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Firm Failure and Relationship Lending: New Evidence from Small Businesses

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Firm Failure and Relationship Lending: New Evidence from Small Businesses[1]

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Abstract

We study the effect of relationship lending on small firms´ failure probability using a uniquely rich data set comprised of information on individual loans of a large number of small firms in Colombia. We control for firm-specific variables and find that small firms involved in long-term liaisons with commercial banks have a significantly lower probability of becoming bankrupt than otherwise identical firms not involved in a long-term credit relationship. We also find that small firms with multiple banking relationships face a lower failure hazard than otherwise identical firms involved in a unique long-term relationship.

JEL Classification: G20; G21; C40.

Keywords: Firms; bank relationships; survival analysis.

1. Introduction

Financial institutions are a key source of external funding for firms. In the US, borrowing from financial institutions accounts for about 25% of the stock of external finance of the productive sector (Mishkin, 2009) and for almost all the stock of external finance of small businesses (Bodenhorn, 2003). Moreover, as Hawkins (2002) points out, the financial system in emerging economies is centered on banks. For example, the ratio of domestic bank lending to the sum of domestic bank lending and private sector domestic debt securities on issue is around 0.8 for Latin American and East Asian economies. Thus, for small businesses in developed countries and for most firms in developing economies, banks loom large.

Bank relationships have long been valued in financial economics theory. In a world in which informational asymmetries exist and matter, banks gather valuable information on firms´ creditworthiness through repeated lending. The establishment of long-term relationships allows banks to identify solvent firms and provide them with funding, reducing credit risk. Firms that form relationships with banks obtain several advantages, such as lower interest costs, lower collateral demands, and protection against credit rationing during times of financial distress. Therefore, both banks and firms seeking to finance profitable projects benefit from repeated contracting.

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[1] *Disclaimer:* The following is a working paper and does not necessarily reflect the official position of the Central Bank or its Board of Directors and Superintendencia Financiera de Colombia. The opinions and statements are the sole responsibility of the authors.

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The evidence indicates that relationships are favorable to firms in the sense that they increase funds availability and reduce loan rates (Elyasiani and Goldberg, 2004). There is also evidence indicating that the establishment of banking relationships may be more important for small firms which are typically more bank dependent than large firms (Fazzari et al, 1988; Dietsch, 2003; Guiso, 2003; Gómez-González and Reyes, 2010). However, while there is consensus in the literature about the importance of credit relationships, surprisingly there is no study on the effects of bank-firm liaisons on small firms´ failure probability.

This study uses a uniquely rich data set comprised of information on individual loans of a large number of small firms in Colombia, and contributes to the literature in two important ways. First, it provides evidence that the establishment of one or more long-term relationships with banks reduces significantly the probability of default of small businesses. This is the first study in providing such evidence. And second, it shows that unlike large firms in which the number of banking relationships does not affect the probability of failure, the choice between unique and multiple relationships significantly affects the hazards of bankruptcy.

Section 2 is a literature review section. Section 3 makes a description of the data used in the empirical analysis. Section 4 presents the empirical model and estimation results. Section 5 concludes.

2. Literature review

The existence of asymmetric information in financial markets makes bank lending unique. Various theoretical studies claim that financial intermediaries have a comparative advantage in the production of information about borrowers that leads to efficiency gains in the borrowing-lending process (e.g., Boyd and Prescott, 1986; Diamond, 1991). The establishment of client relationships may produce an important flow of information that facilitates the building of a bank-specific informational capital that mitigates informational problems in credit markets. Fama (1985) claims that these endogenous long-term relationships affect the ability firms have to raise capital. In particular, firms involved in a long-term relationship with a bank have a higher probability of raising the required funds to finance an investment opportunity than otherwise identical firms not involved in these kinds of relationships4.

Empirical studies have shown that relationship banking has a significant effect on the availability and quantity of credit, particularly for small businesses. To mention just a few examples, Petersen and Rajan (1994) use the 1987 National Survey of Small Business Finance and find that small firms increase their financing ability when they establish a long-term relationship with a bank. Berger and Udell (1996) arrive to the same conclusion using data from Federal Reserve's Survey of the Terms of Bank Lending to Business. Ely and Robinson (2007), using data from the Small Business Administration, report similar findings. Additionally, Boot and Thakor (1994) show that

[4] In a world in which firms´ repaying capacity in the future is not directly observable, the firm that obtains a new loan sends a signal to the market that its projects are worth of being financed, increasing its probability of raising the required funds. A firm that has a well established relationship with a bank has a better chance to obtain a new loan, and therefore the lender-borrower relationship can affect firms´ ability of raising capital.

interest rates charged by banks to firms and collateral requirements decrease as the relationship matures.

