Transportation&Communication		26629	1.94	1	0.53	0.23	0.12	0.12
Whole sale trade		171516	1.94	1	0.52	0.24	0.13	0.11
Retail trade		52218	1.64	1	0.60	0.24	0.10	0.05
Insurance and real state		18629	1.90	1	0.55	0.22	0.11	0.12
Services		41378	1.78	1	0.59	0.22	0.10	0.09
Non-classified		43078	1.86	1	0.52	0.26	0.12	0.10
Total		**603350**	**1.95**	**1**	**0.51**	**0.24**	**0.13**	**0.12**

This table contains the distribution of the number of banks by the percentiles of age, size, leverage, by size categories and by industry (one-digit SIC code). The percentiles are based on the entire sample (*N=603,350*). For instance, the first row of Panel A is based on the smallest 10 percent of firms (age of two or less years). In each row, we report the number of observations, the mean, the median and the proportion of observations with one bank, two banks, three banks or more than three banks. Dataset: SABI (1993-2004).

Table 4.5. Firm characteristics and lending relationships

	One Bank		Two Banks		Three Banks		4-10 Banks		All Firms	
Variables	**mean**	**med**	**mean**	**med**	**mean**	**med**	**mean**	**med**	**mean**	**med**
Age	10.8	9.0	12.3	10.0	14.0	12.0	17.4	15.0	**12.3**	**10.0**
Employees	18.5	11.0	22.6	14.0	27.6	17.0	42.4	29.0	**23.5**	**14.0**
Assets (1,000)	1842	838	2414	1105	3115	1455	5511	3418	**2569**	**1098**
Sales (1,000)	2568	1350	3308	1717	4208	2217	6991	4604	**3475**	**1709**
Leverage	71.1	75.2	70.0	73.9	69.9	73.2	68.9	72.1	**70.4**	**74.2**
Liquidity	1.5	1.2	1.5	1.2	1.5	1.2	1.4	1.2	**1.5**	**1.2**
Tangibility	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**0.2**	**0.2**
Activity	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**0.2**	**0.2**
EBIT on assets	4.6	3.4	4.6	3.4	4.6	3.4	4.4	3.2	**4.6**	**3.4**
Altman Z-score	3.6	3.3	3.5	3.2	3.4	3.2	3.1	2.9	**3.5**	**3.2**
García Z-score	1.1	0.8	1.0	0.8	1.0	0.8	0.9	0.7	**1.0**	**0.8**
Sales growth	22.9	9.8	20.1	9.1	17.7	8.5	15.3	7.9	**20.6**	**9.2**

This table reports the mean and the median of some variables where firms are classified by the number of bank relationhips – one bank, to banks, three banks and more than three banks. The last two columns report the statistics for the whole sample (*N=603,350*). Dataset: SABI (1993-2004).

Table 4.6. Summary statistics of cost of capital
Firms classified by age, market structure and number of bank relationships

	Young Firms		Old Firms	
	One Bank	**More Banks**	**One Bank**	**More Banks**
Most Competitive Market	3.91	4.59	4.10	4.39
	2.65	3.46	2.95	3.40
	4.48	4.55	4.44	4.15
	111999	78640	83904	103112
Middle Market	3.80	4.44	3.83	4.04
	2.73	3.40	2.81	3.14
	4.16	4.29	4.10	3.81
	42817	33145	30715	41355
Most Concentrated Market	3.93	4.57	4.00	4.34
	2.86	3.53	2.94	3.34
	4.14	4.20	4.18	4.05
	20904	15860	14017	18552

The mean, median, standard deviation and number of observations for the variable cost of capital is reported in each cell. Young firms are less or equal than ten years old. Old firms are more than ten years old. The degree of concentration in the banking market is defined by the Herfindahl index of bank branch concentration in the province where the firm is located. We construct three dummy variables based on the Herfindahl index. In a given year, we compute the percentile 33 and percentile 66 of the Herfindahl index of banking market concentration in the 52 Spanish provinces. Then, we classify the provinces below the 33 percentile as the less concentrated markets, provinces with an index between 33 and 66 percentile as intermediate markets and provinces above the 66 percentile as the most concentrated markets.“One bank” refers to those firms that have a single bank relationship. “More banks” is for those firms that have more than one bank relationship (N=603,350). Dataset: SABI (1993-2004).

Table 4.7. Regression analysis of the cost of capital (I)

Sample:	**All Firms**	**Micro**	**Small**	**Medium**
Number Banks	0.065	– 0.188	0.092	0.079
	[2.49]**	[1.67]*	[2.23]**	[2.11]**
Herfindahl	3.578	– 0.894	4.424	3.291
	[6.34]***	[0.57]	[5.26]***	[2.88]***
Herfindahl*NBanks	– 0.364	1.111	– 0.594	– 0.558
	[1.95]*	[1.41]	[2.00]**	[2.07]**
Log(1+Age)	1.393	1.409	1.411	1.003
	[86.02]***	[42.86]***	[50.33]***	[25.92]***
Log employees	0.170	0.126	0.152	0.181
	[14.43]***	[4.26]***	[5.48]***	[8.11]***
Log(1+Assets)	– 1.600	– 2.111	– 2.175	– 1.087
	[112.80]***	[63.33]***	[88.27]***	[38.50]***
Log(1+Sales)	0.689	1.094	0.988	0.379
	[62.76]***	[39.72]***	[47.25]***	[24.39]***
Leverage	0.011	0.010	0.009	0.004
	[21.74]***	[9.50]***	[12.10]***	[3.99]***
Liquidity	0.356	0.475	0.397	0.226
	[50.30]***	[30.12]***	[35.25]***	[18.86]***
Free Collateral	1.626	2.074	1.721	0.955
	[78.16]***	[42.85]***	[57.03]***	[23.29]***
Activity	1.885	1.578	2.446	1.115
	[47.91]***	[20.74]***	[41.03]***	[12.42]***
EBIT on Assets	7.397	7.798	8.278	4.443
	[116.41]***	[63.42]***	[87.25]***	[31.71]***
Z Score Altman	0.048	– 0.005	– 0.058	0.099
	[11.51]***	[0.58]	[7.63]***	[13.63]***
Constant	5.308	6.243	9.111	6.947
	[28.36]***	[15.53]***	[28.52]***	[14.70]***
Observations	510840	134881	261147	114812
Number of Firms	66451	29770	44837	25850
R-squared	0.25	0.21	0.28	0.21

The dependent variable is the average cost of capital. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004).
*significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.8. Regression analysis of the cost of capital (II)

	All Firms	Micro	Small	Medium
One Bank	– 0.125	0.166	– 0.189	– 0.285
	[1.75]*	[0.84]	[1.84]*	[2.08]**
Herfindahl	2.541	1.418	2.657	1.274
	[5.15]***	[1.08]	[3.77]***	[1.33]
Herfindahl*OneBank	0.633	– 0.962	1.260	1.548
	[1.24]	[0.70]	[1.73]*	[1.54]
Log(1+Age)	1.393	1.409	1.411	1.001
	[86.01]***	[42.86]***	[50.33]***	[25.88]***
Log employees	0.170	0.126	0.152	0.180
	[14.43]***	[4.26]***	[5.49]***	[8.08]***
Log(1+Assets)	– 1.599	– 2.112	– 2.175	– 1.088
	[112.79]***	[63.34]***	[88.26]***	[38.56]***
Log(1+Sales)	0.689	1.094	0.988	0.379
	[62.78]***	[39.72]***	[47.26]***	[24.40]***
Leverage	0.011	0.010	0.009	0.004
	[21.75]***	[9.51]***	[12.10]***	[3.99]***
Liquidity	0.356	0.475	0.397	0.226
	[50.30]***	[30.13]***	[35.24]***	[18.86]***
Free Collateral	1.626	2.074	1.721	0.955
	[78.15]***	[42.85]***	[57.03]***	[23.28]***
Activity	1.885	1.578	2.446	1.115
	[47.91]***	[20.74]***	[41.03]***	[12.43]***
EBIT on Assets	7.396	7.799	8.278	4.442
	[116.40]***	[63.43]***	[87.26]***	[31.70]***
Z Score Altman	0.048	– 0.005	– 0.058	0.099
	[11.52]***	[0.58]	[7.63]***	[13.63]***
Constant	5.493	5.853	9.375	7.286
	[29.67]***	[15.15]***	[29.76]***	[15.53]***
Observations	510840	134881	261147	114812
Number of Firms	66451	29770	44837	25850
R–squared	0.25	0.21	0.28	0.21

The dependent variable is the average cost of capital. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004).
*significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.9. Regression analysis of the cost of capital (III)

