The Effects on Firm Borrowing Costs of Bank M&As*

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Abstract

Over the past few decades, banking systems in both mature and emerging markets have experienced a wave of consolidations, and mergers and acquisitions (M&A). These developments have raised a number of questions among researchers and policy makers. A key concern refers to whether bank mergers benefit or harm borrowers. The goal of this paper is to study the effects on bank clients of these M&A deals, by analyzing their effects on the loan rates paid by a sample of Chilean manufacturing firms over the 1990-98 period. Using a unique data set on credit transactions between banks and their clients, we study whether borrowers' terms of lending improve or worsen after the merger. Our methodology allows for a heterogeneous response of firms, depending upon the number of alternative funding sources available to them. We also allow for differences in the short- and long-term response of lending rates. Our results show that M&As do affect firms' borrowing costs, that these effects are long-lasting, and that they critically depend on whether firms have alternative lending sources that guard them from the adverse effects that mergers may convey. These results are consistent with the hypotheses that bank lending is characterized by informational monopolies and other sources of switching costs, and that valuable client-bank relationship information may be lost over the M&A process.

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1 Introduction

Over the past decades, the banking industry has significantly moved towards consolidation as the trend of mergers and acquisitions (M&As) of financial institutions has risen dramatically. A recent Group of Ten report (G-10, 2001) documents over 7600 financial institution acquisition deals within a group of 13 developed economies in the 1990s. The report also shows that the M&A activity increased over the decade, with a threefold rise in the number of deals by the end of the decade. The IMF documents a similar trend in emerging market financial systems (IMF, 2001). It reports that, as a result of the M&A activity and consolidation process, the number of banks operating in a sample of 13 emerging market economies fell by 30% between 1994 and 2002.

A large body of empirical literature has analyzed the effects on bank performance and on the amount of loans supplied or prices charged after consolidation. Most of these papers focus on the ex-post performance at the bank and market levels.[1] The focus on aggregate outcomes requires to deal with the fact that market structure and performance are jointly determined. A number of recent papers, however, analyze the effects of M&A using information on individual borrowers.[2] In particular, Sapienza (2002) uses a data set on Italian firms that allows for the identification of lending conditions at the customer level. Sapienza finds that the effects of mergers on loan prices are heterogenous and depend, among other variables, upon the size of the merger and the number of alternative sources of finance available to the firm. The use of micro data allows for a better identification of exogenous variation in lending concentration. That is, from the borrower's perspective, the merger is an exogenous event that changes market structure in a manner that does not depend on individual clients' decisions.

This paper adds to the growing literature on the effects of bank mergers at the customer level. Our analysis is based on a rich new data set on Chilean manufacturing firms. The merger wave observed in industrialized countries has also been present in Latin American economies (IADB (2004) and IMF (2001)), and Chile has been no exception. Over the 1990-2002 period, the number of commercial banks operating in Chile

[1] See Gilbert (1984) for a review of the early literature. Some recent papers include Akhavein, Berger and Humphrey (1997), Hannan and Prager (1998), Berger, Saunders, Scalise and Udell (1998), Peek and Rosengren (1998), De Young, Goldberg and White (1999), and Berger, Goldberg and White (2001).

[2] Firm level data has been used by Bonaccorsi di Patti and Gobbi (2003), Panetta, Schivardi and Shum (2003), Carow, Kane and Narayanan (2004), and Degryse, Masschelein and Mitchell (2005).

declined steadily from 41 to 26, i.e., a 38% reduction. As a by-product of this M&A activity, market concentration rose significantly. For instance, in 1990 the loan market share of the largest four banks (C4) was 49%, whereas the loan-based Herfindahl index (HHI) was equal to 848. By 2002, the C4 index had reached a level of 61%, whereas the HHI amounted to 1188. The goal of this paper is to study the effects on bank clients of these M&A and the resulting changes in market concentration, by analyzing their effects on the loan rates paid by a sample of Chilean manufacturing firms over the 1990-98 period.

To the best of our knowledge, the existing micro level literature has exclusively analyzed the experience of mature markets (specifically, Belgium, Italy, Norway and the US). Thus, this paper is the first one to study the experience of an emerging market economy. Furthermore, other features make the Chilean banking industry different from the markets analyzed by the recent literature. First, the Chilean market is not geographically fragmented, as are the markets in countries such as Italy and the U.S.; i.e, banks in Chile operate at the national level. Second, the Chilean banking industry ranks as having lower entry barriers than most countries, even the United States (Barth, Caprio and Levine, 2004). Finally, the patterns of ownership and control of Chilean publicly traded banks are strikingly different. Specifically, Chilean banks are controlled by conglomerates, whereas voting rights are widely spread in the US, Norway and other countries (Caprio, Laeven and Levine, 2004). Moreover, a significant fraction of the assets of banks operating in Chile is owned by foreign banks.

In most markets, the effects of mergers can be analyzed by focusing on market power and efficiency. That is, if a bank gains market share as a result of increased efficiency—through economies of scale and scope, synergies, or the selection of the best producers —then customers may gain through price reductions and larger traded volumes (Farrell and Shapiro, 1990). However, if suppliers gain market power as they consolidate, then clients' welfare may be reduced through lower good provision and higher prices.

However, this standard analysis misses the fact that informational frictions characterize lending markets. Banks invest in building relationships with their customers in order to better evaluate the risk of any given loan (Diamond, 1984). If the information that is gathered through the lending process is not easily conveyed to outsiders, then banks can build up informational monopolies that allow them to extract rents from

clients. This hold up problem can make it costly for a firm to switch lenders as it may signal that the most informed bank is not willing to lend to the firm. Firms, thus, have incentives to establish relationships with multiple lenders (Sharpe, 1990; Rajan, 1992).[3] These informational switching costs become particularly relevant during episodes of rising market shares. Indeed, a firm that has established relationships with two banks that merge afterwards, loses its ability to limit lenders' power through switching its funding source. Thus, rising concentration and mergers may facilitate borrower capture.

Another information-driven, although different effect of M&A, arises from possible losses of valuable client-bank relationship information. Because of the existence of imperfect information, relationships are built through repeated contact between the client and particular bank officers. If these matches are broken over a merger (e.g., because of reorganization), then valuable information on client's risk may be lost and, after the merger, borrowing costs may increase, particularly for those firms with no alternative borrowing sources.

In this paper we analyze whether bank clients' terms of lending improve or worsen after an M&A. Our methodology allows for a heterogeneous response of firms, depending upon the number of alternative funding sources firms have prior to the shifts in concentration, and upon the number of banks the firms borrow from that are directly involved in the merger. We also allow for differences in the short and long term response of lending rates. Our results show that M&A deals do affect firms' borrowing costs, that these effects are long-lasting and extremely heterogeneous. In particular, we find that whereas there seems to be no effect on average borrowing costs, there are statistically significant and economically relevant effects for some types of firms. Our results show that having alternative lending sources shields firms from the adverse effects that mergers may convey. We find that firms that borrowed exclusively from the banks involved in the merger suffer the most, with long-lasting rises in the cost of borrowing of up to 4.6 percentage points in some cases. On the contrary, firms that hold loans from multiple banks, and thus face lower switching costs, do not pay higher interest rates after the merger.

Our results are consistent with the hypothesis that bank lending is characterized by borrower capture—perhaps due to informational monopolies and other sources of

[3]See Boot (2000) and Ongena and Smith (2000) for recent literature reviews.

switching costs—, as the firms that suffer the most from increased market concentration are those that have no alternative lending sources. The results are also coherent with the idea that during mergers valuable information about clients may be lost, increasing borrowing costs for firms that can rely on alternative funding.

