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CONCENTRATION, HOLD-UP AND INFORMATION REVELATION IN BANK LENDING: EVIDENCE FROM CHILEAN FIRMS

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Resumen

Este artículo presenta un estudio empírico de la relación banco-cliente, mediante una muestra de empresas manufactureras chilenas. Específicamente, analiza si la concentración y la duración de la relación afecta o no el volumen de los préstamos bancarios. Nuestros resultados indican que una menor concentración, medida según el número de bancos donde se endeuda una misma empresa, se asocia con un efecto grande y positivo sobre el endeudamiento. La duración de la relación deudor-acreedor tiene un efecto positivo —si bien no siempre estadísticamente significativo— sobre el monto prestado.

Abstract

In this paper we empirically study bank-client relationships using a sample of Chilean manufacturing firms. We examine whether concentration and the duration of bank-firm relationships affect the volume of bank lending. Our results indicate that lower concentration, measured by the number of banks a firm borrows from, is associated with a large and positive effect on borrowing. The length of borrower-lender relationships has a positive -although not always statistically significant- effect on the amount borrowed.

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1. Introduction

The efficiency of allocating physical capital and consumption goods over time depends upon the functioning of the financial system. Within this market, banks play a fundamental role as financial intermediaries, providing access to the payment system, transforming assets, managing risk, and monitoring and processing information (Freixas and Rochet, 1998).

In this paper we empirically study the role of banks in overcoming the frictions that arise from asymmetric information. Specifically, we study the effects on the volume of firm borrowing of the relationships that firms and banks develop as a result of banks' monitoring activities. Whenever a bank lends to a firm, the bank gathers information about the quality of the client that is not shared by other intermediaries, i.e., banks and firms establish relationships. These relationships reduce the extent to which moral hazard and adverse selection problems affect the flow of credit to otherwise qualified borrowers. Developing relationships allows the lender to better judge the quality of a borrower, reducing the extent of credit rationing, and benefiting firms. However, the bank may be able to use this information to extract rents, building an informational monopoly that may reduce credit availability and distort the firms' investment decisions.

We use a unique data set to empirically investigate these specific but crucial aspects of financial markets. We examine bank-client relationships in a large sample of Chilean manufacturing firms during the 1990-1998 period. In particular, we investigate whether firm-bank relationships - measured by the duration of lending ties - and actual bank concentration faced by firms affect access to bank financing. On the one hand, if the interaction between a bank and its clients mitigate informational asymmetries over time, then, conditional on the creditworthiness of a firm, the availability of credit should increase with the length of such relationships. On the other hand, if a single lender can exploit an informational monopoly, firms that rely on multiple lending ties should have better access to bank loans. However, there are transaction costs in dealing with more than one bank, because monitoring efforts are duplicated and banks may free ride on each other reducing the level of screening effort. Furthermore, debt renegotiation becomes increasingly complicated when the number of creditors involved grows (Bolton and Scharfstein, 1996). Finally, credit market competition reduces the ability of the firm and the creditor to intertemporally share a surplus, and the extent to which the bank can finance profitable projects when the firm's cash flows are low (Petersen and Rajan, 1995). Thus, multiple banking relationships are not necessarily beneficial for borrowers.

Since the consequences of concentration and relationship length on access to bank lending are theoretically unclear, the empirical assessment of these effects is especially valuable. Moreover, given the particular characteristics of an emerging economy like Chile, this assessment should ideally be done using country-specific data.

Most of the empirical literature on financial market imperfections has focused on the consequences on investment of internal funds availability (in the line of Fazzari, Hubbard, and Petersen, 1988) to conclude that borrower-lender information asymmetries are a key determinant of external funding access. Indeed, a number of articles have studied the effects of lender-borrower relationships on firm performance, e.g. on the value of the firm and investment decisions. Relationships and the extent of the asymmetric information problem have been measured in many ways. For instance, in studying the sensitivity of investment to cash flow according to the degree of attachment to banks, Hoshi,

Kashyap and Stein (1991) associate belonging to a large industrial group as a proxy for weaker asymmetric information. With this same purpose in mind, Schaller (1993) uses the degree of ownership concentration as a measure of information problems, Whited (1992) uses a dummy to capture whether a firm has a bond rating, and Fohlin (1998) uses the number of the firm's board members that sit at a bank's board of directors. Both Medina and Valdés (1998) and Gallego and Loayza (2000) examine this same issue for Chile, using alternative measures of information asymmetries. This paper takes one step back, and studies the empirical plausibility and importance of the asymmetric information problem on bank lending. It also investigates the implications of competition and concentration for bank lending at the microeconomic level.

The issues we examine in this paper are important in their own right for the functioning of the financial market, particularly regarding credit access of small - and medium-sized firms, and in turn, have distinct implications for both market performance and policy. They are also relevant for understanding monetary policy. For instance, monopoly power arising from either information asymmetries or straight lack of competition may also modify an otherwise standard transmission mechanism of monetary policy. Bank lending could also amplify or dampen the effects of monetary policy through endogenous changes in the external finance premium (the credit channel of monetary policy).[1]

Our results indicate that lower concentration, measured by the number of banks a firm is related to, has a positive and economically relevant impact on the the volume of bank lending. Controlling for firms' age, the length of borrower-lender relationships has a positive effect on loans, although its significance is not robust to alternative estimation methods.

The rest of the paper is organized as follows. Section 2 quickly revisits some theory and previous empirical work. Section 3 describes the construction and main characteristics of the data set. Section 4 presents the main findings, evaluating the effects of bank concentration and lender-borrower relationship length on borrowing volume. Finally, section 5 presents the main conclusions and discusses a few policy implications.

2. Theory and Previous Empirical Evidence

From a theoretical point of view, both bank concentration and the length of lender-borrower relationships have ambiguous consequences on access to bank loans. As for concentration, Diamond (1984) develops a model in which bank financing is less expensive than borrowing from public lenders, since intermediaries can save on monitoring and agency costs. Ramakrishnan and Thakor (1984) and Allen (1990) give banks a special screening role. In either model, under increasing economies of scale, concentration may further reduce costs or enhance efficiency. Marquez (2002) shows that increased competition among banks may lead to *information dispersion*, increasing the costs of borrowing. A market with few large banks, he concludes, can have lower interest rates than a market with many small banks. In the same venue, if too many banks serve one particular client, incentives to properly monitor may weaken due to the commons problem, and in turn, increase costs.

