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ECO 2007/46

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DEPARTMENT OF ECONOMICS

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EUI Working Paper **ECO** 2007/46

ISSN 1725-6704

Printed in Italy
European University Institute
Badia Fiesolana
I – 50014 San Domenico di Fiesole (FI)
Italy

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The Structure of Multiple Credit Relationships: Evidence from US Firms*

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Abstract

When firms borrow from multiple concentrated creditors such as banks they appear to differentiate their allocation of borrowing. In this paper, we put forward hypotheses for this borrowing pattern based on incomplete contract theories and test them using a sample of small U.S. firms. We find that firms with more valuable, more redeployable, and more homogeneous assets differentiate borrowing more sharply across their concentrated creditors. We also find that borrowing differentiation is inversely related to restructuring costs and positively related to firms' informational transparency. This evidence supports the predictions of incomplete contract theories: the structure of credit relationships appears to be used as a device to discipline creditors and entrepreneurs, especially during corporate reorganizations.

JEL Classification: G21, G33, G34.

Keywords: Credit Relationships, Multiple Creditors, Borrowing Allocation.

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1 Introduction

When firms borrow from multiple concentrated lenders, such as banks,[1] they appear to differentiate their allocation of borrowing in the sense that they do not obtain equal amounts from several lenders but rather they systematically borrow more from some of the lenders. In Table 1, we display the borrowing pattern of the U.S. firms in the National Survey of Small Business Finance conducted by the Board of Governors of the Federal Reserve System and the Small Business Administration (pooled 1993 and 1998 survey waves). The table shows that firms that borrow from multiple institutions substantially differentiate their borrowing shares. For example, among firms with two lenders, the first lender (the one granting the largest share of loans) provides on average 76.5 percent of total credit and, among firms with three lenders, the first provides on average 65.1 percent of total credit. These figures far exceed the 50 percent and 33 percent shares that would be observed if - given the number of lenders - borrowing was allocated evenly. Although we lack detailed figures, there is also evidence of differentiated borrowing in other countries. In Italy, for example, 97% of the manufacturing firms in the 2001 Mediocredito-Capitalia survey choose multiple, differentiated borrowing and, among firms that have four banks (the sample median number of banks), the first bank provides on average more than 40% of total credit. Differentiated borrowing is also widespread in countries with strong bank-firm relationships, like Germany and Japan (Aoki and Patrick, 1994; Edwards and Fisher, 1994).

Despite a growing interest in firms' debt structure, the literature has largely neglected this issue. As we better argue below, some studies have focussed on the optimal number of creditors, but they have treated creditors as symmetric. Other studies have focussed on the optimal contractual links between firms and their multiple concentrated creditors (see, e.g., Diamond, 1993). Little attention has been devoted to explaining why a firm allocates its borrowing differentially across multiple concentrated lenders, thereby letting them have a different role and influence over its business.

The objective of this paper is to address this issue. In the first part of the paper (Section 2), we put forward testable hypotheses on the structure of firms' credit relationships. These hypotheses are drawn from two sources. In part, they are drawn from the literature on the role of concentrated creditors during private reorganizations (e.g., Levmore, 1982; Picker, 1992; Penati and Zingales, 1997; Sheard, 1994) and especially from our companion theoretical analysis in Minetti (2004) and Guiso and Minetti (2004) (henceforth MGM). A central tenet of this literature is that during private reorganizations concentrated creditors can misbehave to appropriate resources and the structure of credit relationships can be used to mitigate this misbehavior. In

part, our hypotheses are instead drawn from the literature on multiple borrowing.[2] For convenience, we use the implications from MGM as a "benchmark" and then relate to them the implications from the rest of the literature. The key feature in MGM is that the share of credit granted by a lender measures the informational tightness of the credit relationship: the larger the lender's share, the more precise the information the lender acquires on the firm relative to the other lenders. This feature is consistent with the implications of several theoretical studies (e.g., Holmstrom and Tirole, 1997)[3] and with recent evidence in Elsas (2005), who finds that a bank is more likely to be the main bank of a firm when it holds a larger share in its financing. The analysis in MGM shows that, by differentiating its borrowing and hence the banks' information, a firm can discipline its banks during a private reorganization, preventing them from appropriating resources. However, differentiated borrowing is costly because it can induce the premature liquidation of good projects. This analysis generates implications for: (i) the firm's choice between borrowing from a single lender (undifferentiated borrowing) and multiple, differentiated borrowing; (ii) the firm's allocation of borrowing across its banks - the amount of differentiation - conditional on borrowing from multiple lenders. In the second part of the paper, we test these predictions and the alternative/complementary hypotheses obtained from the literature on multiple borrowing using the U.S. data in the National Survey of Small Business Finance.[4] We find that firms with more valuable, more redeployable and more homogeneous assets differentiate their borrowing more sharply. We also find some evidence that the degree of borrowing differentiation is inversely related to restructuring costs and positively related to firms' informational transparency. All in all, this evidence supports the idea that firms differentiate borrowing to mitigate banks' misbehavior during reorganizations. At the same time, it is consistent with incomplete contract theories of multiple borrowing.[5] In particular, the structure of credit relationships appears to be used to tighten creditors' refinancing policy and, hence, to discourage entrepreneurs' choice of inefficient projects (soft budget constraint); it also appears to be used to prevent concentrated creditors from extracting rents during project lifetime (hold-up).

This paper most closely relates to two strands of literature. The first strand investigates the role and (mis)behavior of banks and other concentrated creditors during firm reorganizations (see, e.g., Penati and Zingales, 1997, and the aforementioned studies). The paper brings to the data the implications of this strand of literature for the structure of multiple credit relationships, as formalized by MGM. The second strand of literature studies the determinants of multiple credit relationships.[6] In Section 2, we elaborate on the link with theoretical studies. As for the empirical studies, the existing papers generally assume that the creditors of a firm are

symmetric and, hence, do not investigate the allocation of borrowing. For example, Ongena and Smith (2000) relate the number of bank relationships to firm and country characteristics using a dataset spanning twenty European countries while Benmelech, Garmaise and Moskowitz (2005) investigate the impact of asset redeployability on the number of creditors using a measure of the tightness of U.S. commercial zoning regulations to obtain variation in the degree of redoployability. Finally, the paper shares some features with the literature on syndicated loans (see, e.g., Sufi, 2005). Although it is insightful to carry out a comparison, because of the distinct nature of syndicated loans, this literature has a different objective and focus.

The remainder of the paper is structured as follows. In Section 2, we present the theoretical background of our analysis: we first explain our benchmark hypotheses on the structure of credit relationships (2.1) and then integrate them with the alternative/complementary hypotheses in the literature on multiple borrowing (2.2). In Section 3, we provide details on the data and the empirical methodology. In Section 4, we present the main empirical results. In Section 5, we perform robustness tests. Section 6 concludes.

2 Theoretical Background

2.1 The Benchmark Hypotheses

Our companion theoretical analysis in MGM closely follows the literature on the (mis)behavior of concentrated creditors during private reorganizations (Levmore, 1982; Picker, 1992; Penati and Zingales, 1997; Sheard, 1994) and formalizes the implications of this literature for the structure of multiple credit relationships (allocation of borrowing). The analysis can be explained as follows. Consider a firm that can borrow from one or two banks and invest the borrowed funds in a project. The project can be of good or bad quality, with the quality being initially unknown. With some probability the project succeeds; alternatively, at an interim stage, the project enters distress and can be terminated or reorganized. If the entrepreneur and the banks sustain reorganization costs, with some probability the reorganization will succeed and the project will yield output; alternatively, the reorganization will fail and the assets will be redeployed outside the firm. The probability that the reorganization succeeds is higher for a good project than for a bad one.

The key variable in the analysis is the precision of a bank's information, which in turn is tied to its share of financing: the larger its share of financing, the more precise the information the bank obtains on the firm relative to the other bank. Information plays a dual role when the project enters distress. First, an informed bank can more readily recognize the assets that

are easily redeployable. Therefore, being better able to seize valuable assets, an informed bank has greater ability to appropriate resources during the reorganization. Second, at the interim stage an informed bank can more readily recognize whether the project is good and worth being restructured or bad and worth being terminated.

The firm chooses initially between two "borrowing regimes".[7] In a first regime ("non-differentiated borrowing"), it borrows from one bank; in a second regime ("differentiated borrowing"), it borrows different amounts from the two banks. In the "differentiated borrowing" regime, the firm also chooses the allocation of borrowing. In particular, for what just said, under differentiated borrowing the two banks have different information and their informational gap is increasing in their financing gap.

In MGM, borrowing from one bank and borrowing exactly equal shares of financing from two banks generate the same incentives for the banks. However, even tiny fixed transaction costs for establishing a credit relationship break the indifference and render symmetric borrowing from two banks strictly dominated by borrowing from only one bank when undifferentiated borrowing is chosen. These transaction costs are a realistic feature of credit relationships and are frequently assumed in the literature. Consistent with this, in the sample used for the empirical analysis only a negligible number of firms borrowing from multiple lenders allocate their borrowing exactly evenly across lenders. Hence, we will normally treat borrowing from multiple sources and differentiated borrowing as interchangeable.