The remainder of the paper is organized as follows. In section 2 we provide a brief characterization of the Chilean banking industry. In section 3, we review the construction and properties of our data set. In the fourth section we analyze the M&A episodes, first describing our methodology and building treatment and comparison groups, and then presenting our estimation results. We conclude in section 5.

2 Mergers in the Chilean banking industry

Over our sample years (1990-1998) Chile experienced a period of high and sustained growth. GDP per capita grew at an annual average rate of 6.5%; i.e, in only eight years, income per capita increased by 65%. Banking loans amounted to 60% of GDP in 1990-98 on average. This share grew at a fast pace over the period: by 1998 it was equal to 71.5%. This ratio of banking loans to GDP is large by Latin American standards.

The banking system consolidated over the decade. After a number of regulatory changes—that responded to the massive failure of banks during the crisis of 1982-83—the industry experienced strong growth and a sharp increase in its international integration. The concentration of the system also increased. Figure 1 plots the evolution of two loan-based concentration measures: the Herfindahl index (HHI) and the share of the largest four banks (C4). Both indicators show a large rise in concentration. At the beginning of the period, the C4 index was equal to 49.2%, and the HH index was equal to 837.2. By the end of our sample period (1998), these indices reached 52.2% and 922, respectively. Concentration rose even further after the end of the decade, as the loan-based Herfindahl index reached its peak (1426) in December of 2002. At the time, the C4 index was equal to 67.5%. Despite this tendency, the concentration of the Chilean system does not stand out in international comparisons standards. Moreover, it displays a pattern similar to those of small OECD countries (Levine, 2000; Beck et al., 1999).

The figure also shows that market concentration experienced a number of discrete changes (1996, 1997, 2001, and 2002). All these episodes correspond to M&A activity. The arrows in the figure mark all the M&A events that occured over the period. The first three episodes involved a mid-sized and a small bank, and did not change the concentration of the industry materially. The next four involved larger banks, and thus had an effect on market concentration. M&A activity also led to a significant decline in the number of commercial banks operating in Chile (figure 2). In December of 1990 there were 40 banks in business in Chile. By December of 1998, 32 banks were in operation. This number declined even further by the end of 2002, with only 26 banks remaining in the system.

The Chilean industry is characterized by very high foreign bank ownership ratios (Barth et al., 2004). The asset share of foreign banks rose from 20% in the early 90s to over 50% by the end of the decade. Additionally, publicly traded banks are characterized by ownership and voting rights concentration. According to Caprio et al. (2004), 53% of Chilean banks' voting rights are owned by the controlling shareholder. Their sample average (44 countries) is much lower: 35.8%.

The indicators show that the system has remained profitable and healthy (figure 3). Profits as a percentage of assets averaged 5.86%, whereas past-due loans as a fraction of total loans averaged 1.17%. Moreover, efficiency, measured as expenses over assets, decreased slightly from 3.3% in the early 1990s to 2.7% by 1998 (Ahumada and Marshall, 2001).

3 Data

The data in this study comes from two sources. The first data set gathers information on all credit transactions between commercial banks and firms. The information is collected by the Superintendency of Banks and Financial Institutions (SBIF), the commercial bank regulatory and supervising government agency. The data set contains information on the amount borrowed by each firm from each commercial bank, and the fraction of outstanding and overdue loans, including also data on credits paid late. In Chile, all firms and individuals are assigned a unique identification or taxpayer code when they

are born or legally incorporated, known as *Rol Único Tributario* or RUT. This code is recorded in the data set, and allows us to follow 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 of manufacturing firms conducted annually by the statistics government agency (*Instituto Nacional de Estadísticas*, INE). The ENIA covers all manufacturing plants with at least ten employees. 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, investment, and interest payments including inflation adjustments and bank commissions paid.[6] Although not reported in the publicly available data set, the survey records the firms' RUT, so the two data sets can be matched.

To construct a proxy for interest rates, we use total interest payments from ENIA in year t as a fraction of the average outstanding debt between $t-1$ and t from SBIF. Unfortunately, matching firms across surveys may induce a number of measurement problems. First, since interest includes payments accrued to both banking and non-banking debt we may overestimate the true interest rate paid. Most of the firms in our sample, however, are small, individually owned or limited liability corporations, and have thus limited access to non-banking external finance. Second, debt is possibly overestimated, since 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 represents a broader set of activities than the ENIA. This means that we may overestimate the debt relative to other firm characteristics, and thus may underestimate the interest rate. Finally, 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 produced under the same RUT.

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

[5]Manufacturing employment represents roughly 16% of total Chilean employment.

[6]Inflation adjustments on financial contract interest rates are due to the widespread use of indexation clauses in Chile.

These and other possible measurement problems lead to the existence of a number of extreme outliers in the distribution of interest rates paid. Chilean law, however, prohibits to charge interest rates over a certain maximum (*tasa máxima convencional*). This rate reached a peak of over 80% in 1991 during our sample period. So, to partially account for measurement error in loan rates, we excluded interest rate observations over a hundred percent. We also excluded firms with either no debt or no interest payments, and those that had no bank loans outstanding.

Table 1 presents some basic sample statistics for our interest rate measures. The overall sample mean, including commissions and inflation adjustments, is 30%. The standard deviation suggests that there is heterogeneity in the rates paid by firms. Part of this heterogeneity can be explained by size: larger firms—as measured by employment—tend to pay lower interest rates. Figure 4 shows that the sample average behaves in a manner similar to the aggregate market rate.[7]

Our working data set contains thus almost 8000 observations on more than 1500 firms over the 1991-1998 period.[8] Nominal figures were deflated using the value added and gross production deflators constructed by ECLAC/UN 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 2 describes a number of relevant firm characteristics. The average firm sells almost 4 million 1985 Chilean pesos (about 38 thousand current dollars) annually and has a physical capital stock of 2.7 million 1985 Chilean pesos (26,000 current dollars, approximately).[9] It employs 155 workers and borrows from three banks. About 6.6% of firms have had loans overdue 90 days or more. The table shows that there is wide heterogeneity in all these characteristics. These variables will be used in our regression analysis to control for firm observables that are correlated with interest rates paid.

[7] It is worth noting that these rates are not completely comparable. First, our sample rates include commissions paid. Second, these rates include commercial loans only. Finally, the aggregate rates refer to loans given for a 90 days to one year period, whereas our sample does not allow us to identify maturity.

[8] We lose the observations on 1990, since interest rates were constructed as the ratio of interest payments over average debt at $t-1$ and t.

[9] All Chilean-peso denominated variables are measured at 1985 prices. The amounts reported for sales and capital stock were first converted to 2004 Chilean pesos using the wholesale price index, and then to dollars at the average market rate of 2004; i.e., 609.53 pesos per dollar.

Table 3 lists the five M&A episodes we analyze in this paper, including the average market share of the relevant banks a year before the merger occurred. Three events involve relatively small banks that did not change market concentration significantly ex-post. The remaining mergers involve banks of similar size, with pre-merger average market shares of about 8%.

4 The effects of bank M&A on interest rates

Our empirical analysis focuses on the effect of bank mergers and acquisitions on the cost of borrowing at the firm level. In this section we lay out our estimation strategy and present our estimation results and robustness checks.