Banks find it also convenient to establish credit relationships with firms, because their cost of maintaining long-term relationships is normally lower than the cost of repeated direct monitoring (Haubrich, 1989). The process of repeated contracting can produce valuable input for the lender in making decisions on loan issuing, loan pricing, and collateral requirements.

While there seems to be a consensus on the importance of the establishment of long-term relationships between banks and non-financial firms, the optimal number of such relationships has been a subject of debate. Diamond (1984) shows that in a one-shot game each firm optimally chooses a unique banking relation. However, in a repeated lending setting the results are mixed. Some studies argue in favor of a unique long-term relation (Haubrich, 1989; Sharpe, 1990) while others argue in favor of multiple relations (Rajan, 1992; Detragiache et Al. (2000); Von Thadden, 2004).

In the real world, unique long-term bank relations and multiple bank relations coexist (Degryse et Al., 2009). Some recent studies have shown firm heterogeneity can explain this empirical regularity. Bolton and Scharfstein (1996) build a model in which the optimal number of banking relations depends on individual firm characteristics, such as technology, credit rating, and the industry to which the firm belongs. Bris and Welch (2005) show that if borrower quality is not known, the best firms choose to have a lower number of creditors to signal themselves as robust firms. Von Rheinbaben and Ruckes (2004), assume that revealing information can be costly for firms, and show that highly competitive and innovative firms tend to sustain a lower number of banking relations. Using similar arguments, Yosha (1995), and Bhattacharya and Chiesa (1995) obtain the same result.

There are no theoretical studies in which the firm´s size matters for the optimal number of relationships. However, papers that have studied the microeconomic determinants of the optimal number of banking relationships using data from different countries have shown that small firms tend to maintain fewer bank relationships than large firms (Ongena and Smith, 2000; Dietsch, 2003; Guiso, 2003; Qian and Strahan, 2007; Gómez-González and Reyes, 2010). This empirical regularity may obey to the fact that while all types of banks lend to large firms, normally only small banks extend credit to small businesses (Berger et al, 1995; Peek and Rosengren, 1996; Strahan and Weston, 1998).

Two questions that have not been addressed in the literature appear: i) do banking relationships matter for small businesses survival?; and, ii) does the probability of surviving depend on the number of relationships? This study answers these two important questions. We work on two hypotheses:

H1: The establishment of at least one long-term banking relationship increases the probability of surviving for a small firm.

H2: Moreover, firms involved in multiple relationships have a lower hazard of failing than otherwise identical firms involved in unique long-term relationships.

The intuition behind H1 is simple. On the one hand, in contrast to the "financial irrelevance theorem" of Modigliani and Miller (1958), which claims that the firm´s value is independent of its capital structure, the related empirical literature has shown that the value of the firm depends on its ability to raise external funds (see, for instance, Makhija and Spiro, 2005; Maher et al, 2008; Chan et al, 2009, among others). On the other hand, it has long been recognized in the literature that the probability of failure of a firm depends heavily on the value of the firm (for a literature review see De Giuli et al, 2008). Therefore, the probability a firm fails depends on its ability to raise funds. Fazzari et al (1988) show a financial hierarchy exists and depends on firm-specific characteristics. They also show that, unlike large firms which are able to raise funds in capital markets, small firms are bank-dependent. It is to expect, then, that small firms´ survival depends on their capacity to establish long-term credit relations with commercial banks.

Regarding H2, Detragiache et Al. (2000) claim that relationship banks may be unable to continue funding projects due to internal problems, and firms holding a unique relationship with one of such banks may have to refinance with another bank. However, the latter does not know the quality of the project and may refuse to lend or charge high informational costs to the firm. In that scenario, the establishment of multiple banking relations can reduce the probability of an undesirable liquidation of the project. It is sensible to expect, then, that small firms with multiple relationship creditors have a higher probability of surviving than similar firms with only one committed credit provider.