	All Firms	**Micro**	**Small**	**Medium**
Share by Bank	– 0.266	0.357	– 0.385	– 0.502
	[2.32]**	[1.04]	[2.31]**	[2.45]**
Herfindahl	1.940	2.601	1.616	0.040
	[2.75]***	[1.22]	[1.59]	[0.03]
Herfindahl*Share by Bank	1.323	– 2.261	2.400	3.102
	[1.62]	[0.95]	[2.03]**	[2.07]**
Log(1+Age)	1.393	1.409	1.411	1.002
	[86.02]***	[42.86]***	[50.34]***	[25.89]***
Log employees	0.170	0.126	0.152	0.180
	[14.42]***	[4.26]***	[5.48]***	[8.08]***
Log(1+Assets)	– 1.600	– 2.112	– 2.175	– 1.088
	[112.81]***	[63.34]***	[88.27]***	[38.55]***
Log(1+Sales)	0.689	1.094	0.988	0.379
	[62.77]***	[39.72]***	[47.25]***	[24.39]***
Leverage	0.011	0.010	0.009	0.004
	[21.75]***	[9.51]***	[12.11]***	[3.99]***
Liquidity	0.356	0.475	0.397	0.226
	[50.30]***	[30.13]***	[35.25]***	[18.86]***
Free Collateral	1.626	2.074	1.721	0.955
	[78.16]***	[42.85]***	[57.04]***	[23.29]***
Activity	1.885	1.578	2.446	1.115
	[47.91]***	[20.74]***	[41.03]***	[12.42]***
EBIT on Assets	7.397	7.799	8.278	4.443
	[116.41]***	[63.43]***	[87.26]***	[31.71]***
Z Score Altman	0.048	– 0.005	– 0.058	0.099
	[11.51]***	[0.58]	[7.63]***	[13.62]***
Constant	5.621	5.674	9.554	7.476
	[28.21]***	[12.42]***	[28.73]***	[15.43]***
Observations	510840	134881	261147	114812
Number of Firms	66451	29770	44837	25850
R–squared	0.25	0.21	0.28	0.21

The dependent variable is the average cost of capital. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004).
*significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.10. Regression analysis of the availability of bank credit and the term of credit (I)

Dependent Var:	**Bank Credit Total Liabilities**				**Short Term Bank Credit Total Bank Credit**			
Sample:	**All Firms**	**Micro**	**Small**	**Medium**	**All Firms**	**Micro**	**Small**	**Medium**
Number Banks	0.003	0.011	0.004	0.004	0.000	0.015	0.000	0.000
	[3.12]***	[0.12]	[1.55]	[2.86]***	[0.20]	[0.06]	[0.12]	[0.11]
Herfindhal	– 0.053	– 0.907	0.214	– 0.097	0.371	– 8.157	– 0.099	0.602
	[0.37]	[0.26]	[0.68]	[0.57]	[1.70]*	[0.47]	[0.20]	[2.35]**
Log(1+Age)	0.015	– 0.183	0.014	0.023	0.018	0.644	0.033	0.019
	[1.98]**	[1.08]	[0.62]	[2.53]**	[1.57]	[1.13]	[0.95]	[1.36]
Log employees	0.004	– 0.019	0.022	0.006	0.010	– 0.827	0.027	0.009
	[1.24]	[0.14]	[1.81]*	[1.73]*	[2.11]**	[1.24]	[1.41]	[1.61]
Log(1+Assets)	0.061	0.215	0.043	0.067	– 0.048	– 1.094	– 0.063	– 0.044
	[13.45]***	[1.74]	[3.72]***	[12.35]***	[6.86]***	[1.84]	[3.44]***	[5.31]***
Log(1+Sales)	– 0.028	0.003	– 0.029	– 0.024	0.012	0.130	0.007	0.007
	[7.53]***	[0.02]	[3.01]***	[5.46]***	[2.03]**	[0.27]	[0.43]	[1.07]
Leverage	0.002	0.001	0.002	0.002	– 0.004	– 0.009	– 0.004	– 0.004
	[10.11]***	[0.26]	[5.35]***	[8.49]***	[16.70]***	[0.58]	[6.71]***	[14.39]***
Liquidity	0.016	0.010	0.019	0.014	– 0.093	– 0.941	– 0.095	– 0.087
	[7.36]***	[0.40]	[3.49]***	[5.50]***	[25.86]***	[2.25]*	[10.55]***	[21.15]***
Free Collateral	0.007	0.876	0.016	0.009	– 0.121	– 3.060	– 0.123	– 0.121
	[1.07]	[2.81]**	[1.07]	[1.11]	[11.46]***	[2.63]**	[5.20]***	[9.61]***
Activity	– 0.089	– 0.227	– 0.066	– 0.099	0.133	– 2.208	0.096	0.126
	[6.37]***	[0.80]	[2.06]**	[6.00]***	[6.15]***	[1.12]	[1.89]*	[4.98]***
EBIT on Assets	– 0.114	0.059	– 0.069	– 0.122	– 0.226	1.275	– 0.187	– 0.250
	[6.23]***	[0.13]	[1.61]	[5.76]***	[8.06]***	[0.67]	[2.72]***	[7.72]***
Z Score Altman	– 0.006	– 0.010	– 0.008	– 0.005	0.010	– 0.047	0.012	0.009
	[5.73]***	[0.32]	[2.71]***	[4.90]***	[6.61]***	[0.25]	[2.67]***	[5.47]***
Constant	– 0.409	– 1.219	– 0.257	– 0.620	1.553	13.787	1.632	1.545
	[3.19]***	[0.78]	[0.83]	[4.31]***	[8.00]***	[1.65]	[3.63]***	[7.09]***
Observations	28690	83	7457	21150	27586	62	7069	20455
Number of Firms	9829	51	3478	7564	9536	40	3331	7377
R-squared	0.05	0.77	0.04	0.05	0.05	0.84	0.05	0.05

The dependent variable is specified in the first row. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004). *significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.11. Regression analysis of the availability of bank credit and the term of credit (II)

Dependent Var:	**Bank Credit Total Liabilities**				**Short Term Bank Credit Total Bank Credit**			
Sample:	**All Firms**	**Micro**	**Small**	**Medium**	**All Firms**	**Micro**	**Small**	**Medium**
One Bank	– 0.011		– 0.004	– 0.011	– 0.006		0.015	– 0.018
	[2.63]***		[0.41]	[2.04]**	[0.86]		[1.04]	[2.22]**
Herfindhal	– 0.053	– 0.804	0.206	– 0.097	0.373	– 7.748	– 0.108	0.607
	[0.37]	[0.24]	[0.66]	[0.57]	[1.71]*	[0.54]	[0.22]	[2.36]**
Log(1+Age)	0.015	– 0.189	0.015	0.024	0.017	0.631	0.034	0.017
	[2.02]**	[1.20]	[0.67]	[2.60]***	[1.53]	[1.31]	[0.96]	[1.25]
Log employees	0.004	– 0.021	0.022	0.006	0.010	– 0.837	0.027	0.009
	[1.25]	[0.16]	[1.82]*	[1.74]*	[2.10]**	[1.42]	[1.42]	[1.59]
Log(1+Assets)	0.062	0.219	0.043	0.067	– 0.048	– 1.076	– 0.063	– 0.045
	[13.57]***	[1.90]*	[3.75]***	[12.47]***	[6.89]***	[2.32]*	[3.47]***	[5.39]***
Log(1+Sales)	– 0.028	0.006	– 0.029	– 0.024	0.012	0.138	0.007	0.007
	[7.55]***	[0.04]	[2.99]***	[5.47]***	[2.02]**	[0.32]	[0.44]	[1.04]
Leverage	0.002	0.001	0.002	0.002	– 0.004	– 0.009	– 0.004	– 0.004
	[10.11]***	[0.24]	[5.33]***	[8.51]***	[16.69]***	[0.75]	[6.70]***	[14.36]***
Liquidity	0.016	0.010	0.019	0.014	– 0.093	– 0.944	– 0.095	– 0.087
	[7.36]***	[0.40]	[3.51]***	[5.50]***	[25.87]***	[2.46]**	[10.54]***	[21.16]***
Free Collateral	0.007	0.873	0.016	0.009	– 0.121	– 3.057	– 0.122	– 0.121
	[1.04]	[2.90]***	[1.06]	[1.10]	[11.47]***	[2.84]**	[5.16]***	[9.62]***
Activity	– 0.088	– 0.229	– 0.065	– 0.098	0.132	– 2.164	0.096	0.126
	[6.35]***	[0.83]	[2.04]**	[5.97]***	[6.14]***	[1.30]	[1.88]*	[4.97]***
EBIT on Assets	– 0.114	0.040	– 0.069	– 0.122	– 0.225	1.214	– 0.187	– 0.249
	[6.25]***	[0.10]	[1.61]	[5.76]***	[8.05]***	[0.85]	[2.72]***	[7.69]***
Z Score Altman	– 0.006	– 0.011	– 0.008	– 0.005	0.010	– 0.045	0.012	0.009
	[5.72]***	[0.34]	[2.74]***	[4.88]***	[6.61]***	[0.26]	[2.66]***	[5.47]***
Constant	– 0.406	– 1.176	– 0.262	– 0.619	1.562	13.560	1.625	1.572
	[3.17]***	[0.79]	[0.84]	[4.30]***	[8.04]***	[2.01]*	[3.62]***	[7.21]***
Observations	28690	83	7457	21150	27586	62	7069	20455
Number of Firms	9829	51	3478	7564	9536	40	3331	7377
R–squared	0.05		0.04	0.05	0.05			