At the same time, however, while bank control can reduce costs and increase efficiency, market power by banks may of course result in monopoly pricing if competition and/or contestability are weak. Furthermore, a single bank may build up an ex post information monopoly that adversely affects lending (Sharpe, 1990

[1] See,e.g Bernanke and Gertler (1995) and Kashyap and Stein (1994).

and Rajan, 1992). This hold-up problem can make it costly for a firm to switch lenders, as it may signal that the bank with the information monopoly is unwilling to lend to the firm. In this case, the bank can extract rents from the firm and possibly distort its investment decisions. Concentration, therefore, may produce a borrower capture. This problem is likely to be more relevant if banks observe other banks' lending, because the stigma arising from denying or cutting financing is stronger.

One can also postulate that competition may affect the value of relationship lending, modifying the amount banks are willing to invest in a relationship. Petersen and Rajan (1995) show that greater inter-bank competition reduces bank lending rents and decreases the importance of relationship lending. Boot and Thakor (2000) extend Petersen and Rajan's model to allow for competition from the rest of the capital market (e.g., mutual funds and investment banks). They find that increased inter-bank competition may increase relationship lending, but then each loan has lower value added for borrowers. Furthermore, they find that higher competition from the capital market reduces total bank lending as well as relationship lending, although each relationship loan has higher value added for borrowers.

As for lender-borrower relationships, it is straightforward to argue that a lengthier relationship produces a more durable connection that alleviates information asymmetries, thereby reducing financial costs.[2] Long relationships, however, can potentially be costly for a borrower, if the stigma from cutting financing is higher the longer -and thus the more informed- is the relationship.

There are a number of empirical studies on the effects of concentration and relationships. Regarding concentration, and using detailed information on the debt structure of American publicly traded corporations, Houston and James (1996) find that firms that borrow from a single bank, as opposed to firms that borrow from multiple banks, depend less on bank loans to finance their operations when growth opportunities are important. This evidence is consistent with the notion that information monopolies allow banks to extract rents from borrowers. They also find that banks specialize in lending to smaller and less risky firms (relative to the typical firm in their sample).

Cetorelli (2001) reviews both the theory and the evidence of the effects of competition on the banking industry, and concludes that the common wisdom that restraining competition always reduces welfare is not necessarily correct. For instance, using a panel of 36 industrial sectors for a group of 41 countries, Cetorelli and Gambera (2001) find that bank concentration does impose a deadweight loss on the credit market as a whole, resulting in a reduction of credit supply. However, the effect is heterogeneous across industrial sectors: industries that depended heavily on banks for investment and growth benefit from concentration, presumably because they develop closer relationships. Using the ratio of banks' small business loans to total assets, Berger, Goldberg and White (2001) study the effects of banking entry and of bank M&A's on the supply of small business credit by other banks. They find that there are modest aggregate external effects of both M&A's and new entries, and that these effects depend on bank size. Using a panel of country experiences, Levine (2000) finds that bank concentration is not strongly associated with negative outcomes in terms of financial development, industrial competition, or banking fragility.

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[2] Of course, a lengthier relationship is not the same as firm age, which in turn es probably negatively correlated with information asymmetries.

On the subject of bank-client relationships and concentration, Petersen and Rajan (1994) study the effects of lender-small-business relationships on interest rates and loan availability (the latter proxied by the percentage of firm's trade credits paid late). They find a positive association between the number of banks that lend to a firm and the interest rate charged for the latest loan, but no significant connection between this rate and the length of the firm-lender relationship. They also find a negative effect of the length of the longest relationship and the firm's age on loan availability, although this latter variable is positively related to the number of banks from which the firm borrows. Berger and Udell (1995) analyze the role of lender-borrower relationships on the loan rate spreads (over the lending bank's premium rate) paid by small firms. They find a negative correlation between the length of the firm's relationship and these spreads. Blackwell and Winters (1997) find a positive correlation between the bank's monitoring effort and the loan's interest rate, and that banks monitor firms with which they have closer ties less often. Cole (1998) studies the effect of pre-existing relationships between firms and lenders on loan availability and find a positive association. He does not find any role for relationship length.

Chakravarty and Scott (1999) empirically study the effects of relationships in the market for consumer loans using a data set that allows them to identify credit constrained individuals. They find that the following characteristics significantly lower the likelihood of being liquidity constrained: (i) the length of the relationship between a household and a potential lender; (ii) the number of activities a customer has with his/her bank (proxied by the number of accounts); and (iii) the number of financial institutions that a household has relationships with. Furthermore, they find that the rates charged on collateralized loans are less sensitive to these relationship variables than the rates on uncollateralized loans.

All these papers use data from the US economy from which lessons are not directly applicable to an emerging market economy like Chile. In a closely related paper and using Chilean manufacturing data, Repetto, Rodríguez and Valdés (2002) find that lower concentration, measured by the number of banks a firm borrows from, is associated with lower costs of loans. They also find that the length of lender-borrower relationships has a negative effect on interest rates paid. These findings are at odds with the results of Petersen and Rajan (1994), using US firm data. In comparison to the US, Chilean firms and the financial market structure are both considerably different. Among other things, bankruptcy procedures are not alike, firm size differs substantially, the number of banks is much smaller in Chile, and the Chilean market is highly collateralized.

3. Data

The data in this study come from two sources. The first data set covers information on all credit transactions between commercial banks and firms. The information is collected by the Superintendencia de Bancos e Instituciones Financieras (SBIF), the commercial bank regulatory and supervision government agency.[3] The data set contains information on the amount borrowed by each firm from each commercial bank, the fraction of outstanding and past-due loans, (cartera vencida}, including also data on credits paid late, mora), and the credit risk rating of the loan assigned by each lending bank. In Chile, all individuals and firms are assigned a unique identification or taxpayer code when they are born or legally incorporated, known as Rol Unico Tributario or RUT.

[3] The Central Bank also has regulatory responsibilities.