4.1 Methodology and benchmark results

We investigate whether firms that faced an M&A first-hand pay ex-post interest rates that are different from the rates paid by firms that were not affected by the merger directly. Therefore, in our benchmark econometric model, we classify firms according to whether they borrow or not from banks that merge in the subsequent period. Our methodology is flexible enough to allow us to study the effects at different time horizons and across different groups of firms. Furthermore, since the observed heterogeneity in the cost of borrowing can be explained by other firm characteristics, we control for firm observables. We also include time and firm effects in our regression framework. In the basic setup we thus estimate the following regression:

$$r_{it} = \alpha + \beta d_{it}^{h} + X_{it}\gamma + \phi_i + \lambda_t + \eta_{it} \tag{1}$$

where r_{it} is the interest rate paid by firm i at date t. The dummy variable d_{it}^{h} indicates whether firm i faced a merger first-hand. The superscript h ($h = S, L$) indexes the relevant time horizon; i.e, whether the effect on rates is short or long lived. Specifically, we define $d_{it}^{S} = 1$ if the firm held loans in $t-1$ and in t from a bank that merged in $t-1$ (i.e., two banks operating in $t-1$ became one in t), and $d_{it}^{S} = 0$ otherwise. That is, in this specification we assume that the effect of the M&A on the cost of borrowing lasts

one period only. Similarly, we define $d_{it}^L = 1$ if the firm faced a merger directly in any period s with $s < t$, and $d_{it}^L = 0$ otherwise. Thus, as in Focarelli and Panetta (2003), this specification allows for long lasting effects of M&As. The coefficient β represents the effect of the merger on interest rates paid.

In the regression, X_{it} denotes firm observables, while ϕ_i and λ_t are firm and time effects, respectively. Finally, η_{it} represents mean zero random error.

The M&As may affect different firms in different ways. In particular, we focus on the pre-merger bargaining power of a firm *vis a vis* the newly consolidated bank. For instance, firms may choose to borrow from two banks to reduce the extent to which banks can extract rents from them, as transactional and informational costs may make it difficult to switch to a third bank (Sharpe, 1990; Rajan, 1992). Thus, a firm that borrows exclusively from two banks that merged suffers a worsening in these hold-up costs, whereas a firm that borrows from two banks, one not involved in the merger, can still easily move its business across banks without incurring extra costs. A similar argument can be made for the loss of valuable firm information after a merger.

In order to explore whether there are different responses of different firms, we build different specifications of our M&A dummy variable in order to allow for a heterogeneous response of borrowing costs to bank consolidation. Figure 5 depicts our firm classification strategy. The first set at the top panel of the figure refers to the description of d_{it}^h in equation (1): whether the firm faced an M&A directly or not, in the relevant time horizon. At the second level we separate firms facing the merger according to the availability of alternative bank lending sources; i.e., we distinguish firms that at the time of the merger borrowed exclusively from banks involved in the merger, from firms that had already established other borrower-lender relationships. Finally, at the lower level, we allow for a further subset of categories: (1) firms that borrowed exclusively from one of the merging banks; (2) firms that borrowed exclusively from both merging banks; (3) firms that borrowed from multiple banks and only one of them was involved in the merger, and (4) firms that borrowed from the two banks that merged and from other additional banks. That is, in this specification, we classify firms that faced directly the M&A, according to their availability of other sources of bank lending, and by the effect that the M&A had on the number of lending relationships.

Panel b of figure 5 describes an alternative classification of firms. In this specification we allow for non-banking lending sources. Although most of the firms in the sample are small and depend almost exclusively on banks for finance, firms that are stock corporations can obtain external funds in bond, stock, and other markets. Thus, in this case, we allow for differences in the response of firms that are stock corporations from those that are not.

Table 4 shows the distribution of firms in each of the groups for our different specifications. Unfortunately, some of these bins contain very few observations, reducing the precision of our estimates for these categories.[10]

Our econometric model also controls for a number of variables in order to correct for characteristics that may make firms more or less likely to demand external funds, and more or less risky. These controls include firm characteristics such as the number of employees, the natural log of sales, the natural log of the capital stock, regional dummies, sectoral dummies at the two-digit ISIC level, and a dummy indicating whether the firm has had overdue loans in the past.

We also include the number of banks the firm borrows from in the vector of controls. With repeated lending, having a single banking relationship allows the bank to extract informational monopoly rents from the firm. Additional relationships induce competition from multiple informed banks, reducing the extent of the hold-up costs. The number of relationships held, thus, is a key determinant of the cost of borrowing.[11] Sapienza (2002), a very close paper in terms of methodology, does not control for the number of lenders. Not controlling for this variable may bias the results against the null hypothesis that M&As exert no effect on lending rates, as the number of lenders is mechanically reduced if firms hold loans from both merging banks. Our regression results, reported below, show that the number of lending relationships does have an economically and statistically significant effect on the cost of borrowing.

The vector X_{it} also includes an indirect measure of age to control for firm quality and for a selection bias due to exit. We do not observe directly the dates when firms were

[10] The number of firms in each category does not add up to the same figure across specifications. Since there are multiple M&A episodes in our sample, a firm can fall into more than one category over time.

[11] See Boot (2000) for a recent literature review.

created. However, RUTs are assigned by the Internal Revenue Service chronologically; i.e., a younger firm has a larger RUT number than an older firm. These identification numbers are assigned within ownership categories. For instance, individuals have RUTs between 1 and 48 million, limited liability corporations have RUTs between 77 and 80 million, and stock corporations have RUTs between 90 and 97 million. Since we are not allowed to observe directly the RUTs, the statisticians that prepared the data set for us created a variable we called "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 represented by individuals, limited-liability corporations and stock corporations.

Finally, our model includes a set of firm dummies. To test whether these should be treated as random or fixed effects, we ran our basic specification—i.e., without merger dummies—using both estimation methodologies. Table 5 presents the results of our model of firm borrowing costs without M&A controls. Hausman's specification test rejects the null that firm effects are uncorrelated with other explanatory variables. Thus, in what follows we present results using fixed effect specifications. This choice, of course, although ensuring consistency, implies that the coefficients on variables that do not vary over time—rank RUT, and region and sector dummies—cannot be estimated.

The first column of table 5 shows fixed effect results without controls for M&As. The estimation results indicate that the number of lenders has a negative, statistically significant and economically relevant effect on loan rates. These results are in line with the theoretical and empirical literature on relationship banking: having multiple lenders reduces the ability of any single lender to extract informational monopoly rents from the firm.[12] The effect is quite important: having an extra lending relationship reduces the cost of borrowing by half a percentage point. Our results also indicate that larger firms pay lower rates if firm size is measured by the number of employees. Specifically, if a firm hires 100 more employees (about one third of one standard deviation of employment in the sample), interest rates fall by 0.25 percentage point. These size effects have been found elsewhere in the literature and can be understood as a result of the bargaining power that larger firms have in lending relationships. They also may reflect that size is correlated with firm quality. The effect of sales on the cost of borrowing is also negative.

[12] We investigated whether this relationship is non linear, as the gains from adding a lender should be the largest when the firm borrows from a single bank. We did not find evidence of such a phenomenon.

A 1% increase in sales reduces rates paid by a little less than a quarter of a percentage point. Like employment, sales serve as a proxy for size and quality. Moreover, sales are related to the availability of internal funds, which also reduce the cost of external finance. The coefficient on capital is positive and significant. Possibly, the size of the capital stock is related to the firm's demand for funds and indebtedness, and thus a larger stock of capital, once corrected for firm size, leads to higher interest rates. Finally, the point estimate of the coefficient on the dummy that indicates whether a firm had overdue loans (90 days or more) in the past is negative; however, it is not statistically different from zero.