The dependent variable is specified in the first row. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004). *significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.12. Regression analysis of the availability of bank credit and the term of credit (III)

Dependent Var:	**Bank Credit Total Liabilities**				**Short Term Bank Credit Total Bank Credit**			
Sample:	**All Firms**	**Micro**	**Small**	**Medium**	**All Firms**	**Micro**	**Small**	**Medium**
Share by Bank	– 0.020	– 0.134	– 0.015	– 0.020	– 0.004	– 0.177	0.021	– 0.017
	[3.15]***	[0.12]	[1.12]	[2.58]***	[0.45]	[0.06]	[0.99]	[1.40]
Herfindhal	– 0.052	– 0.907	0.211	– 0.096	0.372	– 8.157	– 0.112	0.606
	[0.36]	[0.26]	[0.68]	[0.57]	[1.70]*	[0.47]	[0.23]	[2.36]**
Log(1+Age)	0.015	– 0.183	0.015	0.023	0.017	0.644	0.034	0.017
	[1.97]**	[1.08]	[0.65]	[2.54]**	[1.54]	[1.13]	[0.97]	[1.27]
Log employees	0.004	– 0.019	0.022	0.006	0.010	– 0.827	0.027	0.009
	[1.24]	[0.14]	[1.82]*	[1.73]*	[2.11]**	[1.24]	[1.42]	[1.59]
Log(1+Assets)	0.061	0.215	0.043	0.067	– 0.048	– 1.094	– 0.063	– 0.045
	[13.51]***	[1.74]	[3.75]***	[12.41]***	[6.89]***	[1.84]	[3.46]***	[5.39]***
Log(1+Sales)	– 0.028	0.003	– 0.029	– 0.024	0.012	0.130	0.007	0.007
	[7.56]***	[0.02]	[3.01]***	[5.48]***	[2.02]**	[0.27]	[0.45]	[1.05]
Leverage	0.002	0.001	0.002	0.002	– 0.004	– 0.009	– 0.004	– 0.004
	[10.11]***	[0.26]	[5.34]***	[8.50]***	[16.69]***	[0.58]	[6.71]***	[14.38]***
Liquidity	0.016	0.010	0.019	0.014	– 0.093	– 0.941	– 0.095	– 0.087
	[7.35]***	[0.40]	[3.50]***	[5.50]***	[25.86]***	[2.25]*	[10.54]***	[21.16]***
Free Collateral	0.007	0.876	0.015	0.009	– 0.121	– 3.060	– 0.122	– 0.121
	[1.05]	[2.81]**	[1.05]	[1.10]	[11.46]***	[2.63]**	[5.17]***	[9.61]***
Activity	– 0.089	– 0.227	– 0.065	– 0.099	0.132	– 2.208	0.096	0.126
	[6.36]***	[0.80]	[2.04]**	[5.99]***	[6.14]***	[1.12]	[1.89]*	[4.97]***
EBIT on Assets	– 0.114	0.059	– 0.069	– 0.122	– 0.225	1.275	– 0.187	– 0.249
	[6.23]***	[0.13]	[1.61]	[5.75]***	[8.05]***	[0.67]	[2.72]***	[7.70]***
Z Score Altman	– 0.006	– 0.010	– 0.008	– 0.005	0.010	– 0.047	0.012	0.009
	[5.72]***	[0.32]	[2.72]***	[4.88]***	[6.61]***	[0.25]	[2.65]***	[5.47]***
Constant	– 0.391	– 1.042	– 0.249	– 0.603	1.561	13.944	1.612	1.573
	[3.04]***	[0.55]	[0.80]	[4.18]***	[8.02]***	[1.39]	[3.58]***	[7.20]***
Observations	28690	83	7457	21150	27586	62	7069	20455
Number of Firms	9829	51	3478	7564	9536	40	3331	7377
R–squared	0.05	0.77	0.04	0.05	0.05	0.84	0.05	0.05

The dependent variable is specified in the first row. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004). *significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.13. Regression analysis of the availability of bank credit and the term of credit (IV)
Interaction terms of the dummy variable *One Bank* with *Market Concentration* dummies

Dependent Var:	**Bank Credit Total Liabilities**				**Short Term Bank Credit Total Bank Credit**			
Sample:	**All Firms**	**Micro**	**Small**	**Medium**	**All Firms**	**Micro**	**Small**	**Medium**
OneBank*Competitive	– 0.008		– 0.006	– 0.006	– 0.010	0.093	0.015	– 0.022
	[1.51]		[0.60]	[0.92]	[1.29]	[0.38]	[0.87]	[2.41]**
OneBank*Intermediate	– 0.021	0.040	– 0.005	– 0.021	0.004		0.006	– 0.002
	[3.01]***	[0.50]	[0.35]	[2.55]**	[0.38]		[0.24]	[0.18]
OneBank*Concentrated	– 0.016		0.021	– 0.023	0.001		0.039	– 0.027
	[1.47]		[0.95]	[1.78]*	[0.06]		[1.12]	[1.36]
Log(1+Age)	0.015	– 0.174	0.015	0.024	0.017	0.625	0.034	0.017
	[2.03]**	[1.10]	[0.66]	[2.60]***	[1.50]	[1.22]	[0.97]	[1.21]
Log employees	0.004	– 0.039	0.021	0.006	0.010	– 0.689	0.026	0.008
	[1.27]	[0.29]	[1.77]*	[1.74]*	[2.10]**	[1.08]	[1.37]	[1.58]
Log(1+Assets)	0.062	0.242	0.043	0.067	– 0.048	– 1.065	– 0.063	– 0.045
	[13.59]***	[1.93]*	[3.72]***	[12.47]***	[6.91]***	[2.21]*	[3.47]***	[5.41]***
Log(1+Sales)	– 0.028	– 0.013	– 0.028	– 0.024	0.011	0.196	0.007	0.007
	[7.54]***	[0.08]	[2.95]***	[5.45]***	[1.99]**	[0.39]	[0.44]	[1.01]
Leverage	0.002	0.001	0.002	0.002	– 0.004	– 0.010	– 0.004	– 0.004
	[10.10]***	[0.23]	[5.33]***	[8.50]***	[16.65]***	[0.75]	[6.72]***	[14.27]***
Liquidity	0.016	0.006	0.019	0.014	– 0.093	– 0.944	– 0.095	– 0.087
	[7.37]***	[0.27]	[3.52]***	[5.52]***	[25.86]***	[2.33]*	[10.53]***	[21.18]***
Free Collateral	0.007	0.851	0.016	0.009	– 0.121	– 2.829	– 0.122	– 0.121
	[1.03]	[2.81]**	[1.10]	[1.08]	[11.45]***	[2.40]**	[5.15]***	[9.59]***
Activity	– 0.089	– 0.265	– 0.065	– 0.099	0.133	– 2.176	0.094	0.126
	[6.36]***	[1.05]	[2.05]**	[5.98]***	[6.16]***	[1.29]	[1.84]*	[4.98]***
EBIT on Assets	– 0.114	0.038	– 0.068	– 0.122	– 0.225	0.817	– 0.186	– 0.247
	[6.26]***	[0.10]	[1.59]	[5.77]***	[8.02]***	[0.49]	[2.71]***	[7.63]***
Z Score Altman	– 0.005	– 0.010	– 0.008	– 0.005	0.010	– 0.031	0.012	0.009
	[5.71]***	[0.33]	[2.75]***	[4.87]***	[6.60]***	[0.16]	[2.65]***	[5.47]***
Constant	– 0.415	– 1.404	– 0.231	– 0.634	1.618	11.127	1.616	1.663
	[3.28]***	[0.98]	[0.75]	[4.47]***	[8.45]***	[2.13]*	[3.63]***	[7.75]***
Observations	28690	83	7457	21150	27586	62	7069	20455
Number of Firms	9829	51	3478	7564	9536	40	3331	7377
R-squared	0.05	0.77	0.04	0.05	0.05	0.84	0.05	0.05

The dependent variable is specified in the first row. The regression is estimated with firm fixed effects. The regression also includes 12 year dummies. Absolute value of robust t–statistics in brackets. Dataset: SABI (1993–2004). *significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.14. Investment-cash flow sensitivities by number of banks and banking market structure (I)