This code is recorded in the data set, and allows us to follow-up firms over time.[4]

This data set has been matched with the second source we use, the Encuesta Nacional Industrial Anual or ENIA, a survey on manufacturing firms conducted annually by the statistics government agency (Instituto Nacional de Estadísticas, INE). The ENIA covers all manufacturing plants that employ at least ten individuals. Thus, it includes all newly created and continuing plants with ten or more employees, and it excludes plants that ceased activities or reduced their hiring below the survey's threshold. The ENIA covers about 50% of total manufacturing employment.[5] It collects detailed information on plant characteristics, such as manufacturing subsector (at the 4 digit ISIC level), ownership status, sales, employment, location, and investment. Although not reported in the publicly available data set, the survey records the firms' RUT, so the two data sets can be matched.[6]

Matching firms across surveys induces a series of measurement problems. The most important, the SBIF data gathers information on all the firm's activities, whereas the ENIA only records manufacturing related activities. Thus, if a firm produces manufacturing and non-manufacturing goods and services under the same RUT, the SBIF data will represent a broader set of activities than will the ENIA. This means that we may overestimate the debt. Furthermore, the ENIA records information at the plant level, and not at the firm level. Still, we were able to add up information on plants belonging to the same firm as long as they produce under the same RUT.

After excluding firms with no debt, our data set contains almost 13,000 observations on 2,063 firms over the 1990-1998 period. Nominal figures were deflated using the value added and gross production deflators constructed by ECLAC at the three digit ISIC level (see Yagui, 1993). These adjustments take into account that stock variables are recorded at year end prices, whereas the prices of flow variables represent within year averages.

Table 1 reports basic statistics on sales, employment, physical capital stock, and profits, by industrial sector.[7] The average firm hires 149 employees, sells just over 4.6 billion pesos, holds a capital stock of almost 2.9 billion pesos, and earns profits of 1.4 billion pesos (or roughly 11.2, 7.0, and 3.4 million dollars, respectively, translated at the average 1996 exchange rate.) The largest firms belong to the 372 (non ferrous metals), 314 (tobacco), 353 (petroleum refining), 371 (steel products), and 341 (pulp and paper) sectors. The smallest firms belong to the 385 (scientific and professional equipment), 390 (other manufacturing products), 354 (oil and coal products), 323 (leather products), and 331 (wood products, except furniture) sectors.

Table 2 describes the borrowing patterns of the sample firms. The first three columns report total debt (in thousands of 1996 Chilean pesos) for all firms,

[4] To protect the firms' identity, RUTs were deleted from our sample by SBIF and Central Bank statisticians. However, firms were randomly assigned a new identification code that allows us to follow them over time.

[5] Industrial employment accounts roughly 16% of total Chilean employment.

[6] The surveys were matched by Central Bank and SBIF statisticians who assigned the new identification code to firms.

[7] Capital is reported (at book value) only since 1996. We constructed the series using the information on investment and the capital accumulation equation $K_t = (1-d)K_{t-1} + I_{t-1}$. We used the depreciation rates in Liu (1991) and the investment deflators in Bergoeing et al. (2002). This procedure forces us to drop a large number of observations in regression models that include the capital stock, because capital cannot be estimated for firms that were in the sample only in years prior to 1996. Capital stock includes machinery, vehicles, buildings, furniture and other forms of capital, but excludes land.

and according to firm size. Firm size categories are based on employment quintiles, so the second entry represents the level of debt of the smallest 20% of firms. The average firm owes over 1.1 billion pesos (over 80 million pesos at the median). The average ratio of debt to capital stock is 2.14, and the median is 0.48. Although the amount borrowed increases with firm size, the ratio of debt to capital stock does not: the smallest and the largest firms have the highest average ratios. One possible explanation to this pattern is that smaller firms have a higher demand for funds, and that those small firms that do obtain loans get large amounts relative to their capital stocks. At the other end of the distribution, larger firms are offered more loans, and borrow more from banks despite their better ability to raise funds from different sources. An alternative explanation is that our matching procedure induces mismeasurement of the debt-capital ratios, and that these errors are larger for smaller firms. The median ratio of debt to capital is hump-shaped. This median should be more robust to our measurement problems.

The table also reports our measures of firm closeness to its creditors. Columns seven and eight report the number of banks that lend to each firm in the sample.[8] On average, sample firms have a lending relationship with about 2.9 banks. At the median, firms borrow from 2 banks. The number of related banks strongly increases with firm size. The smallest 20% of firms have, on average, slightly less than two lenders (one lender at the median), whereas the largest 20% of firms borrow on average from over 5.1 banks (4 at the median).

A second measure of closeness to a bank is credit concentration. The firm-specific Herfindahl index we report was calculated using the shares of total debt borrowed from each of the banks that actually lend to the firm. This measure also shows that bank lending is highly concentrated, and that concentration decreases as firm size increases.

Our final measure of firm-bank closeness is the duration of the relationship. Table 3 presents four alternative measures of our loan tenure variable. Each of them intends to capture different assumptions about the information on borrowers that banks share. The first two columns of the table show the number of years the firm has been borrowing from the banking system starting in 1989. On average, firms have been servicing loans for at least 5.3 years (or 5 years at the median). The second measure takes as a proxy of the strength of the relationship the age of the newest loan currently being served, whereas the other two proxies take the age of the oldest outstanding loan, and the weighted average of the loans' ages, using debt size as weights.[9] Clearly, all these variables are a censored measure of the actual age of the loans anytime a firm was already borrowing in 1989. However, if the firm was either created or got its first loan later on in our sample period, then the relationship's length is properly measured. Except for the newest loan, there is an increasing relationship between the measures of firm-bank ties and the size of the firm at the mean. This is consistent with the notion that smaller firms tend to be younger, and with the fact that censoring of the duration variable might have a larger effect on big firms.

Our empirical application below examines the effects of all these variables. However, it is worth noting that banks do not share all the information on borrowers. Specifically, commercial banks in Chile have access to information on

[8] In 1990 there were 41 banks in business in Chile. In 1999 there were 29 banks. The number of banks declined steadily over the sample period through mergers and acquisitions.

[9] These measures are highly correlated. The lowest correlation coeffcient is equal to 0.48 (between the age of the newest loan and the age of the relationship with the system), and the highest is 0.9 (between the age of the oldest loan and of the relationship with the system).

the total amount borrowed by each firm (with respect to the complete banking system), and whether firms have loans overdue. They know the total amount that is overdue, and the lending institutions involved, although not the exact distribution among creditors. The SBIF provides this information to each bank on a monthly basis.