Hypotheses H1 and H2 are formally tested in this study.

3. Description of the data

This study includes both microeconomic and macroeconomic covariates in order to explain the probability of failure of small businesses. Microeconomic information is collected from two different data sets. On the one hand, we use data reported by commercial banks to the Financial Superintendence of Colombia[5] in the Format 341. This data, which is collected in a quarterly basis, contains specific information about each loan, including identification of its holder, amount of the loan, ex-ante interest rate, type of guarantee, and credit rating of the debtor. We use data on the number of banking relationships from December 1999 to December 2007.

On the other hand, this study uses use data on non-financial firms´ balance sheets reported to the Corporations Superintendence of Colombia[6]. With this information we calculate firm-specific financial ratios used as covariates in the empirical models

[5] The Financial Superintendence of Colombia is the regulator of Colombia´s financial sector.
[6] The Corporations Superintendence is the Firm's / Corporation's Supervisory Agency in Colombia.

estimated in this paper. We use data from December 1995 to December 2007. The two microeconomic data bases are matched using the firms´ identification code[7].

Macroeconomic information is collected from the National Department of Statistics of Colombia.

Our interest relies on the failure of small businesses. Therefore, two decisions regarding firm classification were required. First, we had to decide which definition of "failure" we were to follow. Second, we had to decide how to classify firms according to their size.

The definition of "failure" has been subject of debate. In this study we follow the most accepted view, consisting of a juridical definition in which failure is equivalent to bankruptcy[8] (see Charitou et al, 2004).

Regarding size, firms were placed into three size groups based on asset size[9]. For the allocation of firms into these groups we followed the criterion established by the Law 905 of 2004, which considers small firms as those with total assets´ value is less than 5,000 minimum monthly Colombian wages. Medium-size firms are those with total assets´ value ranging between 5,001 and 30,000 minimum monthly Colombian wages. Large firms are those with total assets valued over 30,000 minimum monthly Colombian.

Table 1. Distribution of firms according to their size

Year	Firm Size			Total	Proportion of Small Firms in the Sample
	Small	Medium	Large		
1995	822	5472	2990	9284	8,85%
1996	947	5219	2993	9159	10,34%
1997	1271	5260	3071	9602	13,24%
1998	1391	5043	2956	9390	14,81%
1999	2024	4863	2868	9755	20,75%
2000	2787	5176	2814	10777	25,86%
2001	2513	4833	2780	10126	24,82%
2002	2423	4496	2575	9494	25,52%
2003	2392	4439	2626	9457	25,29%
2004	3153	4421	2531	10105	31,20%
2005	10859	5987	2882	19728	55,04%
2006	12278	8108	3236	23622	51,98%
2007	10706	7630	3398	21734	49,26%

Table 1 shows the distribution of firms in the sample according to their size. Noteworthy, the proportion of small firms in the sample grew importantly, especially

[7] In Colombia, the firms´ i.d. code is known as the "NIT".

[8] The juridical definition of failure is arguably the most adequate because it provides an objective criterion that allows firms to be separated easily into two distinct populations.

[9] Firm size could have been alternately measured as market value, sales or number of employees.

from 1999 on. An important number of small firms that reported information to the Corporations Superintendence between 2000 and 2007 had not done so before. Therefore, the data set we use in this study exhibits left (and also right) censoring. In order to deal efficiently with this peculiarity we use survival analysis techniques in the empirical analysis of this study.

Following previous studies (e.g., Shumway, 2001; Gómez-González and Hinojosa, 2010) and theoretical expectations, the following financial ratios were considered in the explanation of time to failure (Table 2):