4.2 The effects of M&As

Given the setup of the model specified in equation (1), an M&A can have two effects on the borrowing costs firms face. First, the M&A may have a direct effect on interest rates paid, measured by the coefficient β on the merger dummy. Second, it may reduce the number of banks a firm borrows from, if the firm owes to both merging banks. In other words, if a firm had n lending relationships and two of these n banks merge, then the firm ends up with $n-1$ bank lending sources after the merger occurs.

Table 6 presents our first set of estimation results. The first column assumes that the effect lasts one period only (d_{it}^S), whereas the second assumes that the effect lasts at least as long as the time horizon of our sample period (d_{it}^L). In both cases the point estimates indicate that, conditional on the number of lenders, the merger has a positive effect on rates paid ($\beta = 0.48$ in the short run, and $\beta = 0.33$ in the long run), although these coefficients are not statistically different from zero. Thus our econometric results suggest that if the merger does not reduce the number of lenders, then firms do not face shifts in the interest rates they pay. This result, however, hides important heterogeneous responses.

To start with, if firms hold loans from both merging banks, then the final effect is given by the difference between the coefficients on the M&A dummy and the number of lenders variable, as the merger reduces the outside options of the client firms. The bottom panel of table 6 reports the effect of the M&A for firms that owe to both merging banks. The statistically significant point estimate suggests that the immediate effect is

to rise the rate paid by 1.03 percentage points. For the long term, the point estimate is slightly lower (a rise of 0.86 percentage point), but not statistically different from zero.

4.3 The role of the availability of multiple lending sources

Further heterogeneity arises when we consider the differential impact on firms that had alternative sources of bank finance prior to the merger episode (table 7). Conditional on size and risk, a firm that borrows from a single bank has less bargaining power than a firm that currently borrows from two, three or more banks. If a single lender firm faces an M&A, the firm cannot easily change its credit source. Switching costs are much lower if the firm holds loans from other banks, since it can threat to move its business elsewhere if the lender asks for higher interest rates. Alternatively, a firm that holds loans from multiple banks is more likely to face rate reductions when its lending source becomes larger and gains efficiency.

Our regression results indicate that firms that had no other lending relationships face a rise in the interest rate charged of 2.14 percentage points in the short run, and 4.08 percentage points in the long run, if the number of lenders is kept constant. Firms that received funds not only from banks in the merger, but also from other banks, see no change in the cost of borrowing (again, holding the number of lending banks).

The lower panel of Table 7 reports the net effect once we account for the possible reduction in the number of lending relationships. That is, if a firm held loans from a single bank that merged, then the effect is the one described before by the merger dummy coefficient. If the firm held loans from two banks exclusively, and these banks merge, then the effect is given by the coefficient on the M&A dummy minus the coefficient on the number of lenders. Thus, the net effect on these firms is a rise in the interest rate paid of 2.69 and 4.62 percentage points, depending upon the time horizon. These effects are strikingly different, in terms of level and statistical significance, from the effects on firms that have multiple lending relationships, as these firms experience no change in their costs of borrowing. Thus, our results confirm the hypothesis that having alternative lending sources helps firms isolate from the adverse effects that mergers may convey, and are therefore consistent with the existence of informational monopolies and switching costs or the loss of valuable information.

Table 8 presents the results of the specification that allows for heterogeneous effects depending upon the availability of other sources of bank finance and upon the number of current lending banks that are involved in the merger. The results for the first subgroup of firms—those facing the merger and having only one lending relationship established at the time of the M&A—are consistent with those obtained in the previous specification: if a firm has a single lending relationship, and that single bank merges with another bank, then the firm faces a short-run rise in interest rates of 2.7 percentage points and a long-term rise of 4.3 percentage points.

The results for the second subgroup—firms with only two lending relationships, both in the merger—are very imprecise. This is due to the small number of firms that fall into this category (see table 4). The M&A dummy for firms with multiple lending relationships and only one bank involved in the merger indicate that these firms do not face a significant rise in the interest rate. By definition, these firms have not faced a reduction in the number of banks they owe to, so the final effect is fully captured by the M&A dummy. The effect, thus, is statistically equal to zero in the short and long run.

Finally, the relevant effect for firms that have many lenders, but two were involved in the merger, is the net effect reported at the bottom of the table. In the short run, these firms pay rates that are 0.46 percentage point lower, a not statistically significant effect. In the long run these rates fall even further, up to almost 1 full percentage point, although the effect is still not statistically different from zero.

Our final specification, reported in table 9, is again motivated by the hypothesis that having other external sources of finance reduces the monopoly rents a bank can extract from any given firm. Since firms can rely on non-banking sources of finance, the previous results might underestimate the firms' access to other funding as banks consolidate. This time we classify firms by their ownership status; specifically, whether they are stock corporations or not. Stock corporations are firms that are more likely to have access to bond and stock markets for finance, and thus may enjoy a better bargaining position than firms that are not stock corporations. Our results again point to the fact that having multiple lending sources isolates firms from the negative effects M&A may convey. Firms that are not stock corporations face statistically significant rises in the rates charged of 1 to 1.5 percentage points, depending on whether the number of lending relationships is reduced as a by-product of the merger, whereas firms that are

stock corporations do not experience changes in the interest rate they pay.

Summing up, our results support the general predictions of the theoretical literature: the availability of alternative sources of finance reduces the bargaining power of banks. Although on average there seems to be no effect of M&A on borrowing costs, there is important heterogeneity across firms. Indeed, firms that have no alternative lending sources actually pay higher interest rates when market concentration increases. The potential efficiency gains of increased concentration are shared only with firms that hold loans from multiple banks.

5 Conclusions

We have explored the effects on interest rates paid by a sample of Chilean manufacturing firms of banking M&As. Our results show that bank M&As have heterogeneous effects on firms' borrowing costs. In particular, a key variable is whether firms have access to alternative external funding sources—either from multiple bank lenders or from other markets, such as bond and stock markets. Moreover, our analysis of the effects of bank M&As on the terms of lending show that firms that borrow exclusively from the banks involved in a merger actually face an increase in borrowing costs. These findings are consistent with the idea that bank lending is characterized by borrower capture, perhaps due to informational monopolies and other sources of switching costs, as the ability to obtain better loan rates from a third party reduces the extent to which any given firm loses bargaining power against a bank that consolidates. They are also coherent with the idea that after M&A, valuable client information may be lost.

The results in this paper are limited to the analysis of interest rates. Other key aspects of loan contracts should be studied. For instance, what happens to loan maturity, the probability of being denied credit, the amount lent, and the quality of services when banks consolidate? Moreover, future work should analyze the consequences for regulatory and tax policy of the hold-up problem suggested by our results. As a matter of fact, Chilean firms must pay a tax every time they are granted a new loan, a cost that can be avoided if the credit is rolled over within the same bank. Thus tax policy adds lock-in effects that make it difficult for firms to shop around. Moreover, it has long been

recognized in Chile that moving guarantees across banks is a difficult task. Indivisibility of collateral or guarantees is chief among the difficulties a typical firm faces for having multiple relationships. These are open questions that should be addressed by future research.

References

[1] Ahumada, L. and J. Marshall (2001), "The Banking Industry in Chile: Competition, Consolidation, and Systemic Stability", BIS Working Paper.

[2] Akhavein, J., A.N. Berger and D.B. Humphrey (1997), "The Effects of Megamergers on Efficiency and Prices: Evidence from a Bank Profit Function", *Review of Industrial Organization*, 12, 95-139.