The model in MGM shows that, when the agents cannot commit to reorganization decisions and the asset allocation cannot be made contingent on the occurrence of distress, on the quality of the project or on the asset redeployability, the banks can make an inefficient reorganization decision. In fact, they can elect to keep a bad project going for the sole purpose of seizing assets during its reorganization.[8] Borrowing asymmetrically from the two banks, the firm prevents this misbehavior. In fact, the bank with the lowest share of financing expects that, because of its poor information, it will end up seizing assets with low redeployability and leaving highly redeployable assets to the most informed bank. Therefore, this bank has no incentive to continue a bad project. However, being poorly informed, this bank is also less able to recognize a good project. Therefore, differentiated borrowing can lead to the premature termination of a good project.[9]

2.1.1 Empirical Implications

The analysis in MGM carries a number of empirical implications, which we summarize in Table 2 (see the seventh column for the allocation of borrowing and the second column for the choice

between differentiated and non-differentiated borrowing).

Allocation of Borrowing. Given the decision of a firm to have differentiated borrowing, the degree of borrowing differentiation depends on the following characteristics of the firm.

Asset Value. The degree of differentiation is positively related to the value of the firm's assets. Intuitively, the greater the asset value, the greater the incentive of a bank to continue a bad project solely in order to seize assets. Therefore, the greater the value of seizable assets, the greater is the borrowing and informational differentiation necessary to induce the least informed bank to terminate a bad project.

Asset Redeployability. The degree of differentiation is positively related to the asset average redeployability. In fact, analogously to what observed for the asset value, the greater the asset average redeployability, the greater the incentive of a bank to continue a bad project to seize assets.

Asset Heterogeneity. The degree of differentiation is inversely related to the asset heterogeneity (in redeployability). In fact, when the assets are highly heterogeneous, the bank with the lowest share of financing and information expects that it will claim assets with very low redeployability. Therefore, this bank has the incentive to terminate a bad project even if it has a small informational disadvantage relative to the other bank.

Restructuring Costs. The degree of differentiation is inversely related to banks' restructuring cost. In fact, a high restructuring cost entails a low incentive for a bank to continue a bad project to seize assets.

Informational Transparency. The degree of differentiation is inversely related to the firm's informational transparency. In fact, if information on the quality of the project is publicly available, a bank will be unable to disguise and continue a bad project to seize assets.

Differentiated versus Non-Differentiated Borrowing. When the borrowing differentiation necessary to deter the continuation of a bad project is large, the firm will face a too high risk of premature liquidation of a good project and will opt for non-differentiated borrowing (borrowing from one bank). This implies, for example, that the value and redeployability of the assets of the firm have a positive effect on the degree of borrowing differentiation conditional on choosing differentiated borrowing, but a negative effect on the probability that the firm chooses differentiated borrowing -see Section 3.1 for more details. The analysis also predicts that the choice between differentiated and non-differentiated borrowing depends on the *quality* of the firm, though its effect can be either negative or positive. Intuitively, on the one hand when the project is of good quality with high probability the cost of a premature termination of good

projects associated with differentiated borrowing will be severe. This tends to generate a negative relationship between the firm quality and the probability of differentiated borrowing as a good firm fears premature liquidation. On the other hand, when the project is of good quality with high probability the banks will likely have assets to seize if a project is reorganized. This fosters banks' incentive to continue a bad project and renders differentiated borrowing more necessary, generating a positive relationship between the firm's quality and the probability of differentiated borrowing. In addition, the model implies that the quality of the firm has no effect on the allocation of borrowing (the degree of differentiation); as we will see this provides a natural theoretically-based exclusion restriction that we exploit to identify the empirical model.

2.2 Other Hypotheses

The predictions in MGM and in the literature on the (mis)behavior of concentrated creditors during reorganizations can be complemented and contrasted with those of the incomplete contract literature on multiple borrowing. The large majority of the theoretical studies reviewed below focus on the choice between single and multiple borrowing but are silent on the allocation of borrowing across multiple concentrated creditors.[10] Only recently two strands of literature (on the hold-up issue and on creditors' monitoring) have been extended to explain the allocation of borrowing. It is important to note that the analyses considered below have different ingredients. However, like MGM, they all share the broad view that, when contracts are incomplete, creditors and entrepreneurs can misbehave and the structure of credit relationships helps to mitigate this misbehavior.

Single versus Multiple Borrowing.

Soft Budget Constraint.

The soft budget constraint literature yields predictions on the choice between single and multiple borrowing. Bolton and Sharfstein (1996) show that multiple borrowing reduces the incentive of solvent entrepreneurs to default strategically. In fact, multiple borrowing increases the price that solvent entrepreneurs have to pay to repurchase the assets repossessed by their creditors after the strategic default. However, multiple borrowing also increases the cost of liquidity defaults by reducing the price that outside buyers are ready to pay for the assets of the firm. In a related vein, Dewatripont and Maskin (1995) find that borrowing from multiple creditors hardens creditors' budget constraint, deterring entrepreneurs from implementing long-term unprofitable projects.

Bolton and Sharfstein (1996) offer predictions on the effect on the choice between single and multiple borrowing of the *quality* and *informational transparency* of the firm and its asset *value*

and *redeployability* (see Table 2, third column). In particular, they predict that the asset value and redeployability negatively affect the probability of multiple borrowing: in fact, when the assets have high value and liquidity the drop in liquidation returns associated with multiple borrowing is sharp. They also predict that informational transparency negatively affects the probability of multiple borrowing while the quality of the firm positively affects it. Intuitively, for a high quality firm the cost of multiple borrowing is small because the firm is unlikely to experience a liquidity default.

Hold-Up.

In the hold-up literature (Rajan, 1992; Hubert and Schafer, 2002), a bank with more information than outside financiers can exploit its informational monopoly over the firm and force a renegotiation of the initial contract at an interim stage of the project. Precisely, the bank can threaten to withhold the refinancing of the project and extract rents, depressing the firm's investment effort ex ante. In Rajan (1992) and Hubert and Schafer (2002), borrowing from two banks prevents the hold-up by inducing banks to compete in credit provision at the interim stage. These studies yield two predictions (summarized in Table 2, fourth column). First, the need for multiple borrowing is lower when the firm features higher *informational transparency* and is therefore less exposed to the informational monopoly of its banks. Second, the quality of the firm positively affects the probability of multiple borrowing. In fact, a high quality firm suffers from a severe rent extraction in case of hold-up (see also Elsas, 2005, for a discussion of this point).

Monitoring.

Carletti (2004) and Carletti, Cerasi and Daltung (2005) focus on banks' monitoring to explain the choice between single and multiple borrowing (see Table 2, fifth column). In Carletti (2004), banks' monitoring mitigates an entrepreneur's moral hazard by bringing down the private benefits that the entrepreneur derives from exerting low effort. However, monitoring is costly and erodes the private benefits that the entrepreneur can reap from her project. Carletti (2004) predicts that a firm chooses multiple borrowing when *monitoring costs* are high and its *quality* is high. In Carletti, Cerasi and Daltung (2005), a bank can default on its deposit contracts and this dilutes its incentive to monitor. By borrowing from multiple banks, a firm can foster banks' monitoring by inducing better loan portfolio diversification and lowering the probability of default on deposits. However, multiple borrowing depresses monitoring by inducing duplication of monitoring effort and free riding. Carletti, Cerasi and Daltung (2005) predict that a firm chooses multiple borrowing when monitoring costs are high, its quality is low and its *size* relative to the size of the banks is large.[11]

Secrecy.

A fourth strand of literature focuses on the importance of secrecy for *innovation* (see Table 2, sixth column). In Von Rheinbanen and Ruckes (2004) and Yosha (1995), a bank can disclose to competitors information on the firm's innovations. Since this risk is higher when the firm borrows from multiple banks, Yosha (1995) predicts that innovative firms choose single borrowing. Von Rheinbanen and Ruckes (2004), instead, endogenize the closeness of credit relationships and find that the impact of innovativeness on the number of banks is ambiguous. Von Rheinbanen and Ruckes (2004) also find that high *quality* firms choose multiple borrowing more than low quality ones.[12]

Allocation of Borrowing.

Hold-Up.

Elsas, Heinemann, and Tyrell (2004) have recently extended the hold-up literature to explain the decision of a firm to borrow differentially from multiple banks. As in Rajan (1992) and Hubert and Schafer (2002), multiple borrowing reduces the risk of hold-up at an interim stage. However, since multiple small banks make complementary financing decisions and cannot renegotiate the terms of loan contracts, multiple borrowing increases the risk that the banks withdraw financing at an interim stage. The firm can alleviate this risk of "coordination failure" by borrowing predominantly from one bank. In fact, unlike many small banks, a large pivotal bank can "forgive debt" at the interim stage: thus, the larger the share of financing of this bank, the better the firm will be able to face the credit withdrawal of the small banks. However, the larger the share of financing of the pivotal bank, the larger its bargaining power and the rents it can extract. Elsas, Heinemann, and Tyrell (2004) predict that firms with high *informational transparency* concentrate their borrowing more. Moreover, as we better discuss in Section 4 when we present the empirical results, they predict an ambiguous relationship between the asset *value* and *redeployability* and the concentration of borrowing (see Table 2, eighth column).

Monitoring.