Table 2. Description of firm-specific covariates included in the empirical model

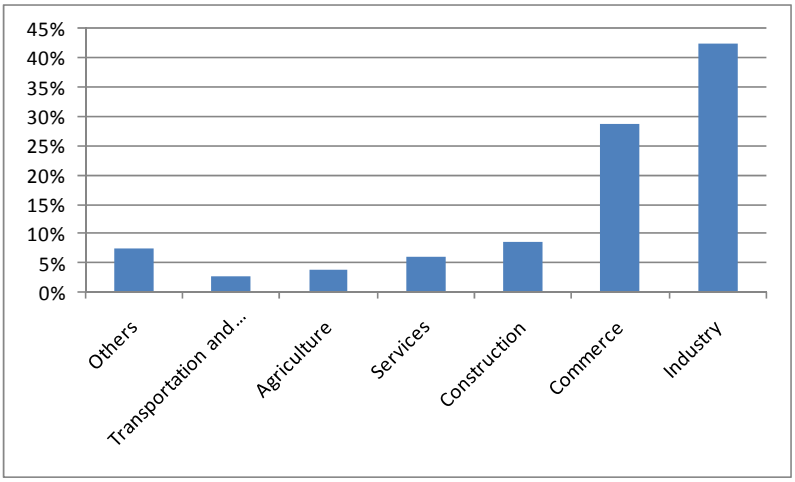
Variable	Description
Liquidity (LIQ)	(Current assets + long-term investments) / (Current liabilities + long-term debt)
Leverage (LEV)	Total liabilities / Equity
Profitability (PROF)	ROA
Inefficiency (INEFF)	Operational costs / Total assets
Debt composition (COMP)	Short-term liabilities / Total liabilities
Relationships dummy (RELDUM)	Indicator function taking the value 1 if the firm has at least one banking relationship and 0 otherwise
Number of relationships (NUMREL)	Number of banking relationships held by the firm

Two macroeconomic variables were also included: the annualized quarterly growth rate of real GDP (GROWTH) and the average real interest rate on loans (INT). These two variables were used to account for factors related to the business cycle that may excerpt influence on the business failure process.

Pair-wise correlations of the included covariates were small and in no case they exceeded 0.42 in absolute value.

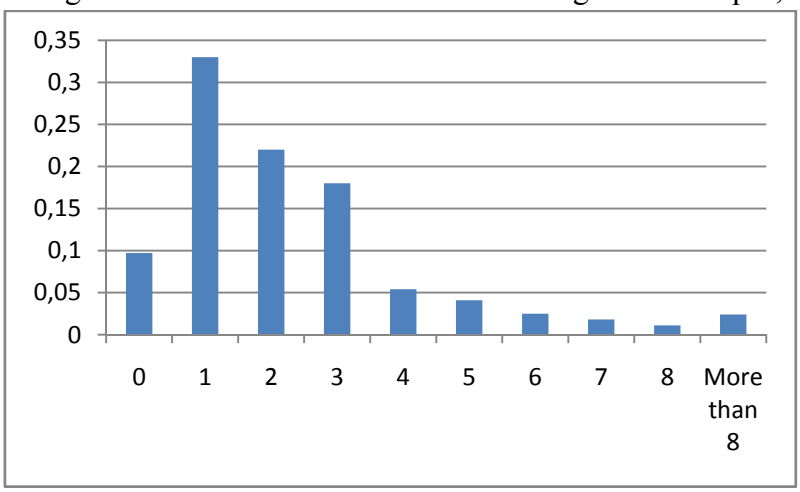
More than 40% of the firms included in the sample belong to the industrial sector. The commercial sector is the second most representative of the sample (roughly 30% of the firms in the sample belong to this sector). See Figure 1.

Figure 1. Empirical distribution of firms according to economic sector



In this study we are particularly interested in the effect of relationship lending on the probability of failure of small firms. Relationship lending is defined as a long-term implicit contract between a bank and its debtor. We follow the empirical literature on relationship lending and use the duration of the bank-borrower relationship as a proxy for relationship lending (see, for instance, Petersen and Rajan, 1994; Berger and Udell, 1995; Ongena and Smith, 2001). We consider this an appropriate proxy, because duration reflects the degree of relationship intensity over time. Figure 2 shows a histogram of the number of relationships for the period 1995-2007.