	Less Concentrated Market		Intermediate Market		More Concentrated Market	
	One Bank	More Banks	One Bank	More Banks	One Bank	More Banks
(I/K)t-1	0.024	0.042	0.045	0.031	0.024	0.037
	[2.39]**	[3.56]***	[2.49]**	[1.60]	[0.90]	[1.13]
Cash/K	0.115	0.058	0.144	0.018	0.101	0.794
	[0.94]	[0.38]	[0.58]	[0.07]	[0.31]	[2.06]**
Sales/K	0.082	0.078	0.088	0.092	0.079	0.076
	[18.31]***	[13.69]***	[10.81]***	[10.12]***	[5.60]***	[4.82]***
Debt	− 0.185	− 0.183	− 0.197	− 0.162	− 0.162	− 0.135
	[23.12]***	[23.63]***	[13.65]***	[13.01]***	[10.83]***	[10.39]***
Constant	− 1.052	− 0.128	− 0.382	− 0.665	0.248	− 0.303
	[1.97]**	[0.35]	[3.26]***	[0.99]	[0.25]	[3.43]***
Observations	112851	112671	42042	46856	18800	20252
Number of firms	24420	22668	12063	12344	5780	5930
AR1 z-test	-25.426	-22.165	-12.918	-12.369	-7.125	-7.537
AR1 p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AR2 z-test	1.418	2.186	1.140	0.848	1.662	1.333
AR2 p-value	0.1561	0.0288	0.2543	0.3963	0.0966	0.1826
Sargan test	22.11	26.61	9.37	9.44	18.49	15.88
Sargan p	0.1397	0.0461	0.8069	0.894	0.2962	0.3209

The dependent variable is (I/K)t. Observations are classified in six subgroups by market concentration and number of bank relationships. The degree of concentration in the banking market is defined by the Herfindahl index of bank branch concentration in the province where the firm is located. We construct three dummy variables based on the Herfindahl index. In a given year, we compute the percentile 33 and percentile 66 of the Herfindahl index of banking market concentration in the 52 Spanish provinces. Then, we classify the provinces below the 33 percentile as the less concentrated markets, provinces with an index between 33 and 66 percentile as intermediate markets and provinces above the 66 percentile as the most concentrated markets."One bank" refers to those firms that have a single bank relationship. "More banks" is for those firms that have more than one bank relationship. Regressions estimated by GMM (Arellano and Bond 1991). The regressions also include 12 year dummies. Absolute value of robust t-statistics in brackets. Dataset: SABI (1993–2004).

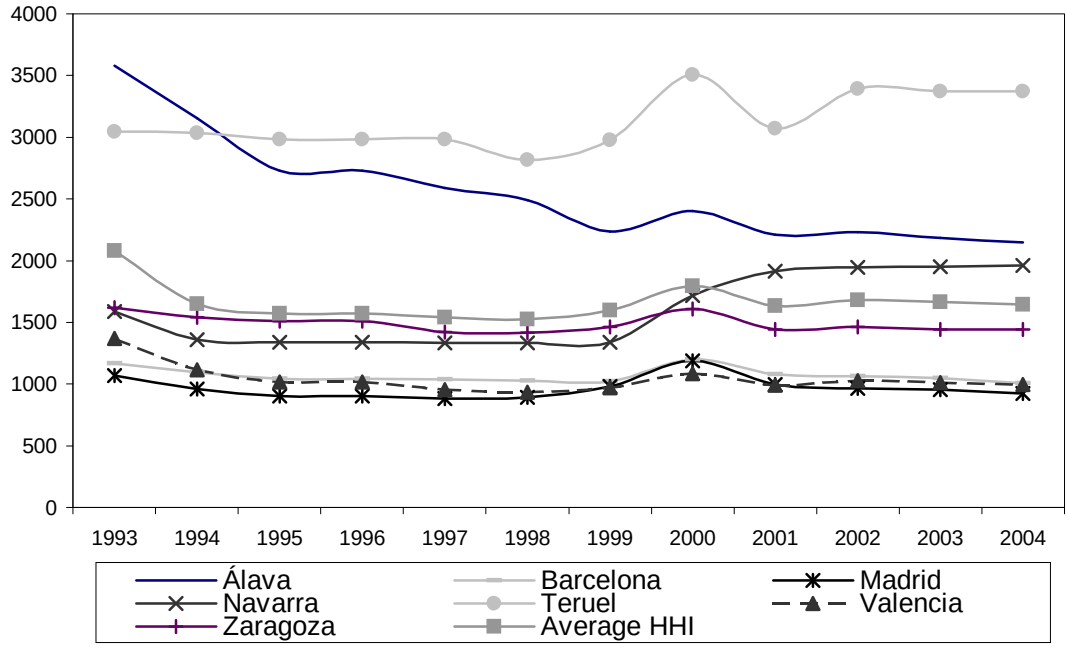
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4.15. Investment-cash flow sensitivities by number of banks and banking market structure (II)

Dependent Variable: (I/K)t	
(I/K)t-1	0.035
	[5.65]***
Sales/K	0.082
	[27.97]***
Debt	– 0.18
	[39.84]***
(Cash/K)*Competitive*One Bank	0.128
	[1.13]
(Cash/K)*Intermediate*One Bank	0.295
	[1.54]
(Cash/K)*Concentrated*One Bank	– 0.018
	[0.07]
(Cash/K)*Competitive*More Banks	0.003
	[0.03]
(Cash/K)*Intermediate*More Banks	0.097
	[0.49]
(Cash/K)*Concentrated*More Banks	0.535
	[1.80]*
Constant	– 0.145
	[0.66]
Observations	353472
Number of Firms	66219
AR1 z-test	-40.334
AR1 p-value	0.0000
AR2 z-test	3.568
AR2 p-value	0.0004
Sargan test	28.66
Sargan p	0.0263

The dependent variable is (I/K)t. Observations are classified in six subgroups by market concentration and number of bank relationships. The degree of concentration in the banking market is defined by the Herfindahl index of bank branch concentration in the province where the firm is located. We construct three dummy variables based on the Herfindahl index. In a given year, we compute the percentile 33 and percentile 66 of the Herfindahl index of banking market concentration in the 52 Spanish provinces. Then, we classify the provinces below the 33 percentile as the less concentrated markets, provinces with an index between 33 and 66 percentile as intermediate markets and provinces above the 66 percentile as the most concentrated markets.“One bank” refers to those firms that have a single bank relationship. “More banks” is for those firms that have more than one bank relationship. Regressions estimated by GMM (Arellano and Bond 1991). The regressions also include 12 year dummies. Absolute value of robust t-statistics in brackets. Dataset: SABI (1993–2004). * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 4.1. Evolution of the Herfindahl-Hirschman index during the sample period
Selection of provinces



The Herfindahl-Hirschman Index in province m and year t is $HHI_{t,m} = \Sigma_i (MS_{i,t,m})^2$ where $MS_{i,t,m}$ is the market share of the ith bank in the mth market at time t and market shares are calculated using regional bank branch distribution. This figure shows the evolution of the HHI during the sample period in some selected provinces and the simple average of HHI by province.

Figure 4.2. Percentage of firms by number of bank relationships in years 1994 and 2003

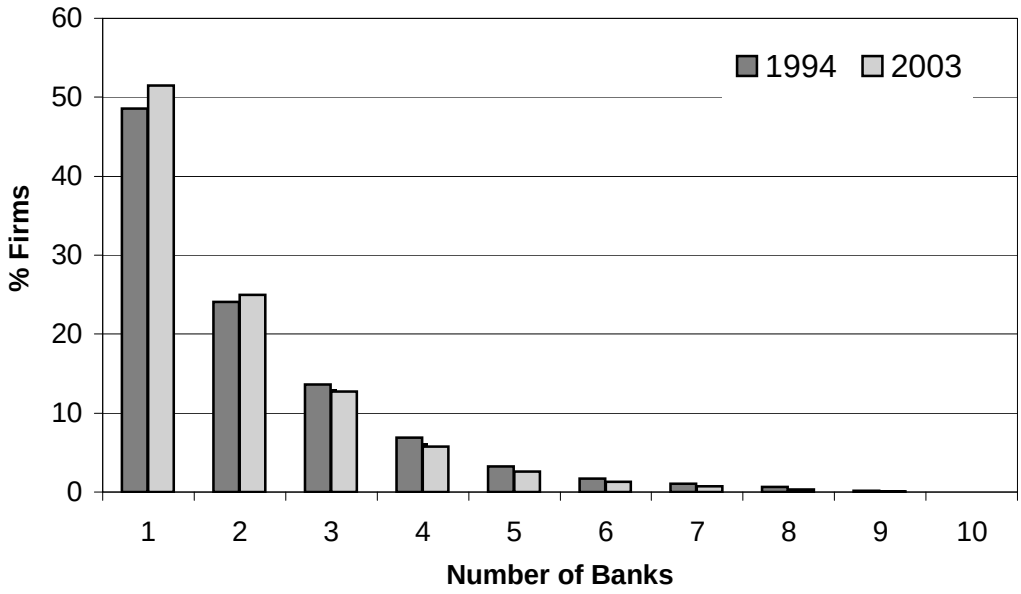
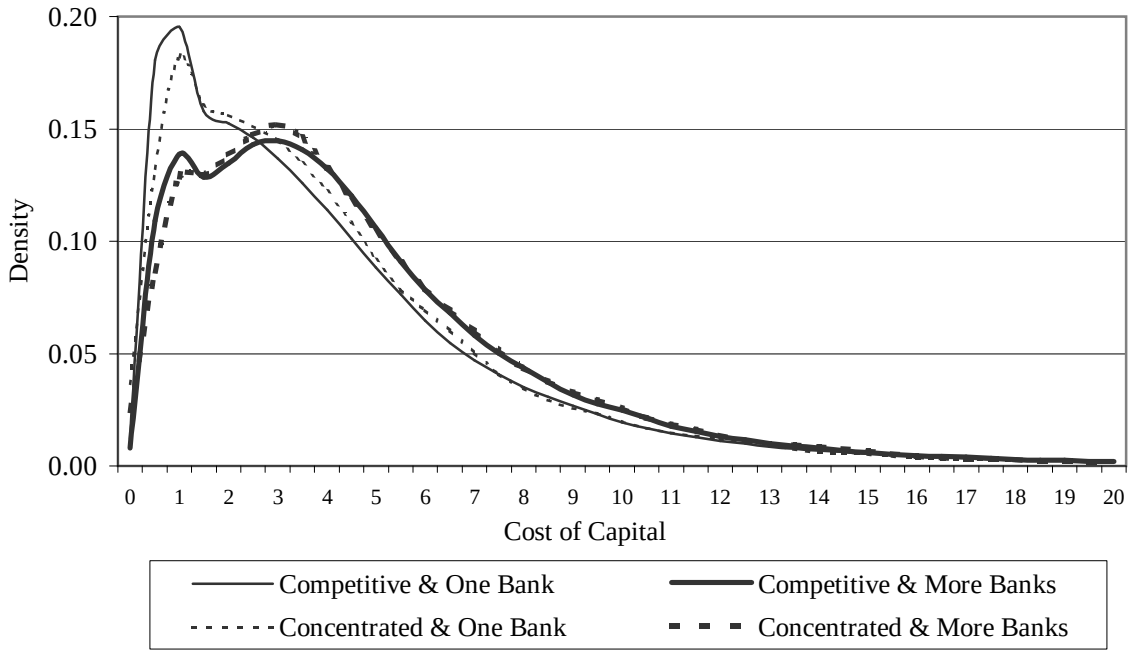