Sufi (2005) has recently revisited the literature on creditors' monitoring to rationalize an asymmetric borrowing structure in the context of syndicated loans. For syndicated loans one of the multiple banks has an intrinsic advantage in monitoring the firm: in fact, the lead arranger establishes a relationship with the firm and then turns to other banks to finance part of the loan. As proved by Holmstrom and Tirole (1997), in these scenarios the firm should concentrate its borrowing in the hands of the lead bank to foster its monitoring and thereby raise the total level of monitoring. The argument put forward by Holmstrom and Tirole (1997) implies that firms with low *informational transparency* should concentrate their borrowing more because they need

more intense monitoring. Moreover, it implies that when *monitoring costs* are low firms need to concentrate their borrowing less to induce sufficient monitoring (see Table 2, ninth column, for these predictions). Note that, although Sufi's study refers to syndicated loans granted to large corporations, the logic applies as well to small businesses, which are more the object of our empirical analysis.

3 Empirical Evidence

3.1 Data Description and Estimation Strategy

In what follows, we test the benchmark predictions and the complementary hypotheses discussed in Section 2 on U.S. data. As a preliminary observation, note that, although some of the analyses in Section 2 place emphasis on firm reorganizations, they do not imply that an empirical study should be carried out on distressed firms. In fact, these analyses consider firms that evaluate *in expectation* costs and benefits of different debt structures in case of liquidation/reorganization.

Our main source of data is the National Survey of Small Business Finance (NSSBF), which is conducted by the Board of Governors of the Federal Reserve System and the Small Business Administration. We pool information from two survey waves, 1993 and 1998. The NSSBF is a stratified random sample of for-profit firms with fewer than 500 employees. The survey includes data on financial conditions, drawn from balance sheets and income statements, and detailed information about relationships with financial institutions. It also collects information on firm demographics. We complement the information from the NSSBF with data on bank employees and loans by census region from the Federal Deposit Insurance Corporation (FDIC), with data on R&D and sales by industry from the Survey of Industrial Research and Development conducted by the National Science Foundation/SRS, and with data from the Standard and Poor's Full-Coverage Compustat tapes.

The NSSBF survey gives data for 4,589 firms in 1993 and 3,431 in 1998, for a total of 8,020 firms.[13] Firms in the pooled sample have on average 29.9 employees. The small size of the firms in the survey appears suitable for our analysis. A crucial feature of most of the models illustrated in Section 2 is that financiers have heterogeneous information on the firm. This feature is realistic if the firm is informationally opaque, and informational opacity is supposed to be a characteristic of small firms because they are not monitored by rating agencies or by the financial press (Petersen and Rajan, 1994).[14] Of the firms in the sample, 2,773 declare they have no lending institutions, 2,694 have one and 2,553 have more than one. We will focus on the subsample of 5,247 firms with at least one lending institution. Table 1 summarizes the

structure of credit relationships, i.e. the number of creditors and the share of credit provided by each financial institution. The table suggests that firms that borrow from multiple institutions substantially differentiate their borrowing shares. The last three columns of Table 1 test formally the null hypothesis that the shares of borrowing are the same across financial institutions: as the values of the F-test show, this hypothesis is always rejected by the data.

The benchmark hypotheses in MGM can be formalized as follows. Let D be an indicator variable which takes on the value of one if the firm chooses differentiated borrowing and zero otherwise. Let also H denote the Herfindahl-Hirschman Index of the loans granted to the firm: the closer H is to 1, the more borrowing is differentiated across lenders. The solution in MGM can be expressed as follows:

$$D = \left\{ \begin{array}{c} 1 \text{ if } \alpha_1 P + \alpha_2 A + \alpha_3 R + \alpha_4 S_R + \alpha_5 C + \alpha_6 T + v > 0 \\ 0 \text{ otherwise} \end{array} \right\} \quad (1)$$

$$H = \beta_1 A + \beta_2 R + \beta_3 S_R + \beta_4 C + \beta_5 T + u \quad \text{if } D = 1. \quad (2)$$

where P is the probability that the project is of good quality, A is the value of the assets of the firm, R the asset average redeployability, S_R the asset heterogeneity (in redeployability), C the banks' restructuring cost, T is an indicator of the firm's informational transparency and v and u are random errors. As we explained in Section 2.1, the analysis predicts a positive sign on $\alpha_4, \alpha_5,\ \beta_1,\ \beta_2$, a negative sign on $\alpha_2, \alpha_3, \alpha_6,\ \beta_3,\ \beta_4,\ \beta_5$, and an ambiguous sign on α_1. Condition (1) determines whether the firm chooses differentiated borrowing or rather chooses non-differentiated borrowing and borrows from only one lender. Whether the firm has differentiated borrowing depends on all the variables that affect the degree of differentiation and hence on all the variables that affect H. Condition (2) determines instead the degree of borrowing differentiation conditional on having differentiated borrowing.

The form of the solution in (1)-(2) suggests a two-step estimator, in the first stage estimating a probability model for whether the firm has differentiated borrowing and in the second stage estimating the degree of borrowing differentiation conditional on having chosen differentiated borrowing while correcting for selection. To implement our test, we estimate a Heckman selection model. In the first stage, we estimate a probit for the probability of the firm having differentiated borrowing. In the second stage of the analysis, we estimate the degree of borrowing differentiation as a function of observables correcting for selection. As conditions (1)-(2) put in evidence, the models in MGM present a natural exclusion restriction, which enables identification. While all the variables that affect the degree of borrowing differentiation also affect the decision to borrow from differentiated sources, the probability P of the project being of good quality affects the decision to rely on differentiated borrowing, but not the degree of borrowing

differentiation. Thus, identification can be obtained by inserting proxies for the firm quality in the first-stage probit and excluding them from the second-stage regression. Note also that this exclusion restriction is not contradicted by the predictions of the models of multiple borrowing reviewed in Section 2, which essentially focus on the role of quality in determining the number of concentrated creditors but not the allocation of borrowing.

3.2 Measurement

Our dependent variable is the Herfindahl-Hirschman Index of loans, which is defined as $H_j = \Sigma_i(Loan_{ij}/TotalLoans_j)^2$ where $Loan_{ij}$ stands for the value of the credit (possibly belonging to different categories) extended by financial institution i to firm j and $TotalLoans_j$ stands for the total credit extended to the firm.[15]

In Table 3, we summarize the measurement of the explanatory variables. Among these variables, we include the total *value* of the assets of the firm. We use different indicators to proxy for the asset average *redeployability*. The redeployability of an asset depends both on the liquidity of its secondary market and on the intrinsic nature of the asset. In order to capture the liquidity of the secondary market, which we treat as our main measure of redeployability, we use the degree of co-movement between the sales of the firm and the sales of other firms in the same industry. As Shleifer and Vishny (1992) argue, when the conditions of the firms in an industry are positively correlated, the redeployability of the assets of the firms in that industry is likely to be low. In fact, the best second-hand users of the assets of a firm are probably the firms in its same industry, since they have the experience and know how to use these assets effectively. If these second-hand users themselves have financial problems when the firm is in distress, they will buy, if at all, only at low prices; otherwise, the firm will have to sell to less efficient, out-of-industry users whose willingness to pay is low. To compute the co-movement of sales, we use data from Compustat firms over the period 1950-2000 for a total of 251,782 firm-year observations. We classify firms into sixty-four industries using a two-digit classification and then, for each industry, regress the standardized annual rate of growth of firms' sales on a full set of year dummies. If firms within an industry co-move significantly, the year dummies will explain a large part of sales variability. We thus retain the R^2 of these regressions and use it as a measure of co-movement of firms in the industry. Industries with high R^2 will be high co-movement industries. We then impute this measure to the firms in our sample using the industry code.[16]

As a second proxy for the asset average redeployability, we use location (rural or urban) setting a dummy equal to one if the firm has a rural location, zero otherwise. This proxy is

aimed at capturing structural aspects that affect the liquidity of the secondary market. In particular, firms that operate in urban areas presumably have easier access to efficient resale markets. Helsley and Strange (1991), for example, develop a model of a statistical agglomeration economy in the capital market of an urban area. In their model, the resale value of pledged assets is higher in cities because the density of possible second-hand uses is greater. Habib and Johnsen (1999) also argue that redeployablity is likely to be higher in urban areas.[17] Finally, as a last proxy for redeployability that stems from asset characteristics, we use the share of illiquid, either intangible or fixed, assets. In fact, it is generally agreed that intangible and fixed assets are less easily redeployable than inventories or cash.

We now turn to variables capturing the asset *heterogeneity*. In MGM, what matters is heterogeneity in redeployability. Differences in redeployability can arise from heterogeneity in the nature of the assets, stemming, for example, from functional diversity in the activities of the firm. Unfortunately, we have no information on whether the firm produces one or multiple products. Heterogeneity in redeployability can also stem from differences in the location of the assets, when the firm operates plants in different places. Geographical location and the liquidity of local asset markets is likely to matter whenever assets are non-tradable, as in construction, or where transportation costs are high. Since we lack details on the nature and location of the assets used by the firm, we use various proxies to capture heterogeneity in redeployability. As a gauge of functional diversity, we include the number of trade creditors normalized by the size (sales) of the firm. For a given size of the firm, a higher number of suppliers may reflect the presence of different lines of production and, therefore, the heterogenous nature of pledgeable, productive assets. To capture geographical dispersion, we include a dummy for the number of sites of the firm, set at one if the firm has only one site, i.e. is geographically homogeneous.[18]

We use two proxies of *restructuring costs*. One is the average length of the relationships between the lending institutions and the firm. The experience that on average the lending institutions involved in a reorganization have accumulated with the firm is plausibly a key input in the reorganization. The shorter the institutions' experience with the firm, the greater their effort, hence the larger the cost of reorganizing. Clearly, one can think that the average length of the relationships may also capture other factors, such as the average degree of informational transparency of the firm vis à vis its concentrated creditors. In this case, this proxy could somewhat overlap with the measures of informational transparency discussed below. To account for this, we also include the share of the firm owned by its principal owner as a second proxy of restructuring costs. As argued by Hart (2001), when ownership is concentrated, stakeholders supposedly have lower costs in coordinating actions, including direct costs for organizing

meetings, transmitting information and so forth.