Figure 2. Histogram of the variable "number of banking relationships", 1995-2007

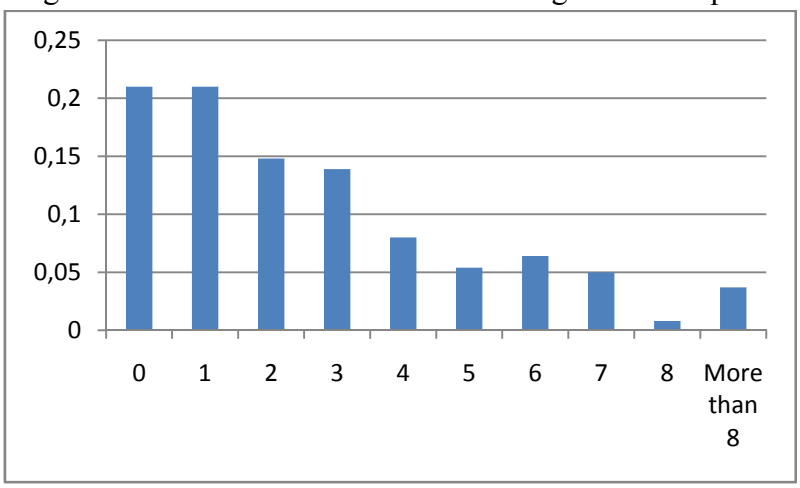


As shown in Figure 2, the density concentrates in a small number of relationships. The empirical probability of having at most two relationships is around 65%. In this sense, firms in Colombia behave similar to firms in the United Kingdom, Norway, and Sweden, which maintain fewer than three relationships on average, while contrast with firms in Italy, Portugal, and Spain, which maintain on average ten or more bank relationships (Degryse et Al., 2009).

There is cross-sectional difference in the number of relationships. Smaller firms exhibit a less concentrated histogram than larger firms, and the empirical probability of having

at least one but no more than three relationships is lower for the former than for the latter (Figure 3).

Figure 3. Histogram of the variable "number of banking relationships" for small firms



Other interesting regularity is that the empirical probability of having more than one but less than three relationships is lower during economic expansions than during economic contractions. This fact provides evidence that the number of bank relationships vary during the business cycle (Gómez-González and Reyes, 2010).

Table 3 shows descriptive statistics for the firms included in our sample. We have a total of 162,242 observations corresponding to 33,576 firms for the sample period. Out of these firms, 3,597 became bankrupt at some point between December 1995 and December 2007. Thus, the overall percentage of failures is 10.7%. The number of periods in risk corresponds to the number of quarters it takes a firm to fail after appearing for first time in the dataset. This time does not correspond necessarily to time to failure, because the data presents right censoring due to, for example, mergers and acquisitions.

Table 3. Descriptive statistics

Category	Total	Mean	Minimum	Median	Maximum
Time at risk (quarters)	-	19.328	4	12	52
Failures	3,597	0.107	0	0	1

4. Empirical model and estimation results

We use a hazard function model to study the time to failure of non-financial firms in Colombia. This approach generalizes the more common binary response approach by modeling not only the occurrence of the event but also the time it takes an individual to change of state (allowing a more efficient use of the available information). Hazard function models applied to this problem can provide answers to questions that are relevant for both supervisors and firm managers, such as: after the occurrence of a negative shock, what is the probability that a firm fails in the following months, given it

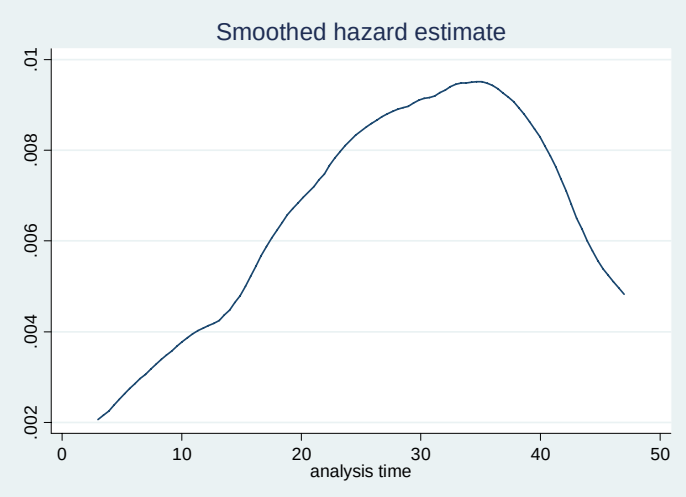
has survived up to that moment? Or, what is the predicted time to failure for a firm of some given characteristics? In the context of this paper, using the hazard function model we are able to test empirically hypotheses H1 and H2 presented above.