Figure 4.3. Kernel density of the cost of capital by number of banks and market structure



We plot kernel density estimates of the distribution of cost of capital for four subgroups in our sample by market concentration and number of bank relationships. The degree of concentration in the banking market is defined by the Herfindahl index of bank branch concentration in the province where the firm is located. We construct three dummy variables based on the Herfindahl index. In a given year, we compute the percentile 33 and percentile 66 of the Herfindahl index of banking market concentration in the 52 Spanish provinces. Then, we classify the provinces below the 33 percentile as the less concentrated markets, provinces with an index between 33 and 66 percentile as intermediate markets and provinces above the 66 percentile as the most concentrated markets.“One bank” refers to those firms that have a single bank relationship. “More banks” is for those firms that have more than one bank relationship.

Chapter 5
Tables

Table 5.1. Definition of variables

Firm Performance Measures		**Mean**	**SD**
Return on Total Assets	Earnings before taxes/Assets	4.60	9.13
Sales Growth	Sales(t+1)/Sales(t) -1	21.71	54.78
Economic Profitability	Earnings (after interest and taxes)/Asset	3.48	6.94
Financial Profitability	Earnings (after interest and taxes)/Shareholders funds	16.91	39.70
Return on Sharehd. Funds	Earnings (before interest and taxes)/Equity	21.18	51.45
Asset Turnover	Sales/Assets	1.96	1.32
Value Added Growth (*)	Value Added(t+1)/Value Added(t) -1	23.90	59.77
Instrumental Variables			
Herfindahl or *HHI*	Herhindahl index of bank branch concentration by province	1303	384
Bank Credit over Assets	Average (bank credit/asset) by industry (SIC-2)	0.20	0.05
Mergers	Number of mergers in province, from t-2 to t	4.33	3.70
Density of Bank Branches	Total number of bank branches (commercial and saving banks), by province	2.11	1.93

(*)Value Added = Operating Revenue - Cost of Goods Sold
This table contains the definition of the dependent variables and the instrumental variables used in this chapter. For definition of the explanatory variables see table 4.1 (N=549,657).

Table 5. 2. Mergers in Spain in years 1992-2004

YEAR	TARGET FINANCIAL INSTITUTION	ACQUIRING FINANCIAL INSTITUTION	N
2004	BANCO ATLANTICO	BANCO DE SABADELL	45
2004	BANCO DE VITORIA	BANCO ESPAÑOL DE CREDITO	5
2004	CREDIT LYONNAIS S.E.	CALYON, S.E.	1
2003	BANCO ZARAGOZANO	BARCLAYS BANK	28
2003	HSBC INVESTMENT BANK PLC. S.E.	HSBC BANK PLC, S.E.	1
2003	ACTIVOBANK	BANCO DE SABADELL	2
2003	BANCO DE ASTURIAS	BANCO DE SABADELL	2
2003	BANCO DEL DESARROLLO ECONOMICO ESPAÑOL	BANCO ESPAÑOL DE CREDITO	2
2003	BBVA PRIVANZA BANCO	BANCO BILBAO VIZCAYA ARGENTARIA	13
2002	BANCO DE EXTREMADURA	BANCO SIMEON	0
2002	BANCO DE MURCIA	BANCO DE VALENCIA	2
2002	BANCO HERRERO	BANCO DE SABADELL	24
2002	BANCO LUSO	BANCO SIMEON	1
2002	EUROHYPO A.G. EUROPAISCHE HYPOTHEKENBANK	EUROHYPO A.G., S.E.	1
2001	CAJA DE AHORROS Y PRESTAMOS DE CARLET	CJ AH. VALENCIA, CASTELLON Y ALICANTE, BANCAJA	1
2001	PROBANCA, SERVICIOS FINANCIEROS	SOCIEDAD ESPAÑOLA BANCA DE NEGOCIOS PROBANCA	1
2001	SOLBANK SBD	BANCO DE SABADELL	18
2000	CREDIT LYONNAIS ESPAÑA	CAJA DE AHORROS DE SALAMANCA Y SORIA	11
2000	BANCA CATALANA	BANCO BILBAO VIZCAYA ARGENTARIA	6
2000	BANCA JOVER	CAJA DE AHORROS Y M.P. DE MADRID	6
2000	BANCO DE ALICANTE	BANCO BILBAO VIZCAYA ARGENTARIA	5
2000	BANCO DEL COMERCIO	BANCO BILBAO VIZCAYA ARGENTARIA	50
2000	CAJA DE AHORROS PROVINCIAL DE PONTEVEDRA	CAIXA DE AFORROS DE VIGO, OURENSE E PONTEVEDRA	5
2000	CAJA AHORROS Y M.P. MUNICIPAL DE PAMPLONA	CAJA DE AHORROS Y M.P. DE NAVARRA	2
2000	BANCO DE NEGOCIOS ARGENTARIA	BANCO BILBAO VIZCAYA ARGENTARIA	1
1999	ARGENTARIA, CAJA POSTAL Y BANCO HIPOTECARIO	BANCO BILBAO VIZCAYA ARGENTARIA	52
1999	BANCO DIRECTO	BANCO DE NEGOCIOS ARGENTARIA	1
1999	CAJA DE AHORROS PROVINCIAL DE ORENSE	CAIXA DE AFORROS DE VIGO E OURENSE	5
1999	DEXIA BANCO LOCAL	BANCO DE CREDITO LOCAL DE ESPAÑA	1
1999	SINDICATO DE BANQUEROS DE BARCELONA	CJ AH. VALENCIA, CASTELLON Y ALICANTE, BANCAJA	7
1999	BANCO CENTRAL HISPANO	BANCO SANTANDER	52
1998	BANCO EXTERIOR DE ESPAÑA	ARGENTARIA, CAJA POSTAL Y BANCO HIPOTECARIO	52
1998	BANCO HIPOTECARIO DE ESPAÑA	ARGENTARIA, CAJA POSTAL Y BANCO HIPOTECARIO	46
1997	BANCO DE LA EXPORTACION	CAIXA D'ESTALVIS DE CATALUNYA	8
1997	CAIXABANK	CAJA DE AHORROS Y PENSIONES DE BARCELONA	3
1996	BANCO GRANADA JEREZ	CAJA DE AHORROS Y PENSIONES DE BARCELONA	10
1995	BANCO DE CREDITO AGRICOLA	ARGENTARIA, CAJA POSTAL Y BANCO HIPOTECARIO	21
1995	CAJA PROVINCIAL DE AHORROS DE CORDOBA	CAJA DE AHORROS Y MONTE DE PIEDAD DE CORDOBA	2
1994	BANCO DE CREDITO CANARIO (CANARIBANK)	BANCO BILBAO VIZCAYA ARGENTARIA	2
1994	BANCO DE JEREZ	BANCO GRANADA JEREZ	8
1994	BANCO MERIDIONAL	BANCO BILBAO VIZCAYA ARGENTARIA	11
1994	BANCO POPULAR INDUSTRIAL(EUROBANCO)	BANCO POPULAR ESPAÑOL	5
1994	CAJA DE AHORROS DE JEREZ DE LA FRONTERA	CAJA AH. PROV. SAN FERNANDO DE SEVILLA Y JEREZ	3
1993	CAJA DE AHORROS Y SOCORROS DE SAGUNTO	CJ AH. VALENCIA, CASTELLON Y ALICANTE, BANCAJA	1
1992	BANCO COMERCIAL ESPAÑOL	CREDIT LYONNAIS ESPAÑA	5
1992	CAJA DE AHORROS DE CUENCA Y CIUDAD REAL	CAJA DE AHORROS DE CASTILLA-LA MANCHA	7
1992	CAJA DE AHORROS PROVINCIAL DE ALBACETE	CAJA DE AHORROS DE CASTILLA-LA MANCHA	3
1992	CAJA AH PROVINCIAL DE ALICANTE Y VALENCIA	CAJA DE AHORROS DEL MEDITERRANEO	4
1992	CAJA DE AHORROS PROVINCIAL DE TOLEDO	CAJA DE AHORROS DE CASTILLA-LA MANCHA	6