The distribution of debt-capital ratios is highly skewed. Figure 1 and Table 4 present these distributions.[10] Not only are the means and medians quite different, but also the distribution contains extremely high and low values. Possibly, a number of these extreme observations are due to our matching procedure. Since the median, unlike the mean, is less affected by these extreme observations, the regression analysis below is based on Least Absolute Deviations (LAD) methods and not on OLS.[11]

4. Relationships, Concentration and Firm Borrowing Patterns

As mentioned in section 2, the closeness of firm-bank relationships has theoretically an ambiguous effect on the availability of funds. First, lengthy relationships allow banks to learn more about the firm, its projects and managers, alleviating information asymmetries. However, if (positive) information on a firm cannot be easily conveyed to the rest of the banking system, then lengthy relationships may lead to information monopolies: if a firm requests a loan from a non-connected bank, it may signal that the related bank is not willing to lend. This hold up problem is more relevant for firms with closer ties. Key for interpreting our findings below is the fact that banks do not share all the information they gather on borrowers as they lend.

Concentration measures have also an ambiguous effect on lending volume. On the one hand, bank concentration may be cost efficient. On the other, concentration can lead to monopoly pricing and to information monopolies. In this and the next section, we empirically estimate the effects of the length of firm-bank relationships on the availability of funds.

4.1 Benchmark Estimates

Our benchmark econometric model includes three sets of variables. The first one includes variables that capture the effects of firm-bank relationships on lending: the age of the oldest loan, the firm specific Herfindahl index, and the number of lending banks. The second set intends to control for firm characteristics, such as size -measured by the natural log of sales and the number of employees-, profitability -measured by the ratio of current profits over sales-, and quality -measured by firm age and an indicator of credit history. Finally, we add time dummies to control for aggregate shocks that affect all firms, sectoral dummies at the 3-digit ISIC level, and regional dummies to account for differences across locations. [12]

The length of the relationship and the age of the firm are correlated. Older firms have been producing for a longer time period. If firm's age is a proxy for firm's quality, then older firms are more likely to be able to borrow. Furthermore, a selection bias due to exit can lead to a positive effect of age on the amount borrowed. In order to distinguish the age effect from the relationship duration effect we add controls for the age of the firm. We do not observe directly the date in which the firm was created. However, RUTs are assigned by the Internal Revenue Service chronologically; i.e., a younger firm

[10] For illustration purposes only, the distribution was truncated at the top in Figure 1.
[11] See Amemiya (1986) for a derivation of the estimator and a proof of its consistency.
[12] Chile is divided into 13 administrative regions.

has a larger RUT number than an older firm. These identification numbers are assigned within ownership categories. For instance, individuals are given RUT numbers ranging between 1 and 48 million, limited liability corporations have RUT numbers between 77 and 80 million, and publicly listed companies have RUTs between 90 and 97 million. Since we are not allowed to directly observe the RUTs, Central Bank statisticians created a variable we label rank RUT. This variable is an ordering from larger to smaller RUT (so the lowest number is assigned to the youngest firm) within ownership categories. There are 11 categories in our data set; however, over 90% of the sample is made up of individuals, limited-liability corporations and publicly traded companies.

The first four columns of table 5 present our benchmark specification using alternative measures of relationship length. The first column uses the number of years the firm has been borrowing from the banking sector, and the next 3 columns use the age of the newest outstanding loan, the age of the oldest outstanding loan, and the weighted average of the age of current loans, respectively. In all specifications our relationship measures have a positive and significant effect on debt to capital ratios, i.e., firms that have been borrowing for a long period are capable of funding a larger fraction of their capital stock through the banking system. The size of the effect is quite similar across specifications, varying betweeen 0.0103 and 0.0138. These magnitudes are large, as they represent about 2.1% to 2.9% of the median debt-capital ratio in the sample. Because the regressions already control for the age of the firm, this effect should effectively capture the role of ties between firms and banks. However, the effect might be overestimated, as our duration measures are right-censored.

Concentration, as measured by the firm specific Herfindahl index, has a large and negative effect on the amount borrowed. Also, the number of banks from which firms borrow has a positive and large effect on loans. The lower panel of the table shows the estimated effect of increasing the number of banks from which a firm borrows from one to two (assuming equal bank shares), and from two to three. Moving from one to two relationships allows firms to increase their debt to capital ratios by about 35 percentage points, and from two to three banks by about 20 percentage points. Figure 2 plots the estimated effect of increasing the number of relationships as well as +/- 2 standard errors, assuming that debt is split equally among banks.[13] The magnitude is always large and significant. Moreover, as the number of ties increases, the effect of the Herfindahl index tends to disappear, and the total effect converges to the coefficient of the number of related banks.[14]

To allow for a more flexible specification of the effect of concentration on firm borrowing, columns (5) to (8) replace the Herfindahl and the number of banks by a set of dummies that account for the number of banks the firms relates to. All the coefficients turn out to be negative and significant. The estimated effect is decreasing - in absolute terms - in the number of banks; i.e., firms with fewer relationships borrow less. The bottom panel of the table reestimates the effect of an extra relationship using these specifications. The effect of moving from a single relationship to two is quite similar to the effect of moving from two to three. The effect (about 25 percentage points) is, on average, very close to the effect estimated in the previous set of regressions, so the combined effect of our concentration variables turns out to be robust to

[13] Figure 1 is based on the results reported in column (1).

[14] Assuming equal bank shares, the Herfindahl index is equal to $\frac{1}{n}$, where n is the number of relationships. Thus the limit of this index as $n \to \infty$ is 0.

alternative functional specifications. It is worth noting that the use of the number of relationship dummies does not alter the other regression results materially.

As to the control variables, both firm size variables show that larger firms have lower debt to capital ratios. At first, this result appears to be counterintuitive. However, larger firms have better access to other forms of financing. Probably, as they grow larger, firms become increasingly dependent on arm's length financing, and not on the banking system.[15] The estimation results indicate that if a firm hires 100 more employees (about a third of the standard deviation of employment in the sample), then the debt-capital ratio falls by 4 percentage points. Moreover, a 1% increase in the value of sales reduces the ratio by 0.3 percentage points.

The effect of profits is also counterintuitive: as firms become more profitable, they finance a larger fraction of their capital stock through bank loans. However, it is worth emphasizing that these regressions are reduced form regressions, so profitable firms have perhaps better access to funds, even though they are in less need of them. If a bank can spot this profitability, it will probably be more interested in lending. According to our regression results, if sales as a fraction of profits increase by one percentage point, the debt capital ratio increase by 0.05 percentage points.