[3] Barth, J.R., G. Caprio and R. Levine (2004), "Bank Regulation and Supervision. What Works Best?", *Journal of Financial Intermediation*, 13(2), 205-248.

[4] Beck, T., A.Demirgüç-Kunt and R.Levine (1999), "A New Database on Financial Development and Structure", The World Bank.

[5] Berger, A.N., L.G.Goldberg and L.J. White (2001), "The Effects of Dynamic Changes in Bank Competition on the Supply of Small Business Credit", mimeo Board of Governors of the Federal Reserve System.

[6] Berger, A.N., A. Saunders, J.M.Scalise and G.F. Udell (1998), "The Effects of Bank Mergers and Acquisitions on Small Business Lending", *Journal of Financial Economics*, 50, 187-229.

[7] Bonaccorsi di Patti, E. and G.Gobbi (2003), "The Effects of Bank Mergers and Acquisitions on Credit Availability: Evidence from Corporate Data", Temi di Discussione 479, Banca D'Italia.

[8] Boot, A.W. (2000), "Relationship Banking: What Do We Know?", *Journal of Financial Intermediation*, 9, 7-25.

[9] Caprio, G., L.Laeven and R.Levine (2004), "Governance and Bank Valuation", World Bank Policy Research Working Paper 3202.

[10] Carow, K.A., E.J. Kane and R.Narayanan (2004), "How Have Borrowers Fared in Banking Mega-Mergers?", NBER Working Papers 10263.

[11] De Young, R., L.G.Goldberg and L.J.White (1999), "Youth, Adolescence, and Maturity of Banks: Credit Availability to Small Business in an Era of Bank Consolidation", *Journal of Banking and Finance*, 23, 463-492.

[12] DeGryse, H., N.Masschelein, and J.Mitchell (2005), "SMEs and Bank Lending Relationships: The Impact of Mergers", CEPR Discussion Papers Series 5061.

[13] Diamond, D. (1984), "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies*, 51, 393-414.

[14] Farrell, J., and C.Shapiro (1990), "Horizontal Mergers: An Equilibrium Analysis", *American Economic Review*, 80(1), 107-126.

[15] Focarelli, D. and F. Panetta (2003), "Are Mergers Beneficial to Consumers? Evidence from the Market for Bank Deposits", *American Economic Review*, 93, 1152-1172.

[16] Gilbert, R.A. (1984), "Bank Market Structure and Competition: A Survey", *Journal of Money, Credit and Banking*, 16, 617-645.

[17] Group of Ten (2001), *Report on Consolidation in the Financial Sector*.

[18] Hannan, T.H. and R.A.Prager (1998), "Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry", *Journal of Industrial Economics*, 46, 433-452.

[19] IADB (2004), "Unlocking Credit: The Quest for Deep and Stable Bank Lending", Economic and Social Progress Report.

[20] IMF (2001), *International Capital Markets. Developments, Prospects, and Key Policy Issues*.

[21] Levine, R. (2000), "Bank Concentration: Chile and International Comparisons", Documento de Trabajo Banco Central de Chile No. 62, January.

[22] Ongena, S. and D.C.Smith (2000), "What Determines the Number of Bank Relationships? Cross-Country Evidence", *Journal of Financial Intermediation*, 9, 26-56.

[23] Panetta, F., F.Schivardi and M.Shum (2003), "Do Mergers Improve Information? Evidence from the Loan Market", mimeo.

[24] Peek, J. and E.S.Rosengren (1998), "Bank Consolidation and Small Business Lending: It's Not Just Bank Size that Matters", *Journal of Banking and Finance*, 22, 799-820.

[25] Rajan, R. (1992), "Insiders and Outsiders: The Choice Between Informed and Arm's Length Debt", *The Journal of Finance*, 47, 1367-1400.

[26] Sapienza, P. (2002), "The Effects of Banking Mergers on Loan Contracts", *The Journal of Finance*, 57, 329-367.

[27] Sharpe, S. A. (1990), "Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationship", *Journal of Finance*, 45, 1069-1087.

[28] Yagui, E. (1993), "Un Deflactor para la Encuesta Nacional Industrial Anual (Base 1989=100)", *Estadística y Economía*, 6, 129-163.

Table 1. Borrowing Cost

	Interest Payments/Debt (%)		
	Mean	Median	St.Dev
All firms	29.80	25.57	21.81
By number of employees (size quintiles)			
I (smallest)	30.28	26.25	23.44
II	31.99	29.06	22.99
III	30.39	26.88	21.15
IV	29.8	26.03	20.83
V (largest)	26.59	21.53	20.09

Table 2. Firm Characteristics

	Mean	Median	St.Dev	Minimum	Maximum
Sales (thousands of 1985 Chilean pesos)	3908	490	20300	6	725000
Number of employees	154.9	68.0	267.2	10	3442
Physical capital (th. of 1985 Chilean pesos)	2692	275	18400	1	934000
Whether it has had past-due loans	0.07	0.00	0.25	0.0	1.0
Number of lenders	3.2	2.0	2.6	1.0	22.0

Table 3. Merger Episodes

	Bank 1		Bank 2	
Date	Name	Average share in year prior to the merger (%)	Name	Average share in year prior to the merger (%)
June 1993	O´Higgins	5.20	Centro Hispano	1.21
December 1993	O´Higgins	5.97	Hong Kong	0.40
January 1996	BHIF	4.63	Banesto	0.94
July 1996	Osorno	7.42	Santander	6.63
January 1997	O´Higgins	8.10	Santander	9.94

Source: SBIF.

Table 4. Classification Strategy

	% of firms
Basic specification	
Firms directly facing a merger	42.18%
Alternative bank lending sources	
Firms directly facing a merger and having no other lenders	5.84%
Firms directly facing a merger and having other lenders	37.16%
Alternative bank lending sources and number of lending banks in the merger	
Firms directly facing a merger and having only one lender	5.40%
Firms directly facing a merger and having two lenders, both in the merger	0.50%
Firms directly facing a merger and having multiple lenders, one in the merger	34.65%
Firms directly facing a merger and having more than two lenders, two of them in the merger	10.55%
Outside lending sources	
Firms that face a merger directly and are not stock corporations	25.92%
Firms that face a merger directly and are stock corporations	16.25%

Note: The number of firms in each category does not add up to the same figure across specifications. Since there are multiple M&A episodes in our sample, a firm can fall into more than one category over time.

Table 5. Determinants of the Borrowing Cost

(Dependent Variable: Interest Rate Paid, %)

	Fixed effects	Random effects
Number of lenders	-0.5358	-0.2942
	(0.151)***	(0.147)**
Sales (natural log)	-0.2240	-0.2380
	(0.139)*	(0.147)*
Number of employees	-0.0025	-0.0043
	(0.001)***	(0.002)***
Physical capital stock (natural log)	1.0398	0.1610
	(0.350)***	(0.268)
Loan overdue 90 days +	-2.4110	-0.8376
	(2.876)	(1.251)

All regressions include a full set of year, regional and 2-digit-ISIC sector dummies. Time-independent age control variables are also included. White-robust standard errors in parentheses.

*** indicates 1% significance.

** indicates 5% significance.

* indicates 10% significance.