This table resports the mergers that took place in Spain in period 1992-2004. In the last column, *N* indicates the number of provinces affected by each Merger/Acquisition

Table 5.3. GMM regressions of relation between firm performance and bank relationships

Dependent Variable:	**Return on Assets**			**Sales Growth**		
Independent Variables						
Number Banks	14.627			– 89.987		
	[3.73]**			[3.21]**		
One Bank		– 48.312			267.654	
		[3.49]**			[2.93]**	
Share by Bank			– 67.190			381.372
			[3.73]**			[3.19]**
Log employees	0.057	0.160	0.113	2.535	1.479	1.861
	[0.37]	[1.17]	[0.81]	[2.06]*	[1.48]	[1.80]
Log(1+Age)	1.880	1.766	1.812	– 81.661	– 80.882	– 81.223
	[29.99]**	[29.56]**	[31.67]**	[58.13]**	[56.33]**	[58.33]**
Leverage	– 0.230	– 0.224	– 0.226	0.405	0.359	0.374
	[75.02]**	[101.89]**	[95.17]**	[16.26]**	[22.01]**	[20.92]**
Liquidity	– 0.942	– 0.960	– 0.951	– 2.283	– 2.166	– 2.218
	[33.68]**	[33.71]**	[34.31]**	[9.15]**	[8.83]**	[9.20]**
Tangibility	– 8.589	– 8.900	– 8.764	– 32.037	– 29.485	– 30.546
	[48.03]**	[51.69]**	[52.87]**	[22.53]**	[22.11]**	[24.02]**
Activity	– 7.624	– 7.663	– 7.663	– 36.906	– 36.519	– 36.572
	[52.82]**	[49.18]**	[52.02]**	[29.09]**	[27.65]**	[28.81]**
Observations	519074	519074	519074	447423	447423	447423
Number of Firms	65825	65825	65825	63269	63269	63269
Excluded instr. F	11.765	8.115	11.186	9.508	7.512	10.344
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000	0.000
Partial R2	0.000	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	11.348	8.195	11.254	10.181	8.176	11.313
Anderson–Rubin F p	0.000	0.000	0.000	0.000	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.279	0.262	0.240	0.000	0.000	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. We use three variables as *Bank Relationship Measures*: *Number of Banks*, *One Bank* dummy variable (1 if one bank, and 0 if multiple banks), and *Share by Bank* (inverse of the number of banks). The *Bank Relationship Measure* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. The first stage regressions are reported in table 5.4. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported).

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.4. First stage regressions. Determinants of the bank relationship measures

Dependent Variable:	**Number Banks**	**One Bank**	**Share by Bank**
Excluded Instruments			
Bank Credit / Assets	0.103	– 0.026	– 0.019
(2–digit industry/year)	[5.12]**	[3.58]**	[4.34]**
Herfindhal	0.029	– 0.023	– 0.016
(province/year)	[0.44]	[1.00]	[1.11]
Merger	0.001	0.001	0.001
(province/year)	[2.92]**	[3.33]**	[3.78]**
Included Instruments			
Log employees	0.038	– 0.009	– 0.007
	[22.28]**	[15.46]**	[19.96]**
Log(1+Age)	– 0.007	0.000	0.000
	[3.10]**	[0.42]	[0.94]
Leverage	0.001	0.000	0.000
	[9.54]**	[2.88]**	[5.56]**
Liquidity	– 0.002	0.000	0.000
	[1.97]*	[0.60]	[1.34]
Tangibility	– 0.020	– 0.001	0.002
	[3.06]**	[0.30]	[1.13]
Activity	0.000	– 0.001	– 0.001
	[0.05]	[0.50]	[0.50]
Constant	1.722	0.591	0.756
	[80.55]**	[77.90]**	[162.09]**
Observations	520713	520713	520713
Number of Firms	66632	66632	66632
R–squared	0.03	0.03	0.04
F test (excl. instruments=0)	11.52	8.29	11.42
F–test p–value	0.000	0.000	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. Reported statistics: F statistic and p-value of excluded instruments test (Ho: instruments are not different form zero). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.5. GMM regressions of relation between firm performance and number of bank relationships
Alternative measures of firm performance and firm growth

Dependent Variable:	**Economic Profitability**	**Financial Profitability**	**Return on Shareholder**	**Asset Turnover**	**Value Added Growth**
Independent Variables					
Number Banks	9.137	25.286	47.684	2.249	– 91.278
	[3.20]**	[1.49]	[2.13]*	[4.85]**	[3.27]**
Log employees	0.063	– 0.635	– 0.845	0.002	5.530
	[0.56]	[0.94]	[0.95]	[0.11]	[4.39]**
Log(1+Age)	1.596	– 3.203	– 4.577	0.189	– 88.092
	[34.07]**	[10.18]**	[11.28]**	[22.22]**	[55.69]**
Leverage	– 0.190	0.172	0.184	– 0.012	0.346
	[82.51]**	[12.51]**	[10.50]**	[33.95]**	[12.87]**
Liquidity	– 0.764	– 0.098	– 0.392	– 0.075	– 2.026
	[34.96]**	[0.94]	[2.93]**	[21.50]**	[8.00]**
Tangibility	– 6.456	– 19.108	– 28.255	– 0.662	– 19.599
	[47.61]**	[23.66]**	[26.98]**	[28.89]**	[12.79]**
Activity	– 5.562	– 25.941	– 35.090	– 0.326	– 35.740
	[51.83]**	[37.81]**	[39.14]**	[16.92]**	[26.60]**
Observations	518723	516111	515832	515012	442701
Number of FID	65788	65739	65763	65642	62911
Excluded instr. F	11.799	11.842	11.843	12.824	10.884
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000
Partial R2	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	11.391	11.454	11.468	12.366	12.008
Anderson–Rubin F p	0.000	0.321	0.021	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.220	0.584	0.136	0.185	0.000

All regressions include firm and year fixed–effects. Two step robust t–statistics in brackets. *Number Banks* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p–value of excluded instruments test, partial R–squared of excluded instruments, Cragg–Donald F statistic of weak identification, Anderson–Rubin test of joint significance of endogenous regressors in main equation (p–value reported), Anderson canonical correlation LR test of underidentification (p–value reported) and Hansen J test of overidentification of all instruments (p–value reported). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.6. GMM regressions of relation between firm performance and one bank relationship
Alternative measures of firm performance and firm growth

Dependent Variable:	**Economic Profitability**	**Financial Profitability**	**Return on Shareholder**	**Asset Turnover**	**Value Added Growth**
Independent Variables					
One Bank	– 30.513	– 66.694	– 131.604	– 8.111	297.352
	[3.00]**	[1.20]	[1.80]	[4.27]**	[2.85]**
Log employees	0.125	– 0.296	– 0.261	0.011	4.684
	[1.25]	[0.53]	[0.36]	[0.58]	[4.08]**
Log(1+Age)	1.524	– 3.393	– 4.931	0.170	– 87.195
	[34.38]**	[11.65]**	[13.14]**	[18.87]**	[52.88]**
Leverage	– 0.186	0.184	0.205	– 0.011	0.304
	[110.10]**	[19.65]**	[17.76]**	[40.92]**	[15.49]**
Liquidity	– 0.776	– 0.132	– 0.457	– 0.077	– 1.893
	[35.22]**	[1.33]	[3.58]**	[19.82]**	[7.47]**
Tangibility	– 6.653	– 19.658	– 29.270	– 0.713	– 17.123
	[51.72]**	[27.17]**	[31.09]**	[29.58]**	[11.59]**
Activity	– 5.586	– 25.979	– 35.166	– 0.331	– 35.408
	[48.99]**	[37.82]**	[39.04]**	[14.65]**	[24.59]**
Observations	518723	516111	515832	515012	442701
Number of FID	65788	65739	65763	65642	62911
Excluded instr. F	7.798	8.226	8.337	8.358	7.209
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000
Partial R2	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	7.914	8.345	8.414	8.374	7.842
Anderson–Rubin F p	0.000	0.321	0.021	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.208	0.388	0.068	0.470	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. *One Bank* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.7. GMM regressions of relation between firm performance and share by bank relationships
Alternative measures of firm performance and firm growth