A lengthier relationship alleviates the information asymmetries between banks and firms. However, firms are only able to get more loans as long as the revealed information is good. The next regression includes a dummy variable equal to 1 if the firm had overdue loan in the past (during our sample period).[16] We find that negative information on past loans has a negative impact on the availability of current funds. If a firm was delinquent in the past, it can today finance about 3.4 percentage points less of its capital stock with banking debt.

Finally, our age controls show that older firms finance a smaller share of their capital stock with debt. The effect is significant for individuals and limited liability corporations, but not for publicly traded companies. Within our sample period, 23 new individually owned plants, 44 new limited liability companies, and 46 new publicly traded companies appear in our data set.[17] Therefore, and according to the regression estimates, the newest individually owned firm has a debt-capital ratio that is 0.14 percentage points larger than the last firm of this ownership type created in 1990, whereas the newest limited liability firm's ratio is 0.18 percentage points higher. Although the effect on publicly owned companies is not significant in most specifications, the point estimate indicates that the newest firm of this type in the sample has a ratio of almost 0.05 percentage points larger.

In sum, in this section we have found that our measures of the closeness of firm-bank relationships have a large impact on the availability of funds. Relationships do matter, and have a beneficial effect on firms. This result is consistent with the hypothesis that not all information is public and easily

[15] In fact, this is precisely what Houston and James (1996) find.

[16] According to Chilean bank regulation, a loan is classified as past due when an installment of either principal or interest is overdue 90 days or more. Banks can start legal collection procedures when installment of principal or interest is overdue. Nevertheless, banks can begin the collection process before 90 days if there is a presumption of a significant deterioration in debtor's quality.

[17] These new firms do not necessarily represent start ups. Some of these firms may have hired more than 10 employees, and/or may have borrowed from the banking system for the first time. Most firms in our sample already existed in 1989-1990.

verifiable and that close ties between firms and lenders do alleviate informational asymmetries. Furthermore, our results indicate that borrowing concentration does make firms worse off. Economically, the greatest effect occurs when the number of ties is relatively small. In the next subsection we extend the analysis to alternative assumptions on the statistical behavior of the concentration variables.

4.2 Endogeneity of Concentration Measures

An alternative interpretation of the role of concentration is that the amount borrowed and the number of lending banks are mechanically related: more debt should naturally be supplied by more banks. This is consistent with the large t-statistics of the estimated coefficients (see Table 5). However, this need not be the case. In order to borrow more, firms may choose not to relate to more banks, as there are fixed costs in establishing ties. And even if this is the case, the linear term should capture this effect, and the large effect measured by the Herfindahl index would still be relevant. Alternatively, one could argue that there are legal limits on how much a bank can lend to a single firm. These limits, however, are most likely non-binding for most of our firms. Finally, it is worth mentioning that if loans are collateralized, firms need to have divisible guarantees in order to borrow from different banks.

To control for these potential problems, we reestimated our regression model through a two step procedure. In the first stage we obtain the ordinary least squares prediction from the regression of the problematic variables (the number of related banks and the Herfindahl index) on the other exogenous variables and a number of instruments. In the second stage we estimate the parameters of the model by a least absolute deviation regression of debt-capital ratios on the projected and exogenous variables.[18]

We use two types of instruments: the number of banks in the locality (provincia) and a set of dummies indicating bank mergers.[19] These dummies are equal to one if the firm was borrowing from two banks that merged in that given year, and zero otherwise.[20] We believe that these variables are correlated with the number of banks a firm can establish a relationship with, and with inter-bank competition (and thus with the lending concentration faced by borrowers). Furthermore, we treat these variables as truly exogenous to individual firms.

Table 6 presents the estimated results. The first column uses the five merger dummies only, whereas the second column uses the complete list of instruments.[21] Both specifications show that the age of the relationship has a positive effect on firm borrowing. However, neither shows a significant effect. Although the sign of the Herfindahl index is reversed, this time we cannot reject the null that the effct of this concentration variable is zero. In spite of this, the effect of the number of related banks is positive and significant, indicating that the establishment of a new relationship increases the availability of funds to firms. Specifically, we find that an extra realtionship increases the debt-capital ratio of the firm by about 20 percentage points. This effect is much larger than the one presented in table 5. The lower panel of the table repeats

[18] This procedure is a modified version of 2SLS, with a LAD regression (instead of OLS) in the second stage.

[19] There are 51 provincias in Chile.

[20] The following are the relevant mergers within our sample period: (1) O'Higgins and Centro Hispano in 1993, (2) O'Higgins and Bank of Hong Kong in 1993, (3) BHIF and Banesto in 1995, (4) Osorno and Santander in 1996, and (5) O'Higgins and Santiago in 1997.

[21] The table reports the results using the age of the newest outstanding loan. The LAD procedures using the alternative relationship length variables did not converge. We believe that these alternative specifications should lead to similar results, given the high correlation among these definitions, and the results in table 5.

our earlier exercise where we estimate the effect of increasing the number of banks from which a firm borrows from one to two, and then from two to three. The effect of a second bank is statistically not different from zero, perhaps because the Herfindahl index is not significant. However, as the number of banks increases, the effect approaches the coefficient of the number of relationship variables, and becomes large and significant.

The estimated effect of the other control variables is not materially affected, with a slightly larger effect of the payment history of the firm, and of the size measures.

Summing up, we have again found that bank lending concentration is harmful for firms in terms of funds availabilty. This result is consistent with the hypothesis that concentration leads to monopoly pricing and information monopolies. However, we do not find that lengthy relationships allow firms to borrow more.

5. Conclusions and Policy Implications

We have examined the effects of concentration and the length of bank-lender relationships on the volume of bank lending using a sample of Chilean manufacturing firms. After controlling for size, economic sector, (relative) firm age, location, profitability and credit history, we find that concentration appears to be very important for the volume of bank lending. The results show that the debt to capital ratio rises significantly as concentration falls, and that this effect is considerably larger when the number of bank-firm relationships is small. For instance, controlling for the linear effect of the number of banks a firm is related to, increasing the number of relationships from one to two rises the median debt to capital ratio from 0.48 to about 0.82, whereas increasing the number of relationships from two to three rises the median debt to capital ratio from 0.48 to about 0.68. The length of borrower-lender relationships (measured by the age of the oldest relationship with the banking system) has a positive, though not always significant, effect on the volume of loans. One extra year of relationship increases the debt to capital ratio by 2.1% to 2.9%.