We follow the literature on relationship lending (e.g., Petersen and Rajan, 2002) in measuring the *informational transparency* of the firm. A first proxy for informational transparency is the size of the firm: small firms are thought to be less informationally transparent than bigger ones because they are not monitored by rating agencies or by the financial press. A second proxy is the age of the firm: old firms are allegedly more informationally transparent than younger ones because they have an established track-record. A third proxy is a dummy which takes on the value of one if the firm has a business credit card, and zero otherwise. As Petersen and Rajan (2002) argue, a business credit card is usually granted on the basis of a credit report, which reflects the availability of accurate information on the firm in the credit market. A fourth proxy consists of the ownership concentration of the firm, measured by the share of the firm owned by the principal owner. As Petersen and Rajan (2002) argue, when owners are dispersed, the firm needs a better informational structure to inform its various stakeholders. The last proxy relates to the records used by the firm to answer the income statement and balance sheet questions in the survey. We construct a dummy which takes on the value of one if the firm declares that it used written records to answer these questions, and zero otherwise.[19] In fact, the availability of written records signals a well organized information structure.

We also follow Petersen and Rajan (2002) in the measurement of *monitoring costs*. In their analysis, monitoring costs are proxied by the productivity of local bank employees. The more advanced the monitoring technology, the higher this productivity and the lower the cost that banks face in monitoring firms. For both years of the survey, we thus measure monitoring costs with the number of bank employees in the census region where the firm is located standardized by the total amount of loans in the region. The data were obtained from the Federal Deposit Insurance Corporation (FDIC).

As discussed in Section 2.2, the literature on secrecy and innovation attributes to firms' *innovativeness* a role in shaping firms' debt structure. The survey does not report information on the degree of firm innovativeness. We thus follow the approach in Guiso (1998) and construct a sector-level indicator of innovativeness. Precisely, we compute the amount of private R&D expenditures in the two-digit sector normalized by the total volume of sales in the sector in 1998, the year of the second wave of the NSSBF.[20] In this case, the data were obtained from the National Science Foundation/SRS.

Finally, we aim at measuring firm quality. The survey asks the firm about its credit history, and we use this information to proxy for firm quality (see also Section 5.3 for further discussion). More specifically, the NSSBF asks firms several questions: *Within the past seven years, has the*

firm or its principal owner declared bankruptcy? we set a dummy variable for bankruptcy equal to one if the firm answers "yes". *Within the past three years, on how many different personal obligations has the principal owner been 60 or more days delinquent*? possible answers are: none, one, two, three or more. We set the variable "delinquent on personal obligations" equal to zero if it has never been delinquent, to one, two and three if it has been delinquent once, twice or three or more times. The third proxy for firm quality is obtained from the question: *Within the past three years, on how many different business obligations has the firm been 60 or more days delinquent? Please include trade credit, or credit from suppliers.* Possible answers are: none, one, two, three or more. We set the variable "delinquent on business obligations" equal to zero if it has never been delinquent, to one, two or three if it has been delinquent once, twice, three or more times. Hence, firm quality is decreasing with all our three indicators.

Table 4 reports summary statistics for the variables used. Panel A refers to all the firms in the pooled NSSBF sample; Panel B refers to the sample of firms with at least one lender on which we run our estimates. There appear to be three main differences between the two groups. Firms with at least one lender are larger (an average of about 40 employees versus 30 for the whole sample). Firms that borrow from financial institutions also have fewer trade creditors on average, which is reasonable as they exploit other sources of funding. Finally, these firms exhibit less concentrated ownership. This could be due to their larger size and the reluctance of small businessmen to share ownership and control.

4 Empirical Results

Table 5 displays the results of the estimates. We report three different sets of regressions: Panels A and B focus on the specification implied by the hypotheses in MGM; Panel C also includes variables predicted by the related incomplete contract theories on multiple borrowing reviewed in Section 2 but not by MGM.

A well known feature of the Herfindahl index is that it varies both because the concentration of borrowing can vary and because the number of multiple creditors can differ across firms. Hence, if we rely on the whole sample, any effect of the explanatory variables on the Herfindahl index may reflect their effect on the number of lenders rather than on the asymmetry in borrowing from various lenders. To avoid this possibility, we restrict the sample to the firms that borrow from only two lenders, when they have more than one relation. This way, any variation in concentration of borrowing that is explained by our regressors reflects only the effect of these variables on the degree of differentiation in firms' borrowing patterns. An alternative, which we

pursue later, is to insert in the regressions variables that have a strong explanatory power on the number of relations. As shown by Detragiache, Garella and Guiso (2000), firm size, whatever its interpretation, is the single most important determinant of the number of bank relations; thus, controlling for size in our second stage regression is enough to account for the effect of variation in the number of relations on the Herfindahl index, as we will show.

From a theoretical standpoint, focussing on the sample of firms that borrow from two lenders is consistent with the analysis in MGM and close in spirit to other studies. For example, Bolton and Sharfstein (1996) consider a basic scenario with one or two creditors; more in general, as stressed by Ongena and Smith (2000), the extant incomplete contract theories of multiple borrowing are "one-to-few" creditor theories. On the basis of the above considerations, we first run our regressions on the sub-sample of firms with up to two lenders and disregard all firms that borrow from three or more sources (1,161 observations). We also drop the very small firms (five or less employees, 1,798 observations) as their borrowing pattern may be dictated by the presence of fixed borrowing costs;[21] in the next section we check the robustness of our results to these exclusions. After these exclusions and the loss of some observations due to missing values in the explanatory variables, the final sample comprises 2,302 firms of which 913 borrowed from multiple lenders and 1,389 had only one lender.

Consider the first-stage regression, whose estimate is shown in the first column of each panel. As we explained in Section 3, we include three indicators of the firm's credit history (a dummy for going bankrupt plus indicators of delinquency on business or personal obligations) in the probit but not in the second-stage regression. Firms with a past personal or business delinquency are more likely to borrow from multiple lenders and differentiate borrowing among their lenders. Both these indicators of firm quality are generally statistically significant, reassuring us about the power of the instruments. Using the estimates in Panel A, we find that, compared with firms that have never been delinquent on business obligations, those that have been delinquent three or more times are 6.6 percentage points more likely to borrow from multiple lenders, and those that have been delinquent three or more times on personal obligations 10.4 percentage points more likely (about 25 percent of the sample mean). By contrary, the indicator for bankruptcy over the past seven years has no effect on the probability of multiple borrowing. Since one exclusion restriction is sufficient to achieve identification, we can also test the validity of our instruments by inserting the three indicators of firm quality one at a time in the second-stage regression. If the exclusion restrictions are valid, they should be statistically insignificant. And in fact, inserting in turn the indicators of personal delinquency, of business delinquency and of bankruptcy, we find that none is statistically significant.

The negative effect of firm quality on the probability of choosing differentiated borrowing is consistent with the predictions in MGM as long as firms' fear of premature liquidation outweighs that of seeing their assets seized during a reorganization. By contrary, this negative effect is in general at odds with the implications of the other strands of the incomplete contract literature, which often predicts that high quality firms prefer multiple borrowing. For example, in the hold-up literature (see, e.g., Rajan, 1992) high quality firms choose multiple borrowing because they are severely damaged by banks' hold-up and the associated rent extraction. Carletti, Cerasi, and Daltung (2004) constitute a notable exception. In fact, they predict that high quality firms resort to single borrowing because, thanks to their good prospects, they can induce their unique lender to monitor intensively and thereby they can commit to efficient investment plans.

The probability of differentiated funding is positively correlated with the value of assets. As we see in Table 2, this contradicts the predictions in MGM, because in that analysis asset value increases the optimal degree of differentiation conditional on choosing differentiated borrowing, but should have a negative effect on the probability of differentiated borrowing. This result also conflicts with the predictions obtained by the soft budget constraint literature. In Bolton and Sharfstein (1996), for example, firms with little assets realize low liquidation returns regardless of the number of creditors and, hence, are more willing to experience the drop in liquidation returns that multiple borrowing entails. One reasonable explanation for the positive sign on the asset value is that it reflects a positive correlation between firm size and the probability of multiple borrowing, for example due to the fact that large firms need larger loans and a wider range of services than small firms. To check this possibility further, we add the firm workforce (in logs) as a proxy for size. Indeed, the coefficient on assets decreases considerably and loses precision although it remains positive and statistically significant.[22]

Turning to the firm's co-movement - our main proxy for ease of asset redeployment - we find that it has a positive and statistically significant (at the 9 percent level) effect on the probability of differentiated borrowing. Raising co-movement from the 10^{th} to the 90^{th} percentile of the distribution increases the probability of multiple differentiated borrowing by 5 percentage points, about 12.5 percent of the sample mean. Both the dummy variable for the rural/urban location and the share of illiquid assets have a positive sign, but neither is statistically significant. These results for the proxies of asset redeployability match the predictions obtained by MGM and are also consistent with the predictions of the soft budget constraint literature (e.g., Bolton and Sharfstein, 1996) - see Table 2. This suggests that multiple borrowing constitutes a device to discipline banks and entrepreneurs. Of the two proxies for asset heterogeneity, the number of trade creditors of the firm is never statistically significant either in the probit or in the intensity

regressions and has thus been dropped in the final regressions; the indicator for single plant has a negative sign and is statistically significant at the 8 percent level. This finding is consistent with the prediction in MGM that firms with geographically diversified assets resort to multiple borrowing more.

