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Winners or Losers? The Effects of Banking Consolidation on Corporate Borrowers

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ABSTRACT

We estimate the impact of bank mergers and acquisitions (M&As) on outstanding credit, credit lines, and the sensitivity of investment to cash flow using a large sample of Italian corporate borrowers. We distinguish between firms that experienced relationship termination as a consequence of bank M&As and those that did not. Our findings are consistent with bank M&As having an adverse effect on credit, particularly when the M&A is followed by relationship termination. The effect persists 3 years and then is absorbed, suggesting that firms are able to compensate for the negative shock.

IN THE PAST DECADE, MANY COUNTRIES EXPERIENCED a wave of mergers and acquisitions (M&As) that profoundly modified the structure of their banking industries (Group of Ten (2001)). One of the key questions that has emerged in the academic and policy debates is what the consequences of M&As are for bank borrowers.

The empirical literature on bank M&As studies extensively the effects of consolidation on bank performance and local market conditions, particularly in terms of efficiency and market power (see Berger, Demsetz, and Strahan (1999), Amel et al. (2004) for reviews). Other studies focus on the effects of consolidation on credit availability. Most of these studies compare the lending policies of banks of different sizes or investigate the market share effects of large versus small banks on credit volumes.

This literature generally finds that larger banks hold relatively fewer small business loans than small institutions (e.g., Berger, Kashyap, and Scalise (1995)), and they differ substantially from small banks in their lending practices (Berger et al. (2005), Berger, Klapper, and Udell (2001), Cole, Goldberg, and White (2004)).[1] However, other research shows that the impact of

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[1] Large and complex organizations could have greater difficulty processing soft information and may have a comparative advantage in transaction-based lending rather than relationship-based lending (Stein (2002)).

changes in bank size on credit availability depends on the entire structure of the market (Berger, Rosen, and Udell (2005), Jayaratne and Wolken (1999)), with the local market shares of banks of different sizes not appearing to affect credit availability. As a consequence, even if the ratio of small business loans to total assets declines after large banks consolidate (Peek and Rosengren (1998), Strahan and Weston (1998)), there might be no long-run effect on credit availability.

Other studies raise the concern that one mechanism through which M&As may be a source of negative shocks to the credit supply is through their impact on bank–client relationships. Bank loans are often based on long-term relationships between borrowers and lenders. Not only can the information generated by the relationship be a source of rents for the bank, but it can also solve hold-up problems (e.g., Sharpe (1990), Petersen and Rajan (1995)). However, because information is often difficult to transfer to other lenders, it can be an important determinant of switching costs for borrowers.

Bank M&As are generally followed by extensive organizational change, employee turnover, and branch downsizing, which may lead to a loss of the knowledge accumulated within each of the merging banks. New management usually reassesses the risk of borrowers and might apply different standards to loan approval. The available evidence is consistent with relatively long transition periods during which difficulties in refocusing lending policies and integrating data processing systems and operations can dominate over potential efficiency gains (e.g., Rhoades (1998), Calomiris and Karceski (2000), Houston, James, and Ryngaert (2001)).

If these frictions produce a loss of soft information or if the new entity simply changes business focus, some bank–firm relationships may end up being severed. Even if termination is initiated by the borrower, since it usually takes time to build a new credit relationship, firms may face problems in finding other credit sources at the previous terms and conditions. The evidence shows that bank merger announcements have an adverse effect on the stock market returns of firms borrowing from the target banks (Karceski, Ongena, and Smith (2005)). This suggests that mergers may have effects that are similar to those of bank distress (e.g., Kang and Stulz (2000), Ongena, Smith, and Michalsen (2000)). Furthermore, econometric analyses of bank–firm relationship data indicate an increase in the probability of relationship termination, especially for customers of target banks (Sapienza (2002), Degryse, Masschelein, and Mitchell (2005)).

From a policy perspective there are a number of unanswered questions. What are the short- and medium-term effects of bank mergers on the supply of loans to individual borrowers? Do bank mergers reduce credit availability and, through this channel, influence the investment decisions of firms? Are borrowers able to compensate for adverse effects on credit availability of relationship termination by banks involved in mergers? The extent to which banking consolidation produces real effects depends on the magnitude of switching costs and on the importance of barriers to creating new credit relationships. Other institutions in the same markets could be willing to lend to positive net present value

borrowers that are no longer served by the banks involved in consolidation, as Berger et al. (1998) find.

We estimate the effect of borrower-specific shocks due to banking consolidation on the amount of bank loans and on firms' investment rates. In a first model, the bank M&A shock is the firm-specific share of credit issued by banks that are involved in M&As. In a second model, we split the shock into two types: (i) the share of credit issued by banks involved in M&As whose relationship with the firm was interrupted and (ii) the share of credit issued by banks involved in M&As whose relationship with the firm was not interrupted. The measured effect of bank M&As includes any adjustment by borrowers and rival banks to the behavior of the merged banks.