These results motivate a few policy implications. First, they show that, on average, a lengthier relationship is convenient for firms. Thus, policy makers should not worry if firms persistently choose to do business with the same banks. And second and most important, the evidence is consistent with the idea that enhancing the number of relationships that a particular firm has can increase the volume of credit.

There are important practical consequences from the latter implication. To begin with, tax policy should avoid lock-in effects that make it difficult for firms to “shop around”. More significantly, policy should foster multiple relationships. And chief among the difficulties a typical firm faces for having multiple relationships is the indivisibility of collateral or guarantees. It has long been recognized in Chile that moving guarantees across banks is a difficult task. In fact, some people have proposed to centralize the administration of guarantees in order to facilitate bank shifts. The evidence of this paper shows that this might not be enough. True competition needs firms to relate contemporaneously to more than one bank, and for that purpose firms need divisible collateral. The proposed central agency could provide that service.

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Table 1. Sample Characteristics

	Number of		Employment			Sales (million 1996 pesos)			Capital (million 1996 pesos)			Profits (million 1996 pesos)		
	Firms	Observations	Mean	Median	St. Dev.	Mean	Median	St. Dev.	Mean	Median	St. Dev.	Mean	Median	St. Dev.
All firms	2063	12913	149	56	322	4623	449	30700	2890	195	19000	1403	73	11900
Manufacturing subsector (3 digit ISIC)														
311	567	3052	146	39	293	3848	373	21600	2274	99	11000	1153	66	8991
312	40	217	238	106	377	15800	796	64500	4695	911	10700	5684	59	26900
313	58	361	228	151	322	6792	559	19300	5553	1528	13300	2608	42	10000
314	3	9	628	681	274	85900	895	133000	37500	30000	26800	61600	-3176	110000
321	202	1231	134	57	263	2693	584	8395	969	191	2698	867	132	4024
322	146	831	135	56	352	3424	487	15500	546	78	3267	1216	116	8662
323	34	190	100	54	136	3941	605	13500	732	241	1872	1037	158	4612
324	64	377	186	56	317	1543	343	3943	723	122	1834	274	60	2101
331	120	668	100	40	174	3125	422	11400	1196	126	4920	1247	81	6726
332	49	285	134	43	241	2205	390	6910	740	130	2322	478	73	3019
341	37	210	272	100	442	7871	1105	22400	29400	838	102000	2715	147	12000
342	101	590	126	37	272	3308	328	15700	1911	162	7992	905	58	7690
351	40	182	113	56	136	5018	562	12300	4976	463	12400	1414	108	4911
352	112	714	183	125	221	7589	652	41200	2430	1015	5665	2142	1	13700
353	3	12	546	648	231	164000	16000	233000	205000	177000	162000	39100	-132	73200
354	11	72	92	57	113	4250	246	11500	2258	317	4499	1384	-26	5533
355	26	164	113	40	191	2824	441	9477	1503	246	5121	678	74	4736
356	109	598	127	73	143	4204	532	32500	1675	366	4461	1331	85	12500
361	4	28	150	198	94	639	201	970	1444	385	2296	-53	-1	565
362	17	110	186	93	224	5428	646	10800	6681	381	19000	2042	156	5196
369	60	365	123	55	152	4491	354	13100	4458	133	15200	1585	88	6928
371	21	100	382	136	817	6791	214	29800	6197	858	14800	821	-196	11700
372	17	97	871	281	1805	25000	643	94000	32800	5828	54600	-617	-294	26600
381	224	1270	111	59	125	2227	476	5813	1317	207	3736	624	64	2714
382	91	478	128	51	458	8982	461	97000	3089	165	27500	2884	66	35000
383	30	190	149	102	142	6068	719	21900	1984	554	4665	2230	143	10300
384	45	249	143	55	169	5338	398	25700	1367	191	2667	1108	38	6269
385	13	76	66	49	50	1857	403	4158	447	115	735	515	85	2135
390	36	187	67	45	73	4309	479	23200	270	111	573	2226	123	14700

Source: ENIA and SBIF data set.

Table 2. Bank Borrowing

	Debt (thousands of 1996 pesos)			Debt/Capital			Number of Banks		Herfindahl	
	Mean	Median	St.Dev	Mean	Median	St.Dev	Mean	Median	Mean	Median
All firms	1163171	80657	4337847	2.1	0.5	21.8	2.9	2.0	0.71	0.74
By number of employees										
10-24	98544	11550	1322544	2.8	0.4	19.3	1.7	1.0	0.85	1.00
25-41	157334	33490	1434784	1.9	0.5	6.3	2.0	2.0	0.79	0.97
42-77	374676	84281	2110044	1.4	0.6	3.7	2.4	2.0	0.72	0.74
78-181	714376	258753	1809108	2.7	0.5	42.4	3.1	2.0	0.65	0.61
182-8580	4489760	1455891	8288604	1.8	0.5	12.2	5.1	4.0	0.52	0.45

Sources: SBIF data set and ENIA.

Table 3. Relationship Length

	With System		Current Min		Current Max		Weighted Average	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All firms	5.3	5.0	3.3	2.0	5.0	5.0	4.4	4.0
By number of employees								
10-24	5.1	5.0	3.6	3.0	4.7	4.0	4.2	4.0
25-41	5.1	5.0	3.5	3.0	4.7	4.0	4.2	4.0
42-77	5.3	5.0	3.3	3.0	4.9	5.0	4.3	4.0
78-181	5.6	5.0	3.2	2.0	5.3	5.0	4.6	4.0
182-8580	5.6	5.0	2.8	2.0	5.4	5.0	4.6	4.2

Sources: SBIF data set and ENIA.

Table 4. Distribution of Debt-Capital Ratios

Percentile	Debt/Capital
1	0.00001
5	0.00450
10	0.02414
25	0.13996
50	0.47993
75	1.27614
90	3.02296
95	5.25120
99	22.1050
Mean	2.137
St. Deviation	21.836
Minimum	0.00000
Maximum	1954.50
N Observations	12913

Sources: SBIF data set and ENIA.

Table 5. The Determinants of Firm Borrowing. Benchmark Estimates.