Turning next to the variables specifically aimed at capturing the firm's informational transparency, we find that the credit card indicator has a negative sign (significant in one specification) while the age of the firm and the indicator for whether the firm has written records are not statistically significant (see Panels B and C). Although non-conclusive, the result for the credit card indicator is consistent with the idea that more informationally transparent firms need to resort less to multiple differentiated borrowing. This is in line with our benchmark predictions and with those of other incomplete contract theories, such as the soft budget constraint and the hold-up theory, suggesting that the availability of public information mitigates banks' and entrepreneurs' misbehavior. The result for the variable "ownership concentration" deserves a more careful inspection. As we argued in Section 3, this variable can be interpreted either as a proxy of restructuring costs or as a proxy of informational transparency. Under our benchmark hypotheses, with both types of interpretation ownership concentration is predicted to have a positive effect on the probability of borrowing from multiple creditors, which is indeed what we find in the data. The other variable aimed at measuring restructuring costs behaves as predicted by our benchmark hypotheses. In fact, the probability of multiple borrowing is affected negatively by the average duration of the relationships between the firm and its lenders: using the estimates in Panel A, a one standard deviation increase in the average length of the relations lowers the probability of differentiated borrowing by 7.8 percentage points. Finally, the proxies for monitoring costs and firm innovativeness are not statistically significant.

The estimates of the degree of borrowing differentiation across lenders are reported in the second column of each panel. The degree of differentiation increases with the asset value, even after controlling for firm size, as measured by the log number of employees; the coefficient is significant at the 1% level. The result for the value of assets is remarkable, because it means that a firm with more assets that borrows from two institutions will tend to allocate borrowing in a more differentiated way (borrowing, say 80 percent from the first and 20 from the second) than a firm with less assets, which will tend to divide its borrowing more evenly. Using the estimates in Panel A, increasing assets by one standard deviation raises the degree of differentiation by 4.3 percentage points - about 10 percent of the sample mean. This result is corroborated by the findings for the proxies of asset liquidity. Co-movement has a negative and statistically significant effect on the degree of borrowing differentiation; economically, increasing co-movement from the

10^{th} to the 90^{th} percentile lowers the Herfindahl on loans by 3.3 percentage points (8.25 percent of the sample mean). The dummies for rural location and the share of illiquid assets have a negative sign and are significant at the 4.6% and at the 5.4% level respectively. These results for the asset value and liquidity match the predictions in MGM. In fact, in that analysis banks have a strong incentive to make inefficient choices to appropriate valuable and liquid assets: therefore, firms with more valuable and liquid assets need to differentiate their borrowing more in order to prevent this misbehavior. For the sake of comparison, observe that, as displayed in Table 2 (eighth column), the analysis in Elsas, Heinemann, and Tyrell (2004) yields ambiguous predictions for the effect of the asset value and liquidity on borrowing concentration. In fact, two opposite forces are at work in their analysis. On the one hand, when the assets that the lenders can repossess are very valuable and liquid, the additional surplus that the lenders can extract in case of hold-up is small. This mitigates the hold-up cost associated with concentrated borrowing and, hence, tends to raise borrowing concentration. On the other hand, when the assets are very valuable and liquid, the probability that the banks with small stakes in the firm rush to withdraw financing at an interim stage is low. This renders concentrated borrowing less necessary and, hence, tends to reduce borrowing concentration.

Turning to the geographical indicator for asset heterogeneity (one site), we find that it has a positive and significant effect on borrowing differentiation, as predicted by MGM. This may indeed indicate that firms with more geographically homogeneous assets need to differentiate their borrowing more to prevent banks' misbehavior. Among the remaining variables, we find that the availability of written records tends to induce higher borrowing concentration: this is consistent with the positive effect that informational transparency has on concentration in Elsas, Heinemann, and Tyrell (2004), for example. Finally, the other proxies for informational transparency and the proxies for monitoring costs and innovativeness are estimated with a high standard error.

To sum up, the results of the estimates appear to support the hypotheses on the structure of multiple credit relationships obtained in MGM and more broadly in the literature on the (mis)behavior of concentrated creditors during reorganizations. This conclusion is reinforced by the observation that the signs of the coefficients in the second-stage and in the first-stage regressions (with the exception of the asset value) tend to be opposite, as MGM imply. At the same time, the results also support hypotheses drawn from incomplete contract theories of multiple borrowing: in particular, we find evidence that the hold-up and the soft budget constraint issues have an important role in shaping the structure of credit relationships.

5 Robustness Tests

In this section, we perform robustness checks. First, we examine issues of sample selection; second, we account for the possibility that different types of loans have different informational content; third, we consider alternative proxies for the allocation of borrowing and for firm quality.

5.1 Sample Selection

The results in Table 5 are based on a selected sample that excludes firms borrowing from more than two sources; while this is intentionally done to identify the effect of the explanatory variables on borrowing concentration, since firms choose the number of lenders, our estimates may be affected by selection bias. To account for this, in Table 6, Panel A, we re-estimate our regressions by including firms that borrow from more than two lenders, while retaining only those with more than five employees. We control for variation in the Herfindahl index induced by the number of relations by controlling for the size of the firm, measured by the number of employees. If this is an effective control, the coefficients of the other explanatory variables should not be very different from those in Table 5. The sample size increases to 2,586 firms, but the size and significance of the parameters estimated are essentially unchanged. The result we obtain for the asset value appears to further corroborate the idea that we are properly controlling for variation in the Herfindahl index induced by the number of relations. If the asset value were picking some of the effect that size has on concentration via the number of lenders, it would have a negative sign (larger firms, larger asset value, more lenders, lower concentration). By contrary, consistent with our benchmark hypotheses, we find that asset value increases the concentration of borrowing and its coefficient is not different from that in Table 5. In Panel B, we expand the sample to include firms with at least two employees, while retaining only those that borrow from just two lenders. Again, results are essentially unchanged; the only coefficient that becomes lower and loses significance is that of the degree of co-movement in the probit equation; the other parameters are basically unaffected. Finally, in Panel C we carry out the estimates on the whole sample; results are robust to this extension too, confirming that they are not driven by sample selection.

5.2 The Informational Content of Loans

It is sometimes argued that different types of loans can convey different amounts of information to a creditor. For example, in the parlance of Wall Street, credit lines are thought to be more "relationship-driven" than other forms of loans (Berger and Udell, 1995). According to Berger

and Udell (1995), mortgages, equipment loans, motor vehicle loans are often one-time loans or loans for nonrecurring credit needs and this dilutes their informational content. By contrary, the informational content associated with the long term commitment of credit lines is likely to be more substantial. Thus, as a robustness check for our results, we compute our measure of loan concentration (the Herfindahl) by assigning a higher weight to credit lines. In Table 7, we display the results obtained with two different weighting schemes: in Panel A, we assign a weight of two to credit lines and a weight of one to the remaining categories of loans; in Panel B, we take a starker approach and assign a weight of one to credit lines and a weight of zero to the remaining categories of loans. The results of the estimates are virtually identical to those already discussed. Since the choice of the "informational weights" is arbitrary, we experimented with other weighting schemes, obtaining similar results.

5.3 Alternative Proxy Variables

Borrowing Differentiation. The reader could wonder whether our results are robust to using alternative measures of borrowing differentiation, such as the Herfindahl-Hirschman Index of the duration of credit relationships. The latter measure is consistent with the analysis in MGM, although it is a poor fit for the analysis in Elsas, Heinemann, and Tyrell (2004), for example, where the share of loans is interpreted literally rather than as a proxy for information. We thus reestimated our regressions using the Herfindahl of the duration of credit relationships. The results (not reported for brevity) generally confirm our findings. For example, borrowing differentiation is negatively affected by firms' co-movement, while the probability of multiple differentiated borrowing is negatively related to firm quality, and to the asset liquidity (inverse of co-movement) and homogeneity (one site), though the statistical significance of the parameters is lower than in the regressions with the Herfindahl of loans. Lack of precision in the estimates can be explained by recent results of the literature on relationship lending. In fact, Elsas (2005) finds that the length of a credit relationship is a much poorer indicator of the tightness of the relationship than the share of credit granted by the financier.