Dependent Variable:	**Economic Profitability**	**Financial Profitability**	**Return on Shareholder**	**Asset Turnover**	**Value Added Growth**
Independent Variables					
Share by Bank	– 42.361	– 96.302	– 188.344	– 11.083	414.824
	[3.17]**	[1.25]	[1.87]	[4.83]**	[3.19]**
Log employees	0.096	– 0.389	– 0.432	0.005	5.051
	[0.92]	[0.64]	[0.55]	[0.26]	[4.41]**
Log(1+Age)	1.553	– 3.327	– 4.805	0.178	– 87.593
	[36.10]**	[11.35]**	[12.79]**	[21.66]**	[55.33]**
Leverage	– 0.188	0.180	0.199	– 0.012	0.319
	[102.31]**	[17.10]**	[15.18]**	[40.68]**	[15.15]**
Liquidity	– 0.770	– 0.118	– 0.430	– 0.076	– 1.953
	[35.50]**	[1.17]	[3.34]**	[21.18]**	[7.90]**
Tangibility	– 6.566	– 19.456	– 28.880	– 0.689	– 18.213
	[52.12]**	[26.46]**	[30.39]**	[31.05]**	[12.87]**
Activity	– 5.586	– 25.988	– 35.184	– 0.331	– 35.441
	[51.11]**	[37.98]**	[39.44]**	[16.21]**	[25.88]**
Observations	518723	516111	515832	515012	442701
Number of FID	65788	65739	65763	65642	62911
Excluded instr. F	10.886	11.244	11.372	11.798	10.594
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000
Partial R2	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	10.986	11.364	11.458	11.806	11.709
Anderson–Rubin F p	0.000	0.321	0.021	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.196	0.406	0.069	0.377	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. *Share by Bank* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.8. GMM regressions of relation between firm performance and bank relationships
Regressions with small and medium firms

Dependent Variable:	**Return on Assets**			**Sales Growth**		
Independent Variables						
Number Banks	18.563			– 39.613		
	[3.57]**			[1.60]		
One Bank		– 64.048			148.839	
		[3.22]**			[1.74]	
Share by Bank			– 85.747			200.133
			[3.59]**			[1.82]
Log employees	– 0.036	0.065	0.027	1.035	0.894	1.010
	[0.18]	[0.34]	[0.15]	[0.94]	[0.94]	[1.03]
Log(1+Age)	1.505	1.302	1.390	– 80.483	– 79.774	– 80.078
	[20.35]**	[11.74]**	[16.36]**	[48.98]**	[44.22]**	[47.29]**
Leverage	– 0.230	– 0.221	– 0.224	0.385	0.363	0.372
	[52.37]**	[79.98]**	[72.61]**	[14.95]**	[22.67]**	[20.28]**
Liquidity	– 0.934	– 0.960	– 0.947	– 2.265	– 2.228	– 2.253
	[27.32]**	[27.19]**	[28.34]**	[8.71]**	[8.78]**	[8.89]**
Tangibility	– 8.754	– 9.290	– 9.048	– 30.400	– 28.838	– 29.598
	[37.50]**	[41.93]**	[44.42]**	[21.57]**	[21.96]**	[23.55]**
Activity	– 7.678	– 7.674	– 7.702	– 36.436	– 36.372	– 36.340
	[41.63]**	[37.26]**	[41.31]**	[27.56]**	[26.68]**	[27.26]**
Observations	424513	424513	424513	367389	367389	367389
Number of Firms	52340	52340	52340	50566	50566	50566
Excluded instr. F	7.871	5.188	7.601	7.439	5.826	8.444
Excluded instr. F p	0.000	0.001	0.000	0.000	0.001	0.000
Partial R2	0.000	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	7.194	5.001	7.321	7.641	6.147	8.947
Anderson–Rubin F p	0.000	0.000	0.000	0.000	0.000	0.000
Anderson can corr LR p	0.000	0.002	0.000	0.000	0.000	0.000
Hansen J Overident p	0.741	0.571	0.561	0.000	0.000	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. We use three variables as *Bank Relationship Measures*: *Number of Banks*, *One Bank* dummy variable (1 if one bank, and 0 if multiple banks), and *Share by Bank* (inverse of the number of banks). The *Bank Relationship Measure* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported).

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.9. GMM regressions of relation between firm performance and bank relationships
Control by Altman Z-score

Dependent Variable:	**Return on Assets**			**Sales Growth**		
Independent Variables						
Number Banks	7.030			– 94.195		
	[2.37]*			[3.34]**		
One Bank		– 24.616			277.719	
		[2.35]*			[3.03]**	
Share by Bank			– 33.673			394.674
			[2.42]*			[3.30]**
Log employees	0.209	0.244	0.225	2.304	1.174	1.562
	[1.75]	[2.29]*	[2.03]*	[1.85]	[1.17]	[1.50]
Log(1+Age)	1.081	1.023	1.047	– 79.128	– 78.318	– 78.674
	[21.16]**	[20.55]**	[21.70]**	[57.13]**	[55.61]**	[57.54]**
Z Score Altman	1.688	1.692	1.691	5.703	5.715	5.715
	[57.16]**	[55.96]**	[56.62]**	[32.49]**	[31.31]**	[32.56]**
Leverage	– 0.150	– 0.147	– 0.149	0.702	0.655	0.670
	[56.66]**	[65.95]**	[64.52]**	[30.52]**	[38.58]**	[38.22]**
Liquidity	– 1.451	– 1.460	– 1.456	– 4.373	– 4.252	– 4.306
	[49.79]**	[50.27]**	[50.41]**	[17.66]**	[17.18]**	[17.82]**
Tangibility	– 6.733	– 6.887	– 6.815	– 26.166	– 23.480	– 24.581
	[40.79]**	[45.45]**	[44.48]**	[17.61]**	[17.47]**	[18.87]**
Activity	– 7.558	– 7.571	– 7.574	– 35.453	– 35.044	– 35.103
	[61.34]**	[59.16]**	[60.70]**	[27.88]**	[26.55]**	[27.72]**
Observations	514810	514810	514810	447326	447326	447326
Number of FID	65629	65629	65629	63259	63259	63259
Partial R2	0.000	0.000	0.000	0.000	0.000	0.000
Excluded instr. F	12.984	8.551	12.021	9.590	7.558	10.414
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	12.514	8.557	12.021	10.265	8.215	11.378
Anderson–Rubin F p	0.035	0.035	0.035	0.000	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.436	0.544	0.514	0.000	0.000	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. We use three variables as *Bank Relationship Measures*: *Number of Banks*, *One Bank* dummy variable (1 if one bank, and 0 if multiple banks), and *Share by Bank* (inverse of the number of banks). The *Bank Relationship Measure* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.10. GMM regressions of relation between firm performance and bank relationships
Control by García Z-score

Dependent Variable:	**Return on Assets**			**Sales Growth**		
Independent Variables						
Number Banks	4.202			– 99.870		
	[1.48]			[3.34]**		
One Bank		– 15.330			299.221	
		[1.57]			[3.01]**	
Share by Bank			– 20.914			425.825
			[1.58]			[3.33]**
Log employees	0.326	0.344	0.331	2.668	1.466	1.907
	[2.87]**	[3.55]**	[3.19]**	[2.05]*	[1.39]	[1.75]
Log(1+Age)	0.948	0.910	0.926	– 80.521	– 79.582	– 79.986
	[19.99]**	[18.76]**	[20.03]**	[55.12]**	[52.18]**	[54.89]**
Z Score Garcia	0.903	0.906	0.905	2.259	2.190	2.211
	[51.04]**	[51.33]**	[51.30]**	[27.79]**	[27.47]**	[28.24]**
Leverage	– 0.199	– 0.197	– 0.198	0.494	0.439	0.457
	[76.34]**	[106.05]**	[96.45]**	[17.73]**	[25.03]**	[23.56]**
Liquidity	– 1.703	– 1.710	– 1.706	– 4.521	– 4.303	– 4.390
	[51.26]**	[53.64]**	[52.84]**	[15.71]**	[15.84]**	[16.33]**
Tangibility	– 6.852	– 6.935	– 6.894	– 27.813	– 25.097	– 26.236
	[45.11]**	[49.66]**	[48.52]**	[18.41]**	[17.80]**	[19.51]**
Activity	– 6.398	– 6.394	– 6.400	– 32.546	– 32.289	– 32.296
	[52.48]**	[51.46]**	[52.11]**	[24.36]**	[23.18]**	[24.27]**
Observations	500777	500777	500777	437539	437539	437539
Number of FID	64911	64911	64911	62694	62694	62694
Partial R2	0.000	0.000	0.000	0.000	0.000	0.000
Excluded instr. F	12.232	8.332	11.537	8.835	6.865	9.536
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	11.794	8.256	11.474	9.499	7.443	10.428
Anderson–Rubin F p	0.197	0.197	0.197	0.000	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.339	0.430	0.406	0.000	0.000	0.000