(Dependent Variable: Debt to Capital Ratio)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Relationship Length								
With the Banking System	0.0138				0.0107			
	[2.785]**				[2.549]*			
Current Min		0.0103				0.0108		
		[3.588]**				[3.776]**		
Current Max			0.0103				0.0089	
			[2.784]**				[2.604]**	
Weighted Average				0.0137				0.0132
				[4.154]**				[4.359]**
Herfindahl	-0.4300	-0.4646	-0.4238	-0.4479				
	[14.251]**	[14.602]**	[13.641]**	[14.694]**				
Number of Banks	0.1262	0.1268	0.1260	0.1263				
	[32.935]**	[31.352]**	[32.073]**	[32.543]**				
Number of Relationships Dummies								
Single Relationship					-0.9027	-0.9292	-0.8995	-0.9089
					[70.890]**	[55.019]**	[61.658]**	[64.737]**
Two Banks					-0.6488	-0.6582	-0.6471	-0.6519
					[49.081]**	[39.427]**	[43.303]**	[44.071]**
Three Banks					-0.4095	-0.4053	-0.4082	-0.4102
					[27.034]**	[21.675]**	[23.883]**	[24.177]**
Loan Overdue 90 days +	-0.0352	-0.0349	-0.0304	-0.0340	-0.0329	-0.0303	-0.0232	-0.0280
	[1.729]	[1.638]	[1.454]	[1.644]	[1.937]	[1.455]	[1.211]	[1.473]
Rank Rut - Individuals	-0.00006	-0.00006	-0.00006	-0.00005	-0.00003	-0.00003	-0.00003	-0.00003
	[2.362]*	[2.207]*	[2.219]*	[2.047]*	[1.584]	[1.226]	[1.459]	[1.381]
Rank Rut - Limited Liability	-0.00004	-0.00004	-0.00004	-0.00004	-0.00004	-0.00004	-0.00004	-0.00004
	[8.594]**	[7.957]**	[8.217]**	[8.280]**	[10.395]**	[8.242]**	[9.225]**	[9.163]**
Rank Rut - Publicly Traded	0.00000	0.00001	0.00000	0.00000	0.00004	0.00004	0.00004	0.00003
	[0.181]	[0.383]	[0.016]	[0.052]	[1.809]	[1.529]	[1.693]	[1.470]
Ln (Sales)	-0.0030	-0.0022	-0.0032	-0.0032	-0.0091	-0.0079	-0.0095	-0.0092
	[0.869]	[0.610]	[0.881]	[0.911]	[3.105]**	[2.194]*	[2.868]**	[2.809]**
Employment	-0.0004	-0.0004	-0.0004	-0.0004	-0.0002	-0.0002	-0.0002	-0.0002
	[18.190]**	[17.327]**	[17.534]**	[18.252]**	[12.872]**	[10.668]**	[11.502]**	[11.616]**
Profit/Sales	0.0005	0.0004	0.0006	0.0005	0.0005	0.0005	0.0005	0.0005
	[1.457]	[0.977]	[1.455]	[1.356]	[1.614]	[1.401]	[1.446]	[1.522]
Constant	0.2388	0.4917	0.3146	0.4767	0.9299	1.1568	1.0121	1.5351
	[1.757]	[3.746]**	[2.113]*	[3.751]**	[8.378]**	[9.218]**	[7.580]**	[13.335]**
Number of obs.	12913	12913	12913	12913	12913	12913	12913	12913
Pseudo R^2	0.0511	0.0512	0.0511	0.0513	0.0476	0.0478	0.0476	0.0478
Effect of One Extra Relationship								
From 1 to 2 banks	0.341	0.359	0.338	0.350	0.254	0.271	0.252	0.257
(St. Error)	0.012	0.013	0.013	0.013	0.012	0.015	0.013	0.013
From 2 to 3 banks	0.198	0.204	0.197	0.201	0.239	0.253	0.239	0.242
(St. Error)	0.003	0.004	0.003	0.003	0.015	0.018	0.017	0.017

Table 6. The Determinants of Firm Borrowing. Instrumented Estimates.
(Dependent Variable: Debt to Capital Ratio)

	(1)	(2)
Relationship Length (Min)	0.0211	0.0132
	[1.364]	[0.884]
Herfindahl	0.0662	0.3938
	[0.092]	[0.565]
Number of Banks	0.1895	0.2105
	[3.206]**	[3.672]**
Loan Overdue 90 days +	-0.0593	-0.0716
	[1.495]	[1.861]
Rank Rut - Individuals	-0.00013	-0.00013
	[4.235]**	[4.255]**
Rank Rut - Limited Liability	-0.00006	-0.00006
	[8.483]**	[8.808]**
Rank Rut - Publicly Traded	0.00001	-0.00001
	[0.121]	[0.296]
Ln (Sales)	-0.0044	-0.0032
	[1.043]	[0.789]
Employment	-0.0006	-0.0006
	[7.849]**	[8.099]**
Profit/Sales	-0.0004	-0.0003
	[1.106]	[1.023]
Constant	-0.3982	0.1036
	[0.611]	[0.157]
Number of obs.	12913	12913
Pseudo R^2	0.0111	0.0185
Effect of One Extra Relationship		
From 1 to 2 banks	0.156	0.013
(St. Error)	0.304	0.295
From 2 to 3 banks	0.178	0.145
(St. Error)	0.066	0.064