Firm Quality. In the empirical analysis we have proxied the quality of the firm with measures of its probability of default. The reader could wonder whether this approach is too restrictive and we have neglected alternative measures of the quality of the firm such as its profitability. To check the robustness of the results, we thus reestimated our regressions adding the profits of the firm normalized by its sales as an additional control variable. Since the exclusion restriction drawn from MGM specifically refers to firm quality as profitability of default, we

experimented with profitability in both stages of the estimation and then only in the first stage. Regardless of the approach followed, profitability turned out to be statistically insignificant in virtually all the estimations. Furthermore, the inclusion of profitability left the results virtually unaffected.[23]

6 Conclusion

We have examined how a firm allocates its borrowing across multiple concentrated creditors. In formulating our benchmark hypotheses, we have been inspired by growing evidence on the misbehavior of concentrated creditors during private reorganizations. This misbehavior is far from being a remote problem. In fact, large creditors appear to behave opportunistically not only during reorganizations but also before the distress of a firm becomes publicly known, when they can detect failure more quickly and grab the available assets first. For example, analyzing Belgian firms, Degryse and Van Cayseele (2000) find that the share of collateral that a bank can seize increases with the tightness of the relationship between the firm and the bank, as measured by the scope of services provided by the latter.

We have tested our benchmark hypotheses on the structure of credit relationships and the complementary hypotheses in the incomplete contract literature on multiple borrowing using data from a sample of small U.S. firms. We have found that firms with more valuable and more redeployable assets differentiate their borrowing more sharply. We have also found that firms with assets more heterogeneous in their redeployability choose to have less differentiated links with their creditors. Finally, we have found some evidence that the degree of borrowing differentiation is inversely related to restructuring costs and positively related to firms' informational transparency. All in all, this evidence appears to confirm our hypotheses.

We believe that this analysis represents a step in a potentially fruitful line of research. As stressed by Bolton and Sharfstein (1996), although debt is far more important than equity as a source of financing, in the past the corporate finance literature devoted much more attention to explaining firms' debt to equity ratio than the structure of firms' debt. Indeed, since Bolton and Sharfstein (1996), some scholars have carried out analyses on firms' choice between dispersed and concentrated debt. In this paper, we have found that treating concentrated debt itself as a monolithic entity is unjustified and that the distribution of borrowing across concentrated creditors may provide rich insights.

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Notes

[1]Throughout the analysis, we use the term "bank" with a broad meaning, as standing for any concentrated lender or financial institution.

[2]Analyzing the restructuring of the Italian Ferruzzi Group (19.9 billion dollars of total indebtedness), Penati and Zingales (1997) find that the bank restructuring committee gained a net Lit. 1,952 billion ($1.3 billion) from the (reorganization) plan with respect to an equally feasible break-up alternative and argue that, during private reorganizations, "...the desire to increase their payoff leads the "controlling" creditors to choices that are inefficient (p. 29)". Analyzing lenders' practice in the United States, Picker (1992, p. 657) writes "Creditors fear their fellow creditors. When the going gets tough, the tough creditor gets going: aggressive creditors seek payment of their claims in full from the failing debtor with the hope of avoiding the pro rata payment regime that would otherwise apply in bankruptcy". Sheard (1994) argues that this type of opportunistic behavior extends to Japanese main banks that frequently intervene in the reorganization of distressed firms but then force the firms into bankruptcy after securing their own claims.

[3]Holmstrom and Tirole (1997) develop a model where the larger the amount of credit a lender grants to a firm, the higher its incentive to acquire information on the firm.

[4]In fact, a substantial amount of the information a lender acquires about a firm comes through its operations with the firm. Observing how a credit line evolves, whether a ceiling is exceeded and how often, whether installments on loans are regularly paid etc., conveys excellent information on the financial and economic condition of a firm. This is also consistent: i) with banks' practice of computing "internal scores", that is scores based on information derived solely from how the credit relation evolves; ii) with the existence of Credit Registers, i.e. devices through which banks share some of the information they obtain from a relationship with a firm. Credit Registers make sense only if relations are continuously started over (e.g., because of high geographical mobility, as shown by Pagano and Jappelli, 1993) or because borrowers engage in multiple relationships so that each lender has partial information on its customers. However, since information is only partially shared, lenders will continue to have different information even when a Credit Register is available.

[5]For a detailed analysis of the costs and benefits of credit relationships when contracts are incomplete, see, e.g., chapter 10 in Allen and Gale (2000).

[6]The paper also shares some features with the empirical analyses on corporate reorganizations (see, e.g., Gilson, John and Lang, 1990, and Weiss, 1990).

[7]The analysis is robust to specifying that the firm establishes credit relationships sequentially rather than simultaneously. In fact, the bargaining power of a bank when contracting upon the firm's assets is related only to its share of financing, regardless of when the credit relationship starts.

[8]In this aspect, the model shares some features with the analysis of Manove, Padilla, and Pagano (2001) where the presence of sufficient collateral can discourage a bank from screening a project and, hence, induce the continuation of bad projects.

[9]In Minetti (2004) and Guiso and Minetti (2004), a bank's bargaining power in asset seizure and its reorganization cost are proportional to its share of financing. This implies that the firm derives no benefit from having multiple credit relationships in terms of competition among banks at an interim stage of the project (as instead it happens in the hold-up literature -see Rajan (1992) and Section 2.2 in this paper for more).

[10]Focussing on dispersed debt, Bris and Welch (2005) develop a model in which the larger the number of creditors the higher creditors' incentive to free ride on each other. Bris and Welch (2005) focus on problems of team free-riding among dispersed creditors, i.e. "very small creditors that may not find it worthwhile to register" (p. 21). This paper focuses instead on concentrated creditors, such as banks.

[11]For an analysis of lenders' monitoring in a more abstract setting, see Khalil, Martimort, and Parigi (2004).

[12]Two other studies are worth mentioning. Fluet and Garella (2005) study a model with multiple lenders with different information and focus on the possibly imperfect aggregation of information. In their model, a firm borrows from multiple lenders and at the liquidation/continuation stage a non-informed lender can choose to continue only because it knows that its mistake can be corrected by a better informed lender. Detragiaghe, Garella and Guiso (2000) develop a model where a firm may borrow from multiple banks to insure itself against negative liquidity shocks hitting its main bank (and the consequent contraction of credit). The only determinant of the number of banks that is not already accounted for in other theories is the degree of fragility of the main bank. However, in order to test its impact on the number of creditors, one would need matched bank-firm data, which we lack.

[13]We dropped a few observations with exceedingly high (>2.84e07 current dollars) and exceedingly low assets (<270 current dollars). These firms are clear outliers.

[14]Another possible reason for which small firms better fit our analysis is that their stakeholders could be relatively unsophisticated and, hence, unable to contrast the misconduct of concentrated creditors. For example, the trade creditors of small firms are often themselves small firms.

[15]Categories of loans include: credit lines, leases, mortgages, motor vehicle loans, equipment loans, and other loans.

[16]The number of observations on which the co-movement measure is based varies with industry; the mean is 7,292, the lowest 402. Note also that the NSSBF requests each firm to provide a unique SIC code to classify the firm's activities. Being very small businesses, it is unlikely that these firms operate in more than one industry at least when a two-digit classification is used, as we do.

[17]MGM predict that firms located in rural areas have more incentives to borrow from more than one bank. Interestingly, this prediction is the opposite of what one would derive from the argument that in rural areas the offer of financial services is more limited than in cities.

[18]If we focus on the first-stage regression, MGM predict that firms with more than one site borrow from more than one bank. In principle, one could argue that this is because a firm wants to minimize the distance between plants and creditors. In particular, a firm with multiple plants could have an advantage in borrowing from multiple creditors, each close to a plant and with particular expertise in assessing production in that plant. However, Petersen and Rajan (2002) find that, at least for U.S. firms, thanks to computers and communication equipment, hard information about a firm is now also available at a distance, and distance itself has become a far less important factor than in the past.

[19]Written records include tax records and financial statements.

[20]We rely only on the 1998 data because data for 1993 - which could match the first wave of the NSSBF - had several missing observations. However, for the industries where the information is available for both years we found a positive and high correlation coefficient between the indicator in the two years, suggesting a fairly stable pattern of R&D intensity across industries.

[21]Moreover, the financing of some assets could exhibit some indivisibility and this could bias the results towards concentrated funding. If present, these indivisibilities are likely to be relatively more important for firms with a small volume of activity and to be negligible for bigger firms. This suggests dropping very small firms.

[22]For a more thorough discussion on the correlation between firm size and number of lenders, see Detragiache, Garella, and Guiso (2000). The positive correlation between the probability of differentiated funding and asset value could also stem from financial imperfections and supply side effects. In particular, if some minimum collateral

is required, a firm with low asset value could be unable to borrow from more than one bank.

[23]Two further issues are worth discussion. The first is the persistence of the debt structure. The cross-sectional nature of the NSSBF data does not allow us to investigate (exploit) possible time variation in the structure of credit relationships. However, to have a feeling about this, we considered data from the "VIII Indagine sulle Imprese Manufatturiere", a survey of small and medium sized manufacturing firms conducted by the Italian banking group Capitalia in 2001. This survey reveals that the bank with the largest share of financing tends to be the same for many years (on average 17). This suggests high stability in the shares of borrowing across lenders, thus implying that most variation is likely to be cross sectional. The second issue is the role of collateral. The analysis in MGM especially applies to free assets, that is assets that do not secure any loan in particular. The NSSBF data do not report the value of collateral so that we cannot measure the percentage of free assets. However, the mean share of collateralized loans is below 55%. This suggests that many creditors are not secured by collateral and may have an incentive to try and seize free assets. Moreover, for secured lenders the face value of debt may well exceed the collateral value so that these lenders may also have the incentive to seize free assets. Finally, even making the implausible assumption that for all the collateralized loans the value of collateral equals the face value of debt, debt is only a fraction of the assets of a firm implying that a significant portion of a firm's assets do not secure any loan in particular.