Table 6. M&A Effects on the Cost of Borrowing

(Dependent Variable: Interest Rate Paid, %)

	Short-lived	Long-lived
M&A dummy	0.4826	0.3333
	(0.414)	(0.806)
Number of lenders	-0.5486	-0.5419
	(0.151)***	(0.152)***
Sales (natural log)	-0.2307	-0.2285
	(0.142)*	(0.139)*
Number of employees	-0.0025	-0.0025
	(0.001)***	(0.001)***
Physical capital stock (natural log)	1.0662	1.0594
	(0.354)***	(0.364)***
Loan overdue 90 days +	-2.4330	-2.4151
	(2.873)	(2.871)
M&A dummy net of effect on number of lenders	1.0312	0.8752
	(0.456)***	(0.826)

Fixed effect regressions that also include a full set of year dummies.
White-robust standard errors in parentheses.
*** indicates 1% significance.
** indicates 5% significance.
* indicates 10% significance.

Table 7. Alternative Bank Lending Sources

(Dependent Variable: Interest Rate Paid, %)

	Short-lived	Long-lived
M&A dummy		
Firms directly facing a merger and having no other lenders	2.1447 (0.998)**	4.0791 (1.237)***
Firms directly facing a merger and having other lenders	0.2892 (0.409)	-0.2659 (0.776)
Number of lenders	-0.5413 (0.151)***	-0.5367 (0.147)***
Sales (natural log)	-0.2207 (0.141)*	-0.1753 (0.150)
Number of employees	-0.0025 (0.001)***	-0.0026 (0.001)***
Physical capital stock (natural log)	1.0273 (0.351)***	1.1127 (0.359)***
Loan overdue 90 days +	-2.3926 (2.871)	-2.3191 (2.839)
M&A dummy net of effect on number of lenders		
Firms directly facing a merger and having no other lenders	2.6860 (1.076)**	4.6158 (1.261)***
Firms directly facing a merger and having other lenders	0.8305 (0.430)*	0.2708 (0.786)

Fixed effect regressions that also include a full set of year dummies.
White-robust standard errors in parentheses.
*** indicates 1% significance.
** indicates 5% significance.
* indicates 10% significance.

Table 8. Firms Borrowing from M&A and other Outside Banks

(Dependent Variable: Interest Rate Paid, %)

	Short-lived	Long-lived
M&A dummy		
Firms directly facing a merger and having only one lender	2.6884 (1.154)**	4.2787 (1.484)***
Firms directly facing a merger and having two lenders, both in the merger	-3.3649 (2.196)	0.2904 (3.477)
Firms directly facing a merger and having multiple lenders, one in the merger	0.5989 (0.451)	-0.2401 (0.779)
Firms directly facing a merger and having more than two lenders, two of them in the merger	-1.0088 (0.539)*	-1.4919 (0.900)*
Number of lenders	-0.5534 (0.150)***	-0.5498 (0.151)***
Sales (natural log)	-0.2091 (0.139)	-0.1439 (0.152)*
Number of employees	-0.0024 (0.001)***	-0.0028 (0.001)***
Physical capital stock (natural log)	1.0862 (0.345)***	1.1227 (0.361)***
Loan overdue 90 days +	-2.3419 (2.882)	-2.2827 (2.848)
M&A dummy net of effect on number of lenders		
Firms directly facing a merger and having only one lender	NF	NF
Firms directly facing a merger and having two lenders, both in the merger	-2.8115 (2.106)	0.8402 (3.414)
Firms directly facing a merger and having multiple lenders, one in the merger	NF	NF
Firms directly facing a merger and having more than two lenders, two of them in the merger	-0.4554 (0.500)	-0.9422 (0.834)

Fixed effects regressions that also include a full set of year dummies.
White-robust standard errors in parentheses.
NF: no firms fall into this category, as only one of their lending banks merge.
*** indicates 1% significance.
** indicates 5% significance.
* indicates 10% significance.

Table 9. Outside Lending Sources: Stock Corporations

(Dependent Variable: Interest Rate Paid, %)

	Short-lived	Long-lived
M&A dummy		
Firms that face a merger directly and are not stock corporations	1.0431 (0.586)*	0.9993 (0.964)
Firms that face a merger directly and are stock corporations	-0.3594 (0.953)	-0.7317 (0.923)
Number of lenders	-0.5466 (0.156)***	-0.5512 (0.153)***
Sales (natural log)	-0.1983 (0.126)	-0.1531 (0.146)*
Number of employees	-0.0025 (0.001)***	-0.0026 (0.001)***
Physical capital stock (natural log)	1.0741 (0.355)***	1.0765 (0.365)***
Loan overdue 90 days +	-2.4050 (2.877)	-2.4480 (2.876)
M&A dummy net of effect on number of lenders		
Firms that face a merger directly and are not stock corporations	1.5897 (0.593)***	1.5505 (0.993)*
Firms that face a merger directly and are stock corporations	0.187211 (0.992)	-0.180517 (0.929)

Fixed effects regressions that also include a full set of year dummies.
White-robust standard errors in parentheses.
*** indicates 1% significance.
** indicates 5% significance.
* indicates 10% significance.