Preliminary analysis on the raw data (data not conditioned on covariates) showed that the survival functions of firms belonging to different economic sectors are statistically identical. Therefore, we do not differentiate firms according to their economic sector. Similar tests showed, however, that small firms have a different survival function that the rest of the firms (Table 4). Therefore, we estimated separate hazard functions for small firms and for medium and large firms[10]. Figure 4 shows the hazard function of failure of small firms[11]. This function is clearly non-monotonic, showing that the most commonly used parametric models for the distribution of duration do not seem to be appropriate for modeling the baseline hazard considered in this study[12]. Therefore, this paper estimates a proportional hazards model in which no parametric form is assumed for the baseline hazard function, following Cox (1972). As shown below using a specification test, this assumption seems to be appropriate for the problem of interest.

Table 4. Tests for the equality of the survivor functions
Null-hypothesis: Small firms and medium and large firms have identical survivor functions

Test for failure			
Test	Log-rank	Cox	Wilcoxon
χ^2 (1 d.f.)	7.02	7.03	7.12
Prob>χ^2	0.0081	0.0080	0.0076

Figure 4. Estimated smoothed hazard function – failures of small firms



[10] Firms of medium and large sizes have statistically identical survivor functions according to different tests. Thus, both groups were pooled into a unique group of firms.
[11] Hazard functions are estimated here as a kernel smoothed difference of the Aalen-Hansen estimator of the cumulative hazard functions. We use an asymmetric Epanechnikov kernel function.
[12] The hazard function of medium and large firms exhibited a non-monotonic behavior as well.

Under the proportional hazards specification the hazard rate takes the following multiplicative form (see, for example, Gómez-González and Hinojosa, 2010)

$$\lambda(t, X, \beta, \lambda_0) = \varphi(X(t), \beta)\lambda_0(t) \qquad (1)$$

The baseline hazard function, $\lambda_0(t)$, captures the direct effect of time on the hazard rate. We specify $\varphi(X(t), \beta) = exp(X(t)'\beta)$, where X(t) is a vector of time-varying covariates and β is the vector of parameters to be estimated. Under this specification, the coefficients can be given a partial derivative interpretation (Kiefer, 1988). In other words, each coefficient represents the constant, proportional effect of the corresponding covariate on the conditional probability of ending a spell.

We estimated the corresponding proportional hazards model using the partial maximum likelihood method proposed by Cox (1972)[13]. Ties in duration are handled by applying the method of Efron (1977)[14]. Two different models were estimated. Specification 1 incorporates both macroeconomic covariates and all microeconomic covariates except NUMREL. Specification 2 incorporates the two macroeconomic variables and all microeconomic covariates except RELDUM. Estimation results are shown in Table 5.

Table 5. Estimation results for duration to failure (Proportional hazards specification) +

	Specification 1		Specification 2	
Covariate	Small firms	All other firms	Small firms	All other firms
LIQ	-0.008 (0.012)	-0.051 (0.32)	-0.008 (0.012)	-0.050 (0.31)
LEV	0.021 (0.031)	0.11 (0.042)	0.021 (0.032)	0.12 (0.042)
PROF	-0.044** (0.023)	-0.038** (0.017)	-0.044** (0.023)	-0.041** (0.019)
INEFF	0.003* (0.002)	0.003* (0.002)	0.003* (0.002)	0.003* (0.002)
COMP	0.002** (0.001)	(0.002) (0.002)	(0.002)** (0.001)	0.001 (0.001)
RELDUM	-0.069*** (0.009)	-0.009* (0.005)		
NUMREL			-0.017** (0.009)	-0.002 (0.004)
GROWTH	-0.010** (0.006)	-0.011** (0.005)	-0.010** (0.006)	-0.011** (0.005)
INT	0.001 (0.002)	0.002 (0.005)	0.001 (0.003)	0.002 (0.005)
Log-likelihood	-135466.7	-15323.5	-79045.2	-16457.1
LR χ^2 (8 d.f.)	9429.5	1315.0	6282.7	1848.1
Prob>χ^2	0.000	0.000	0.000	0.000

+Standard errors in parenthesis. ++Degrees of freedom in parenthesis.
*Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.

[13] The parametric models, estimated for comparison purposes, are estimated by maximum likelihood.
[14] Hertz-Picciotto and Rockhill (1997) show that the Efron method for handling ties is to be the preferred, especially when the sample size is small either due to heavy censoring or from the outset.