Table 1: Structure of Credit Relationships

The table summarizes the structure of lending relations for the U.S. firms in the pooled 1993 and 1998 waves of the National Survey of Small Business Finance conducted by the Board of Governors of the Federal Reserve System and the Small Business Administration. The second column reports the share of firms in the sample that have n (=0, 1, 2, 3, >3) lenders. Columns 3-6 report the share of loans granted by each lender ranked from highest to lowest. Columns 7-9 report the F-values for a test of the equality between the shares of loans granted by two different lenders (first and second in column 7, first and third in column 8, second and third in column 9).

Number of lenders	Share of firms with n lenders	Share of loans from x^{th} lender				F-test for equal borrowing shares		
		1st	2nd	3rd	other	1st vs 2nd	1st vs 3rd	2nd vs 3rd
No lenders	0.334							
One	0.339	1.00						
Two	0.180	0.765	0.235			478.44		
Three	0.080	0.651	0.181	0.168		701.75	1,352.05	135.92
Four or more	0.067	0.538	0.174	0.065	0.229	849.30	1,212.28	193.50

Table 2: Expected Signs of the Effect of the Explanatory Variables

For the theories in Section 2 of the paper, the table summarizes the expected effects of the explanatory variables used in estimation on the decision to rely on differentiated borrowing (i.e. borrow from multiple lenders, the extensive margin) and on the extent of differentiation conditional on differentiating (the intensive margin). In the probability of differentiation the dependent variable is an indicator variable equal to 1 if the firm has more than one lender. In the degree of differentiation the dependent variable is the degree of concentration of the loans obtained from the firm's multiple lenders, as measured by the Herfindahl-Hirschman Index. "MGM" refers to the analysis in Minetti (2004) and Guiso and Minetti (2004); "SBC" refers to the soft budget constraint literature, especially Bolton and Sharfstein (1996); "Hold-up" refers to the literature on the hold-up issue, especially Rajan (1992) and Hubert and Shafer (2002) for the probability of differentiated borrowing and Elsas, Heinemann, and Tyrell (2004) for the degree of differentiation; "Monitor." refers to the literature on banks' monitoring, especially Carletti (2004) and Carletti, Cerasi and Daltung (2005) for the probability of differentiation and Holmstrom and Tirole (1997) for its degree; "Secrecy" refers to the literature on secrecy and innovation, especially Von Rheinbanen and Ruckes (2004) and Yosha (1995).

	Effect on							
Variable	Probability of Differentiation					Degree of Borrowing Differentiation		
	MGM	SBC	Hold-up	Monitor.	Secrecy	MGM	Hold-up	Monitor.
Firm Quality	?	+	+	?	+			
Asset Value	−	−				+	?	
Asset Liquidity	−	−				+	?	
Asset Heterog.	+					−		
Transparency	−	−	−			−	+	−
Monitor. Costs				+				+
Restruct. Costs	+					−		
Innovativeness					−			

Table 3: Measurement of the Explanatory Variables

The table lists the proxies used in the empirical analysis to measure the variables in Table 2.

Variable	Proxies
Firm Quality	Business and Personal Delinquency, Bankruptcy
Asset Value	Asset Value
Asset Liquidity	Comovement, Rural Location, Share Illiquid Assets
Asset Heterogeneity	One Site Dummy, Number of Suppliers
Information Transparency	Size, Age, Credit Card, Records
Monitoring Costs	Region (Bank Employees)/Loans
Restructuring Costs	Average Length of Relations, Ownership Concentration
Firm Innovativeness	Sector R&D/Sales

Table 4: Descriptive Statistics

The table reports summary statistics for the variables used in estimation. Panel A refers to the whole sample; Panel B to the sample of firms with at least one lender. In each panel, the second column reports the mean of the variables while columns three to five report the quartiles of the distribution. Loans concentration is measured by the Herfindahl-Hirschman Index. Assets and sales are in current dollars. Rural location, one site, bankruptcy, records, and credit card are dummies taking the value of one if the firm has the specified characteristic. The length of relations is expressed in months. Main owner share is the share of equity held by the principal owner (in percentage). Business (personal) delinquency is a variable taking the value of 0,1,2,3 if the firm has been delinquent on business (personal) obligations zero, one, two, three or more times, respectively. Age is expressed in years from the foundation. Monitoring costs is the ratio (bank employees)/loans in the census region. R&D is the ratio (R&D expenditures)/sales in the sector.

Variable	**Panel A: All firms**			
	Mean	25%	50%	75%
Loans concentration	0.813	0.580	1	1
Assets	1,243,267	28,000	127,040	731,966
Comovement	0.051	0.019	0.037	0.078
Rural location		0	0	1
Illiquid assets (share)	0.383	0.08	0.333	0.645
N. employees	29.870	2	6	27
N. suppliers/sales	8.01e-05	3.16e-06	1.61e-05	0.000496
One site		0	1	1
Length of Relations	84.414	32	60	112
Main owner share (%)	77.631	50	100	100
Age	14.948	6	12	20
Credit Card		0	1	1
Records		1	1	1
Monitor. Costs	0.00678	0.0057	0.0068	0.0071
R&D	0.0427	0.0075	0.0302	0.0637
Business delinquency	0.402	0	0	0
Personal delinquency	0.330	0	0	0
Bankruptcy	0.027	0	0	0
Variable	**Panel B: Firms with at least 1 lender**			
	Mean	25%	50%	75%
Loans concentration	0.813	0.580	1	1
Assets	1,732,056	62,959	273,658	1,492,000
Comovement	0.053	0.02	0.037	0.08
Rural location		0	0	0
Illiquid assets	0.403	0.12	0.359	0.662
N. employees	39.790	4	10	50
N. suppliers/sales	5.96e-05	4.41e-06	1.52e-05	4.17e-05
One site		0	1	1
Length of Relations	84.414	32	60	112
Main owner share (%)	74.081	50	92	100
Age	15.212	6	12	20
Credit Card		0	0	1
Records		1	1	1
Monitoring Costs	0.00677	0.0057	0.0068	0.0071
R&D	0.0414	0.0075	0.0302	0.0637
Business delinquency	0.458	0	0	0
Personal delinquency	0.367	0	0	0
Bankruptcy	0.025	0	0	0

Table 5: Estimating the Choice of Multiple Borrowing and the Degree of Differentiation

The table reports estimation results for the subsample of firms with up to two lenders; firms with 5 or less employees are excluded. In each panel, the first column reports estimates for the first-stage probit for the decision to borrow from differentiated sources; the second column reports the estimates for the second-stage decision of the degree of differentiation. In the probit, the dependent variable is an indicator variable equal to 1 if the firm borrows from more than one lender. In the intensive margin, the dependent variable is the degree of concentration of the loans obtained from the firm's multiple lenders, as measured by the Herfindahl-Hirschman Index. Assets are in current dollars. Rural location, one site, bankruptcy, records, and credit card are dummies taking the value of one if the firm has the specified characteristic. The length of relations is expressed in months. Main owner share is the share of equity held by the principal owner (in percentage). Business (personal) delinquency is a variable taking the value of 0,1,2,3 if the firm has been delinquent on business (personal) obligations zero, one, two, three or more times, respectively. Age is expressed in years from the foundation. Monitoring costs is the ratio (bank employees)/loans in the census region. R&D is the ratio (R&D expenditures)/sales in the sector. t-values are in parenthesis. All regressions include a constant term and a dummy for 1998; ***, **, * denote significance at 1%, 5% and 10%.