Figure 1. Banking System Concentration
Chile, 1990-2002

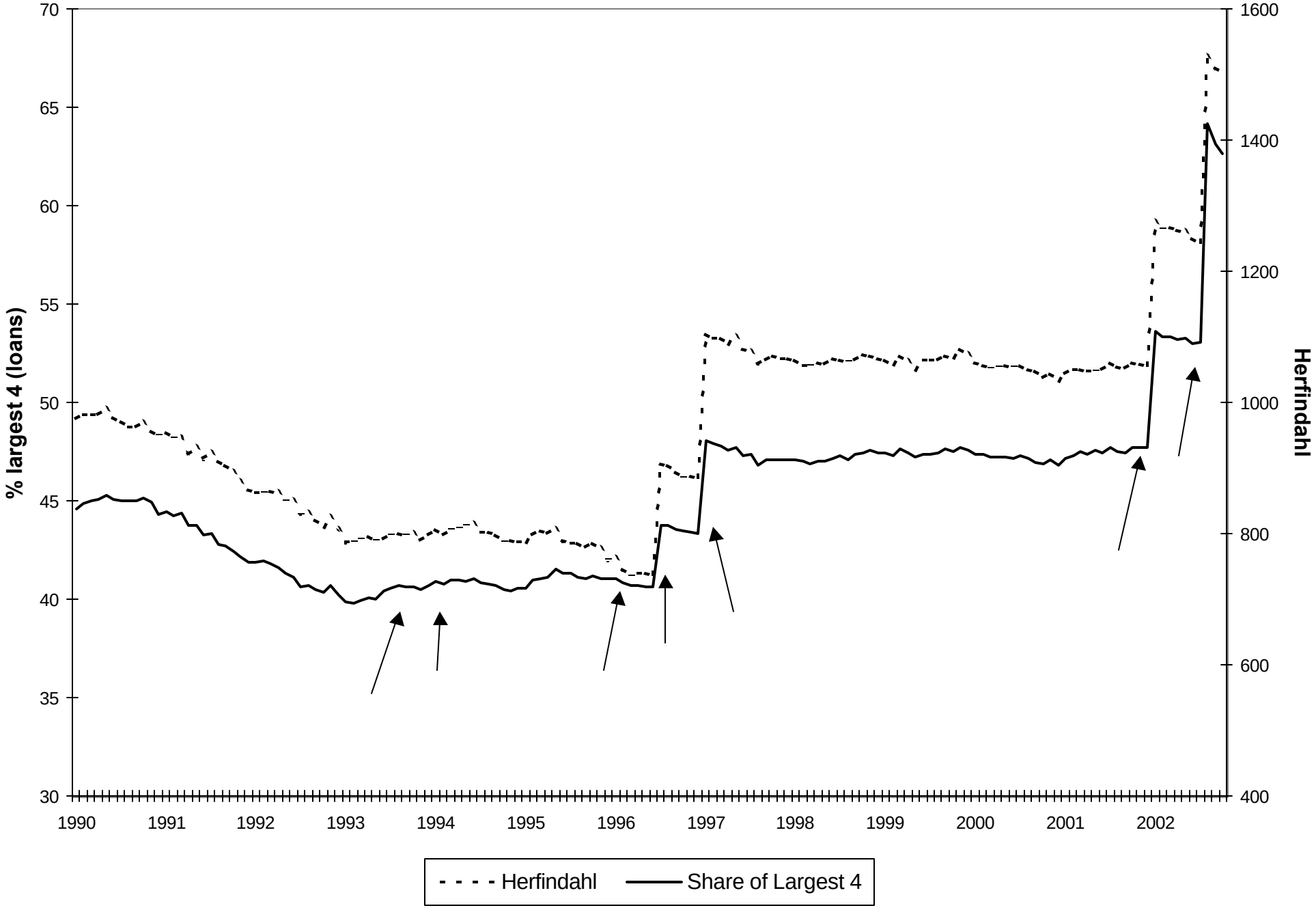

Figure 2. Number of Banking Institutions
Chile, 1990-2002

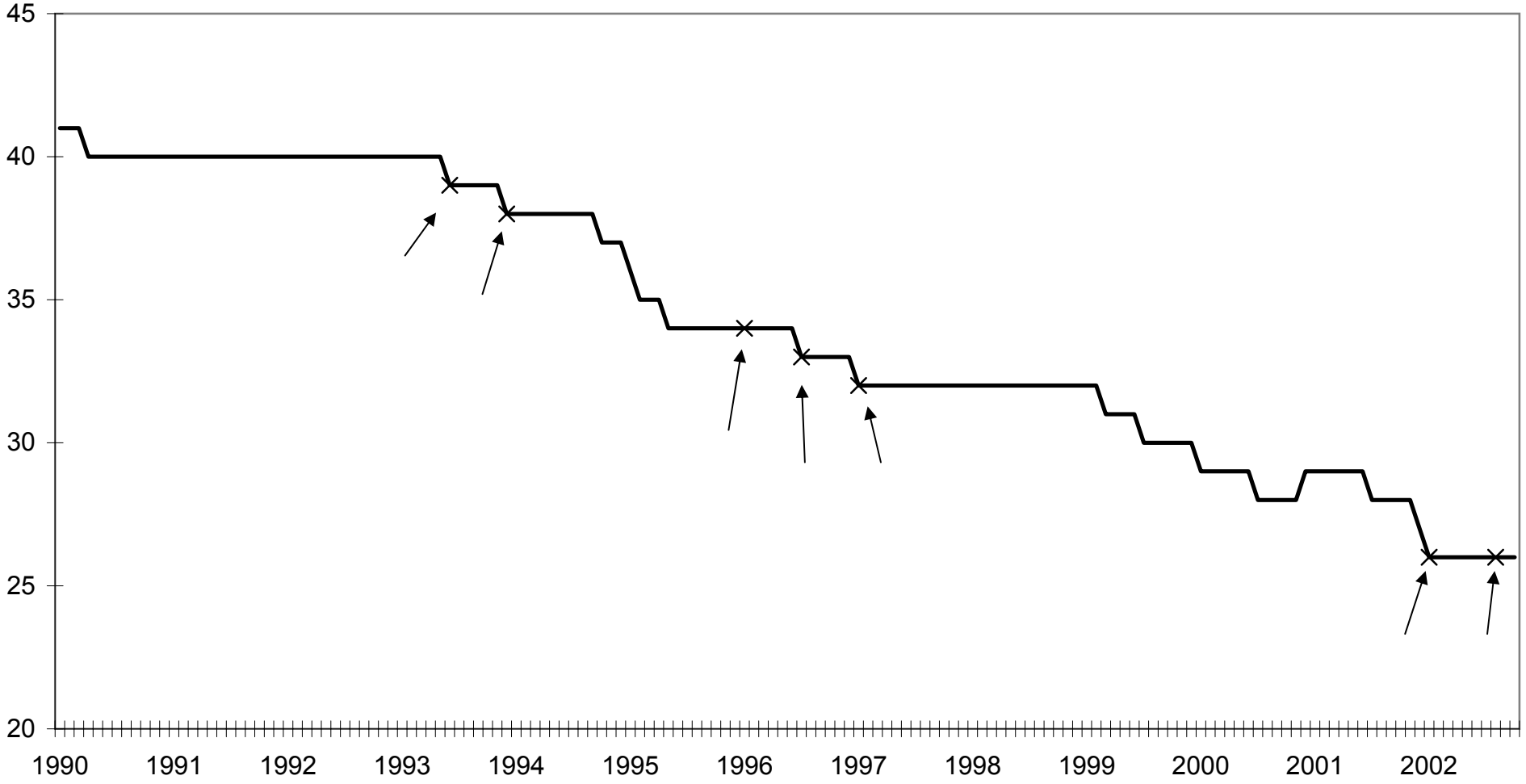

Figure 3. Banking System Performance Indicators

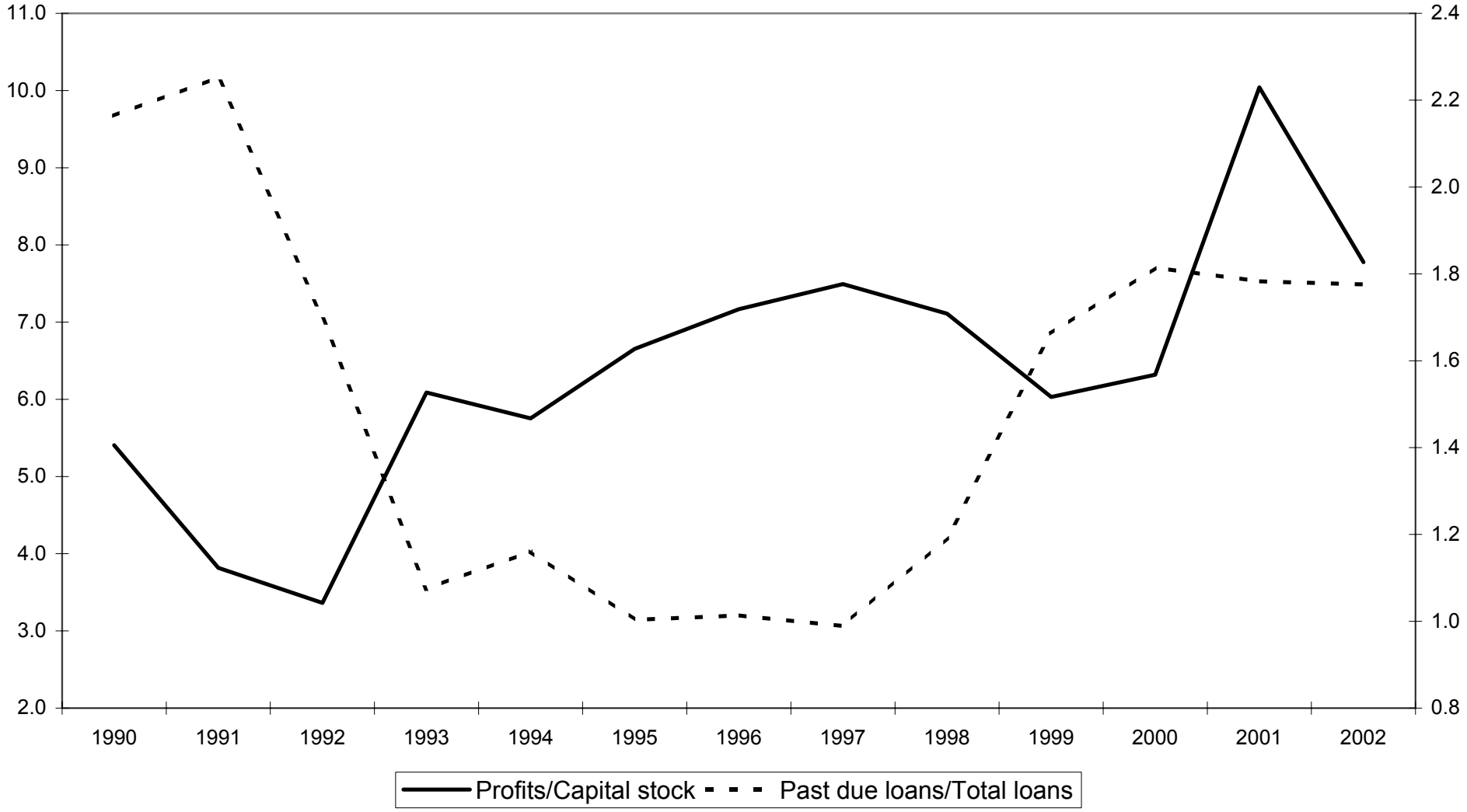