Both specifications are globally significant for the two groups of firms. The results show that both firm-specific and business cycle variables are important determinants of time to failure of non-financial firms. For all firms, profitability, inefficiency, and the annualized quarterly growth rate of real GDP appear to be significant explanatory variables of the failure process. A one percentage point increase in profitability leads to a reduction in a firm´s probability of failure of around 4 percent. A one percentage point increase in inefficiency leads to a reduction in a firm´s probability of failure of around 0.3 percent. And a one percentage point increase in the annual growth rate leads to a reduction in a firm´s probability of failure of around 1 percent.

Two other covariates are important explaining the failure process for small businesses but not for medium and large firms. A one percentage point increase in the ratio of short-term debt to total debt increases in 0.2 percent the hazard of failure of a small firm, but has no effect on the probability of failure of a medium or large firm.

Our more interesting result relates to the effect of relationship lending on the hazard of failure of firms of different size. According to the results of Specification 1, all else constant, a small firm without a partner bank will reduce in almost 7 percent its hazard rate of failure if it establishes a long-term relationship with a financial institution. In contrast, the effect of relationship lending on the hazard rate of failure of a large firm is much modest and less significant.

According to the results of Specification 2, an increase in the number of banking relationships benefits small firms while has no effect on larger firms. A small firm gains a reduction of 1.7 percent in its hazard rate of failure when increasing by one its number of relations. This effect is zero for a larger firm.

Altogether, the results show that relationship lending has an effect on firms´ probability of failure. However, the effect is not homogeneous across firms of different sizes. The effect is much stronger and significant for small firms, which are more affected by the existence of asymmetric information in credit markets.

Table 6 presents evidence that the proportional hazards assumption is adequate for our sample. The proportional hazards factorization implies that the effect of the covariates on the hazard function is constant over time. This hypothesis can be tested using the Schoenfeld´s residual test, which tests for a zero slope in a generalized linear regression of the residuals on time. The null hypothesis of the test is that the slope is zero. A rejection of the null hypothesis indicates that the proportional hazards assumption is unsuitable.

Table 6: Schoenfeld´s residuals test results – small firms

	Specification 1			Specification 2		
Covariate	ρ	χ^2	Pr>χ^2	ρ	χ^2	Pr>χ^2
LIQ	0.248	1.77	0.1837	-0.177	1.41	0.2351
LEV	0.093	0.28	0.5995	-0.136	0.70	0.4045
PROF	0.019	0.01	0.9360	0.195	1.69	0.1932
INEFF	0.323	2.14	0.1434	0.112	0.55	0.4569
COMP	0.180	0.84	0.3582	0.089	0.35	0.5552
RELDUM	0.321	0.83	0.3623			
NUMREL				0.045	0.12	0.729
GROWTH	0.044	0.12	0.728	0.091	0.29	0.590
INT	0.123	0.78	0.3771	0.312	2.32	0.1277
Global test		9.87	0.2743		9.49	0.3027

Note that the null hypothesis of a zero slope cannot be rejected in any case. Therefore, the Schoenfeld´s residuals test provides evidence that the proportional hazards specification is adequate in this study.

5. Conclusions

We study the effect of relationship lending on small firms´ failure probability using a uniquely rich data set comprised of information on individual loans of a large number of small firms in Colombia. We control for firm-specific variables and find that small firms involved in long-term liaisons with commercial banks have a significantly lower probability of becoming bankrupt than otherwise identical firms not involved in a long-term credit relationship. We also find that small firms with multiple banking relationships face a lower failure hazard than otherwise identical firms involved in a unique long-term relationship. We thus find evidence that supports the validity of our working hypothesis H1 and H2.

We also show that while long-term relationships are beneficial for firms of all sizes, these are significantly more important for small businesses. These results are complementary to those of other studies that suggest that the establishment of banking relationships may be more important for small firms which are typically more bank dependent than large firms (Fazzari et al, 1988; Dietsch, 2003; Guiso, 2003; Gómez-González and Reyes, 2010). However, this study is the first to show that small firms with long-term credit relationships with financial institutions are less prone to fail than otherwise identical firms without these kinds of relationships.

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