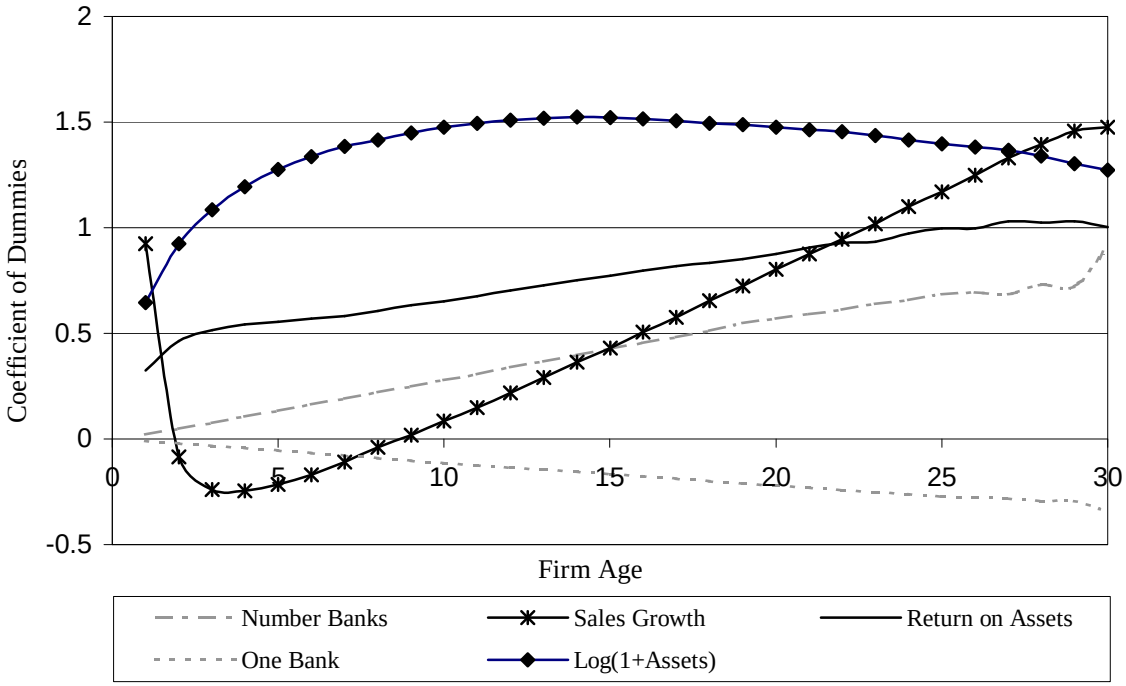
All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. We use three variables as *Bank Relationship Measures*: *Number of Banks*, *One Bank* dummy variable (1 if one bank, and 0 if multiple banks), and *Share by Bank* (inverse of the number of banks). The *Bank Relationship Measure* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported). * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5.11. GMM regressions of relation between firm performance and bank relationships
Control by firm age

Dependent Variable:	**Return on Assets**			**Sales Growth**		
Independent Variables						
Number Banks	11.404			– 57.886		
	[3.30]**			[2.53]*		
One Bank		– 36.122			154.338	
		[3.05]**			[2.12]*	
Share by Bank			– 50.483			226.095
			[3.21]**			[2.30]*
Log employees	0.317	0.412	0.375	0.536	– 0.320	– 0.049
	[2.36]*	[3.57]**	[3.11]**	[0.53]	[0.40]	[0.06]
Leverage	– 0.230	– 0.226	– 0.227	0.422	0.392	0.401
	[81.27]**	[109.54]**	[101.76]**	[19.82]**	[27.73]**	[25.51]**
Liquidity	– 0.969	– 0.984	– 0.977	– 1.978	– 1.888	– 1.922
	[36.37]**	[36.96]**	[37.20]**	[8.71]**	[8.58]**	[8.72]**
Tangibility	– 8.610	– 8.846	– 8.746	– 30.269	– 28.698	– 29.310
	[52.19]**	[56.54]**	[57.06]**	[24.64]**	[25.22]**	[26.28]**
Activity	– 7.555	– 7.581	– 7.582	– 36.143	– 35.957	– 35.973
	[55.67]**	[53.48]**	[55.44]**	[31.37]**	[30.87]**	[31.36]**
Dage(0–1)	2.186	2.123	2.141	– 114.653	– 114.230	– 114.367
	[25.74]**	[25.26]**	[26.13]**	[88.58]**	[89.39]**	[89.66]**
Dage(2–3)	1.622	1.561	1.573	– 127.116	– 126.697	– 126.793
	[14.49]**	[13.46]**	[14.18]**	[92.00]**	[92.15]**	[92.98]**
Dage(4–5)	0.804	0.679	0.717	– 125.907	– 125.231	– 125.429
	[5.37]**	[4.25]**	[4.77]**	[82.50]**	[81.35]**	[83.02]**
Dage(6–7)	0.191	0.050	0.101	– 121.031	– 120.255	– 120.532
	[0.99]	[0.24]	[0.52]	[70.40]**	[68.28]**	[70.50]**
Dage(8–9)	– 0.314	– 0.475	– 0.418	– 116.695	– 115.752	– 116.078
	[1.32]	[1.83]	[1.73]	[60.01]**	[57.40]**	[59.78]**
Dage(10–11)	– 0.728	– 0.829	– 0.791	– 111.723	– 111.098	– 111.339
	[2.55]*	[2.71]**	[2.75]**	[50.77]**	[49.13]**	[50.94]**
Dage(12–13)	– 1.111	– 1.118	– 1.121	– 106.28	– 106.020	– 106.113
	[3.33]**	[3.23]**	[3.39]**	[42.98]**	[42.39]**	[43.57]**
Dage(14–15)	– 1.437	– 1.396	– 1.423	– 100.661	– 100.594	– 100.580
	[3.77]**	[3.56]**	[3.79]**	[36.63]**	[36.46]**	[37.32]**
Dage(16–17)	– 1.891	– 1.881	– 1.900	– 94.675	– 94.484	– 94.513
	[4.39]**	[4.21]**	[4.45]**	[31.09]**	[30.74]**	[31.58]**
Dage(18–19)	– 2.115	– 2.065	– 2.105	– 88.728	– 88.627	– 88.597
	[4.44]**	[4.22]**	[4.49]**	[26.67]**	[26.58]**	[27.22]**
Dage(20–21)	– 2.284	– 2.300	– 2.314	– 84.196	– 83.641	– 83.746
	[4.44]**	[4.31]**	[4.54]**	[23.43]**	[23.18]**	[23.84]**
Dage(22–23)	– 2.419	– 2.511	– 2.510	– 78.575	– 77.607	– 77.787
	[4.31]**	[4.28]**	[4.50]**	[20.12]**	[19.79]**	[20.40]**
Dage(24–25)	– 2.314	– 2.561	– 2.502	– 74.340	– 72.270	– 72.784
	[3.80]**	[4.06]**	[4.18]**	[17.22]**	[17.12]**	[17.66]**
Dage(26–27)	– 2.548	– 2.661	– 2.617	– 70.828	– 68.977	– 69.488
	[3.67]**	[3.76]**	[3.88]**	[14.69]**	[14.81]**	[15.22]**
Dage(28–29)	– 4.058	– 3.753	– 3.584	– 67.675	– 68.644	– 69.558
	[1.55]	[1.33]	[1.30]	[5.04]**	[5.29]**	[5.33]**
Observations	519074	519074	519074	447423	447423	447423
Number of FID	65825	65825	65825	63269	63269	63269
Partial R2	0.000	0.000	0.000	0.000	0.000	0.000
Excluded instr. F	12.630	8.706	12.003	10.261	7.987	11.015
Excluded instr. F p	0.000	0.000	0.000	0.000	0.000	0.000
Cragg–Donald F stat	12.284	8.857	12.159	11.045	8.729	12.093
Anderson–Rubin F p	0.000	0.000	0.000	0.000	0.000	0.000
Anderson can corr LR p	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J Overident p	0.113	0.076	0.068	0.000	0.000	0.000

All regressions include firm and year fixed-effects. Two step robust *t*-statistics in brackets. We use three variables as *Bank Relationship Measures*: *Number of Banks*, *One Bank* dummy variable (1 if one bank, and 0 if multiple banks), and *Share by Bank* (inverse of the number of banks). The *Bank Relationship Measure* is instrumented using Herfindahl branch concentration index by province/year, industry dependence on external finance and number of mergers. Reported statistics: F statistic and p-value of excluded instruments test, partial R-squared of excluded instruments, Cragg-Donald F statistic of weak identification, Anderson-Rubin test of joint significance of endogenous regressors in main equation (p-value reported), Anderson canonical correlation LR test of underidentification (p-value reported) and Hansen J test of overidentification of all instruments (p-value reported). * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 5.1. Firm's life cycle



We plot the evolution of the variables *Number of banks, One bank, Sales growth, Return on assets* and *Log(assets)* during the firm age. We define 30 dummy variables of firm age: *D1* equals one if firm is one year old and zero otherwise, ..., *D30* equals one if firm is 30 years old and zero otherwise. For each variable Y, we estimate a regression of the following form: $Y = \sum_i \beta_i D_i + \alpha_i + d_t + u_i$, where α_i are firm fixed-effects and dt are time fixed-effects. Finally, we plot the coefficients estimated of the dummy variables.