	Panel A		**Panel B**		**Panel C**	
	Prob. of different.	Degree of different.	Prob. of different.	Degree of different.	Prob. of different.	Degree of different.
Firm quality						
Business delinquency	0.057^{*} (1.90)		0.058^{*} (1.91)		0.046 (1.47)	
Personal delinquency	0.087^{**} (2.49)		0.088^{**} (2.51)		0.077^{**} (2.13)	
Bankruptcy	-0.012 (-0.07)		0.073 (0.04)		-0.030 (-0.16)	
Asset value (log)	0.051^{**} (2.52)	0.023^{***} (4.97)	0.048^{**} (2.37)	0.022^{***} (4.87)	0.048^{**} (2.27)	0.019^{***} (3.92)
Asset liquidity						
Comovement	1.137^{*} (1.69)	-0.329^{**} (-2.28)	1.196^{*} (1.78)	-0.331^{**} (-2.29)	1.200 (1.56)	-0.317^{*} (-1.90)
Rural Location	0.046 (0.75)	-0.026^{**} (-2.00)	0.046 (0.74)	-0.028^{**} (-2.13)	0.030 (0.47)	-0.027^{**} (-2.00)
Illiquid Assets	0.085 (0.92)	-0.039^{*} (-1.93)	0.102 (1.09)	-0.038^{*} (-1.84)	0.128 (1.28)	-0.059^{**} (-2.66)
Log(Employees)	0.057^{*} (1.77)	0.009 (1.33)	0.057^{*} (1.76)	0.009 (1.37)	0.061^{*} (1.82)	0.010 (1.43)
Asset heter.						
One Site	-0.103^{*} (-1.75)	0.024^{*} (1.90)	-0.106^{*} (-1.79)	0.024^{*} (1.88)	-0.114^{*} (-1.86)	0.021 (1.59)
Restruct. Costs						
Length of Relations	-0.002^{***} (-6.21)	$-0.8e-04$ (-0.77)	-0.002^{***} (-6.15)	$-0.9e-04$ (-0.84)	-0.002^{***} (-5.63)	$-0.1e-03$ (-1.32)
Main Owner Share	0.002^{**} (2.11)	$0.2e-04$ (0.07)	0.002^{**} (2.06)	$0.5e-04$ (0.21)	0.002^{**} (1.96)	$0.3e-04$ (0.12)
Transparency						
Credit Card			-0.106^{*} (-1.93)	-0.001 (-0.08)	-0.092 (-1.62)	-0.003 (-0.22)
Records			0.021 (0.22)	0.047^{**} (2.23)	0.012 (0.12)	0.041^{*} (1.92)
Age					$-0.4e-03$ (-0.17)	$0.8e-03$ (1.59)
Monitoring Costs					-0.032 (-0.00)	-5.556 (-1.39)
R&D					0.090 (0.12)	-0.028 (-0.17)
N. obs.	2,302		2,302		2154	
N. uncensored	913		913		859	

Table 6: Robustness. Including Firms with more than Two Lenders and Very Small Firms

The table reports estimation results for firms with at least one lender, excluding firms with 5 or less employees (Panel A); estimation results for firms with up to two lenders including the very small businesses (Panel B); estimation results for firms with at least one lender including the very small businesses (Panel C). In each panel, the first column reports estimates for the first-stage probit for the decision to borrow from differentiated sources; the second column reports the estimates for the second-stage decision of the degree of differentiation. In the probit, the dependent variable is an indicator variable equal to 1 if the firm borrows from more than one lender. In the intensive margin, the dependent variable is the degree of concentration of the loans obtained from the firm's multiple lenders, as measured by the Herfindahl-Hirschman Index. Assets are in current dollars. Rural location, one site, bankruptcy, records, and credit card are dummies taking the value of one if the firm has the specified characteristic. The length of relations is expressed in months. Main owner share is the share of equity held by the principal owner (in percentage). Business (personal) delinquency is a variable taking the value of 0,1,2,3 if the firm has been delinquent on business (personal) obligations zero, one, two, three or more times, respectively. Age is expressed in years from the foundation. Monitoring costs is the ratio (bank employees)/loans in the census region. R&D is the ratio (R&D expenditures)/sales in the sector. t-values are in parenthesis. All regressions include a constant term and a dummy for 1998; ***, **, * denote significance at 1%, 5% and 10%.

	Panel A		Panel B		Panel C	
	Prob. of differ.	Degree of different.	Prob. of differ.	Degree of different.	Prob. of differ.	Degree of different.
Firm quality						
Business delinquency	0.076***		0.048*		0.073***	
	(2.73)		(1.76)		(2.98)	
Personal delinquency	0.086***		0.074**		0.081***	
	(2.66)		(2.45)		(2.96)	
Bankruptcy	−0.113		−0.011		−0.069	
	(−0.65)		(−0.07)		(−0.48)	
Asset value (log)	0.063***	0.022***	0.071***	0.016***	0.087***	0.018***
	(3.24)	(4.84)	(3.90)	(3.63)	(5.21)	(4.27)
Asset liquidity						
Comovement	1.641**	−0.263*	0.605	−0.275*	0.893	−0.248*
	(2.37)	(−1.71)	(0.90)	(−1.92)	(1.46)	(−1.90)
Rural Location	0.059	−0.027**	0.049	−0.020*	0.082	−0.020*
	(1.02)	(−2.22)	(0.87)	(−1.70)	(1.62)	(−1.82)
Illiquid assets	0.221**	−0.073***	0.126	−0.042**	0.245***	−0.069***
	(2.45)	(−3.54)	(1.50)	(−2.27)	(3.22)	(−3.83)
Log(Employees)	0.061**	0.012*	0.061**	0.011*	0.059**	0.013**
	(1.98)	(1.85)	(2.25)	(1.92)	(2.38)	(2.30)
Asset heter.						
One site	−0.143**	0.027**	−0.066	0.017	−0.112**	0.024**
	(−2.59)	(2.16)	(−1.18)	(1.39)	(−2.20)	(2.14)
Restruct. Costs						
Length of relations	−0.002***	$-0.1e-03$	−0.002***	$-0.2e-03$	−0.002***	$-0.2e-03$
	(−7.30)	(−1.18)	(−6.15)	(−1.34)	(−7.79)	(−1.37)
Main owner share	0.001	$0.1e-03$	0.002*	$-0.3e-07$	0.001	$0.1e-03$
	(1.51)	(0.45)	(1.77)	(−0.02)	(1.27)	(0.57)
Transparency						
Credit Card	−0.107**	−0.007	−0.110**	−0.003	−0.143***	−0.002
	(−2.07)	(−0.61)	(−2.18)	(−0.30)	(−3.12)	(−0.16)
Records	0.016	0.038**	0.044	0.032*	0.044	0.031*
	(0.17)	(2.01)	(0.51)	(1.68)	(0.56)	(1.84)
Age	$0.4e-03$	$0.5e-03$	−0.002	0.001*	−0.001	0.001
	(0.18)	(0.98)	(−1.02)	(1.81)	(−0.66)	(1.33)
Monitoring Costs	−5.329	−5.347	8.843	−3.906	1.837	−3.749
	(0.31)	(−1.46)	(0.54)	(−1.10)	(0.12)	(−1.15)
R&D	0.891	−0.068	−0.118	−0.062	0.540	−0.136
	(1.30)	(−0.46)	(−0.18)	(−0.42)	(0.89)	(−1.15)
N. obs.	2,586		2,859		3,375	
N. uncensored	1,291		1,072		1,588	

Table 7: Robustness. Weighted Loans and Credit Lines

The table reports estimation results for all firms with at least one lender excluding the very small businesses (5 or less employees). In the estimates of Panel A, credit lines are attributed a weight twice that attributed to other types of loans. In the estimates of Panel B, credit lines are attributed a weight of one and other types of loans are attributed a weight of zero. In both panels, the first column reports estimates for the first-stage probit for the decision to borrow from differentiated sources; the second column reports the estimates for the second-stage decision of the degree of differentiation. In the probit, the dependent variable is an indicator variable equal to 1 if the firm borrows from more than one lender. In the intensive margin, the dependent variable is the degree of concentration of the loans obtained from the firm's multiple lenders, as measured by the Herfindahl-Hirschman Index. Assets are in current dollars. Rural location, one site, bankruptcy, records, and credit card are dummies taking the value of one if the firm has the specified characteristic. The length of relations is expressed in months. Main owner share is the share of equity held by the principal owner (in percentage). Business (personal) delinquency is a variable taking the value of 0,1,2,3 if the firm has been delinquent on business (personal) obligations zero, one, two, three or more times, respectively. t-values are in parenthesis. All regressions include a constant term and a dummy for 1998; ***, **, * denote significance at 1%, 5% and 10%.

	Panel A Weighted Loans		**Panel B** Credit Lines	
	Prob. of differ.	Degree of different.	Prob. of differ.	Degree of different.
Firm quality				
Business delinquency	0.083^{***} (3.05)		0.010 (0.28)	
Personal delinquency	0.099^{***} (3.12)		0.073^{*} (1.77)	
Bankruptcy	-0.069 (-0.41)		-0.349^{*} (-1.66)	
Asset value (log)	0.061^{***} (3.24)	0.028^{***} (5.77)	0.202^{***} (8.71)	-0.007 (-1.11)
Asset liquidity				
Comovement	1.224^{**} (2.02)	-0.197 (-1.43)	0.251 (0.33)	-0.343^{***} (-3.97)
Rural Location	0.066 (1.19)	-0.024^{*} (-1.96)	0.028 (0.41)	0.005 (0.60)
Illiquid assets	0.166^{*} (1.96)	-0.078^{***} (-3.93)	0.715^{***} (6.93)	-0.034^{*} (-1.72)
Log(Employees)	0.059^{**} (1.99)	0.013^{*} (1.90)	0.118^{***} (3.17)	-0.003 (-0.62)
Asset heterogeneity				
One site	-0.136^{**} (-2.55)	0.027^{**} (2.13)	-0.093 (-1.36)	0.017^{**} (2.16)
Restructuring Costs				
Length of relations	-0.002^{***} (-7.95)	$-0.1e-03$ (-0.92)	0.001^{***} (2.91)	$-0.3e-04$ (-0.86)
Main owner share	0.001^{*} (1.65)	$0.1e-03$ (0.59)	0.001 (0.52)	$-0.6e-04$ (-0.45)
Transparency				
Credit Card	-0.129^{***} (-2.60)	-0.016 (-1.33)	-0.292^{***} (-4.73)	0.005 (0.52)
Records	0.039 (0.44)	0.042^{**} (2.16)	0.144 (1.36)	0.010 (0.75)
N. obs.	2,756		2,302	
Uncensored	1,367		1,709	