Figure 1. Density of Debt-Capital Ratios

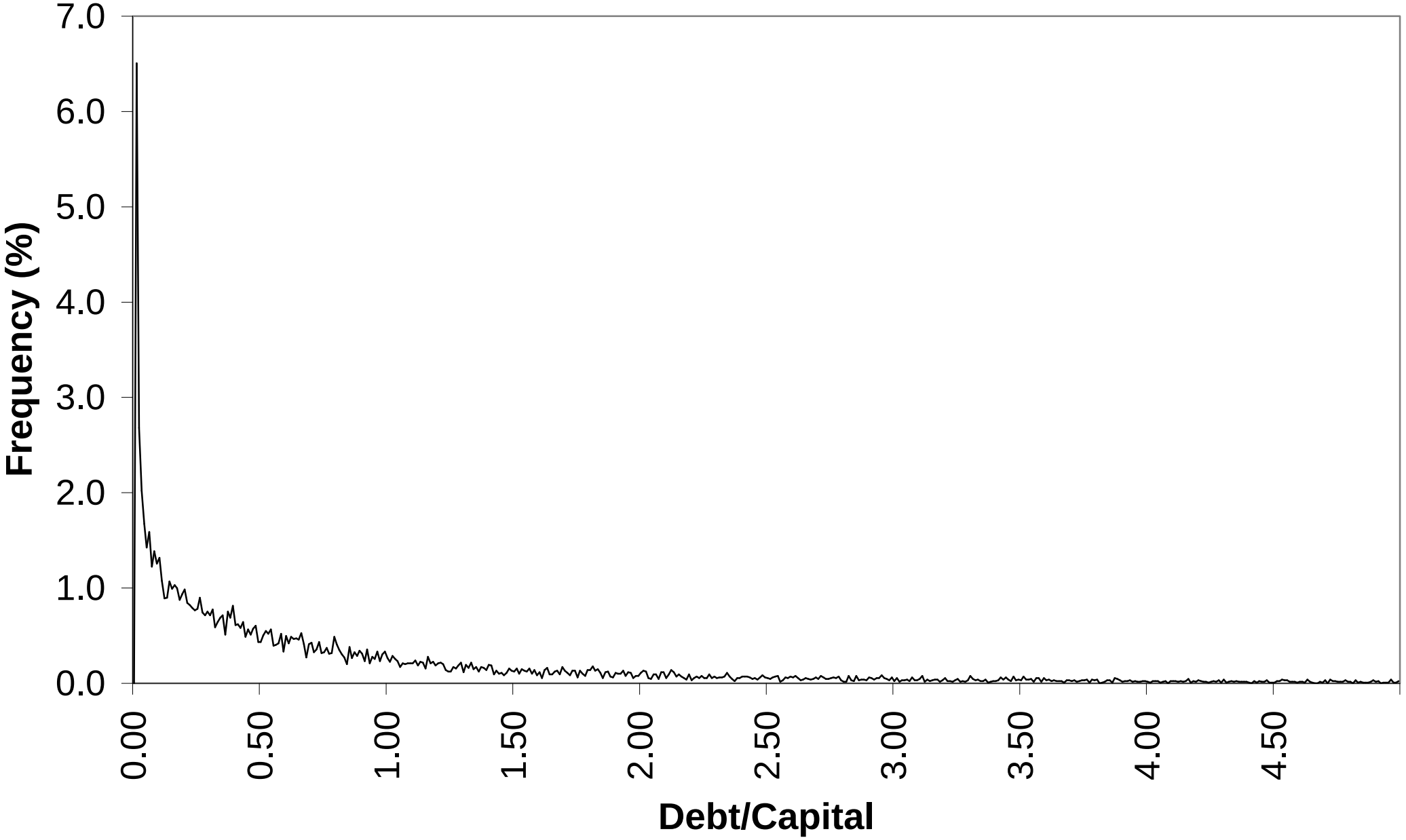
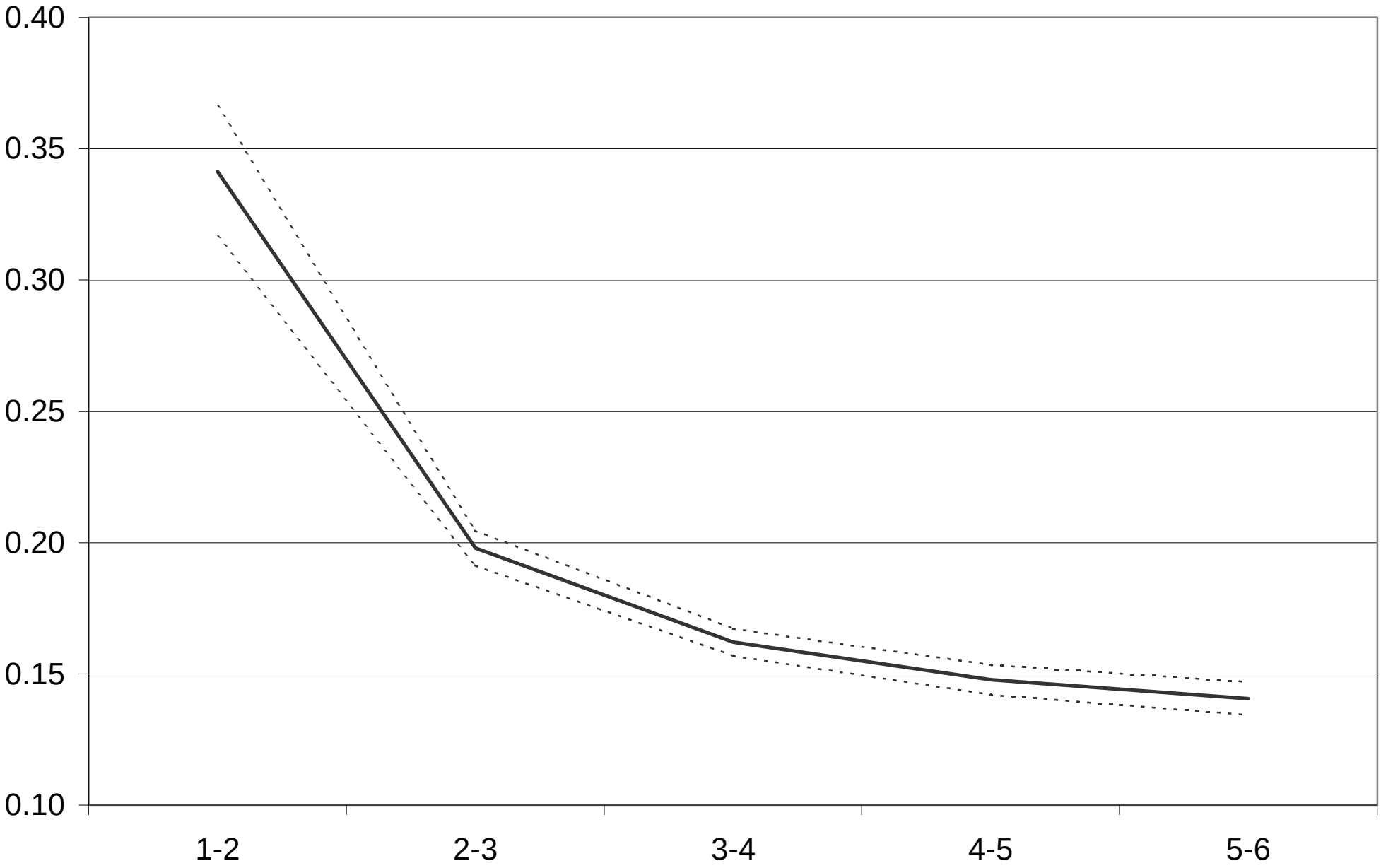


Figure 2. The Effect on Borrowing of Increasing the Number of Relationships



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