Figure 4. Evolution of Average Lending Rates
(%)

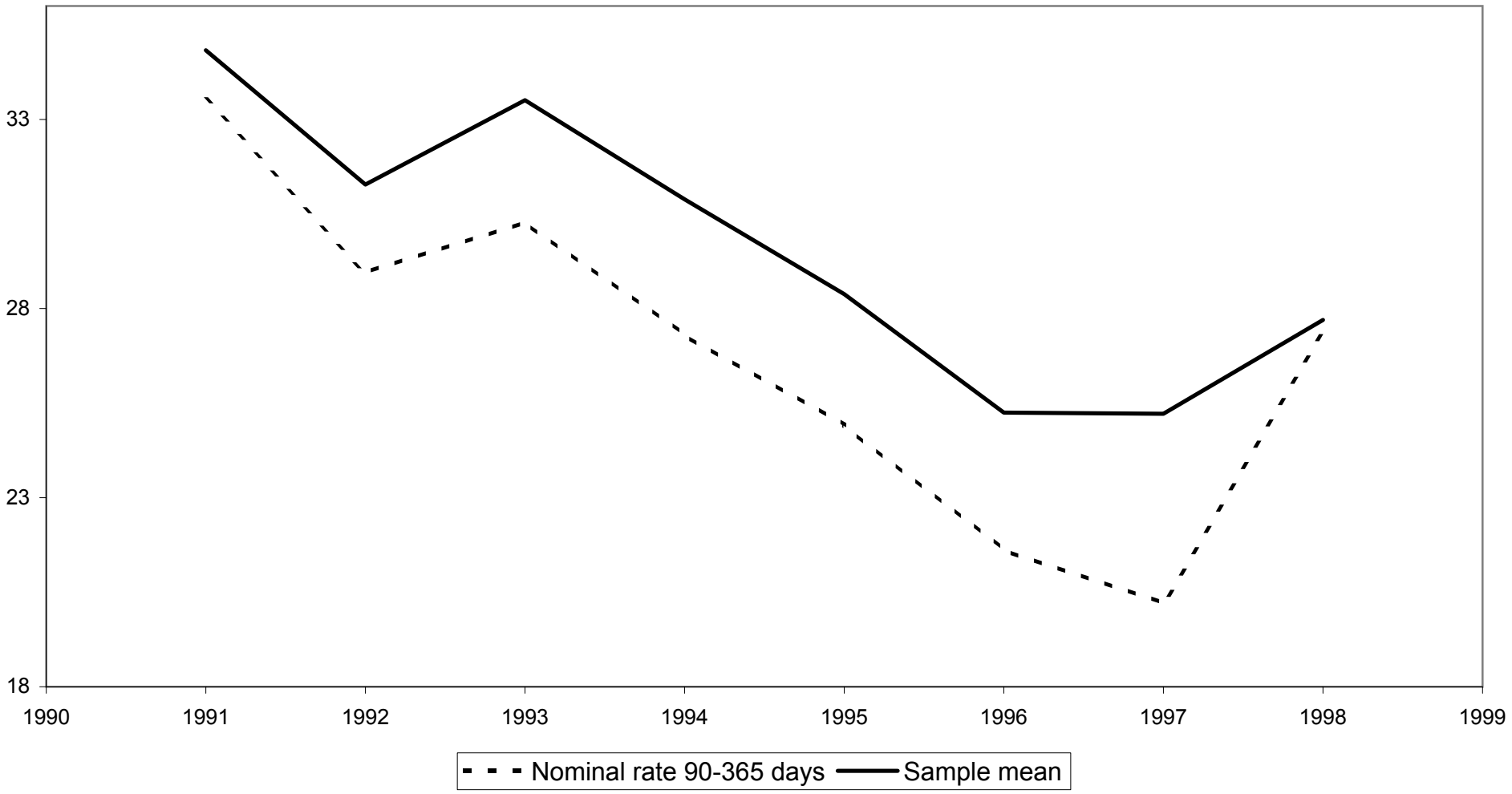

Figure 5a. Firm Categories: M&As and Other Bank Lending Sources

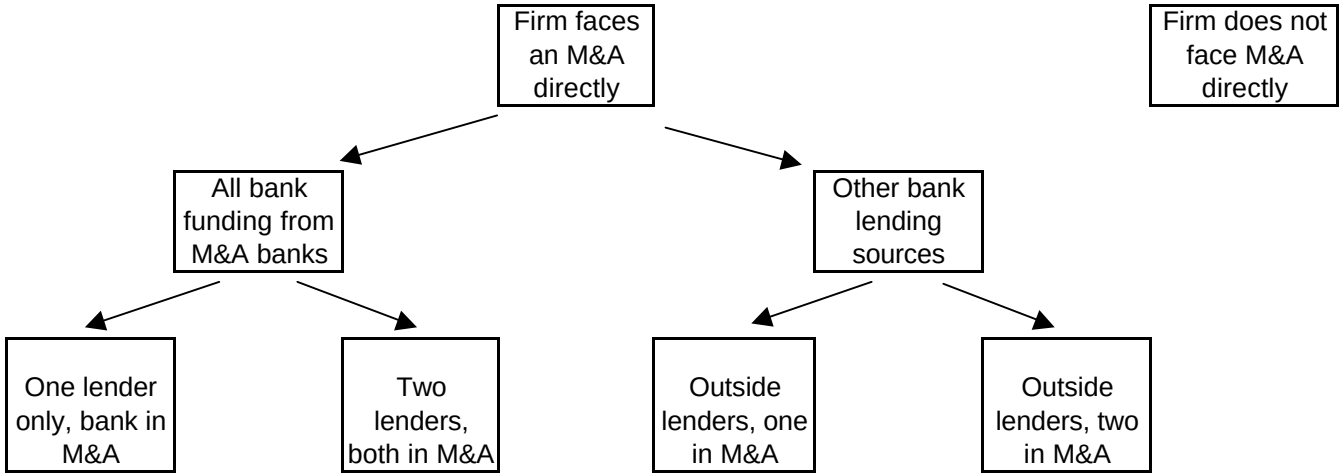

Figure 5b. Firm Categories: M&As and Other Non-Bank Lending Sources