We conduct the empirical analysis on a large panel of Italian corporate borrowers, mostly small- or medium-sized and privately owned, for which credit relationship information and balance sheet data are available. We test for heterogeneous effects on subsamples of firms that are small, risky, and dependent on a small number of lenders as they are potentially more subject to switching costs.

The main results are the following. On average, firms borrowing from a bank involved in a merger as a bidder or as a target experience a temporary reduction in credit of approximately 1.5% and 2.0%, respectively. The negative shock is absorbed after 3 years. If the relationship between the firm and the merged bank is severed, loans are reduced by the entire amount issued under the terminated relationship, reverting to the pre-merger level after 3 years. In economic terms, the shock implies a temporary drop in credit of 9% after termination. Our findings are consistent with the results in the literature that banks reassess their portfolios after mergers and modify some of the terms and conditions on existing loans, inducing relationship termination. The results are also consistent with the evidence that short-run shocks to credit due to consolidation tend to be absorbed at the market level after some time (e.g., Berger et al. (1998)).

The paper is organized as follows. Section I discusses the data employed in the analysis. Sections II and III present the empirical analysis of the impact of bank M&As on credit and the results of the tests, respectively. Section IV provides the analysis of the sensitivity of investment to cash flow. Finally, Section V concludes.

I. Data and Key Explanatory Variables

The data cover a large sample of Italian corporate borrowers over the period 1990 to 1999. As Table I shows, merger activity in the banking industry was more intense between 1990 and 1995; acquisitions were more numerous after 1994. The data set includes information on credit received by each borrower, the M&A activity of the lending banks, and firm characteristics based on balance sheet and income statements.

We obtain our data from three sources. The first source is the Central Credit Register. The Register, which is coordinated by the Bank of Italy (the central

Table I
Mergers and Acquisitions in Italy

Mergers are defined as all cases in which two institutions form a new entity. Acquisitions include cases in which a bank or a bank-holding company acquires a controlling shareholding in another bank but both charters survive. The number of M&As does not include deals involving foreign subsidiaries. The share of targets' assets is in percentage points and is given by the sum of the assets of target banks divided by the banking industry total assets. Assets are measured at the end of the year before the deal.

		Mergers		Acquisitions		Total	
Year	Total Number of Banks	Number of Deals	Share of Targets' Assets	Number of Deals	Share of Targets' Assets	Number of Deals	Share of Targets' Assets
1990	1,156	19	1.06	4	0.37	23	1.43
1991	1,108	33	0.45	5	0.37	38	0.82
1992	1,073	20	3.04	1	0.01	21	3.05
1993	1,037	38	0.63	6	1.50	44	2.13
1994	994	42	1.59	10	1.90	52	3.49
1995	970	47	1.57	19	4.50	66	6.07
1996	937	37	0.47	19	1.08	56	1.55
1997	935	24	0.80	18	3.42	42	4.22
1998	921	27	2.65	23	11.02	50	13.67
1999	876	36	0.39	28	14.35	64	14.74

Source: Bank of Italy, Annual Report, various years.

bank), collects information from all banks on individual borrowers with bank debt above the threshold of 150 million lire (approximately 75,000 dollars in 1999).[2] The second source is the Bank of Italy archive on bank M&As. For each deal the institutions involved are classified as bidders or targets. The third source is the *Company Accounts Data Service* (CADS, "Centrale dei Bilanci" in Italian), a proprietary database that includes annual balance sheets and income statements of about 25,000 firms, largely privately owned. CADS is maintained by an agency owned by banks for the purpose of credit risk evaluation.

We select from the Credit Register all the information on those corporate borrowers for which balance sheets exist in CADS for at least 3 years during the period 1990 to 1999. The identity of the banks lending to these firms is matched with data on merger activity. We assign a dummy that is equal to 1 for each bank-year observation in which the bank is a bidder in a merger or an acquisition, and 0 otherwise. We construct a similar dummy for targets.

A dummy variable equal to 1 if one or more of its lenders are involved in M&As could be used to measure if a firm is affected by bank M&As. However, a binary variable would give equal weight to M&As of banks of different importance to the firm. We therefore prefer a weighted dummy variable, with weights given by the share of credit that each firm receives before the deal from banks that

[2] Before 1995 the reporting threshold was 80 million lire, approximately 40,000 dollars at the 1999 average exchange rate.

are involved in M&As. If there are multiple banks involved in M&As, their shares are aggregated at the firm level to construct measures of the "shock" potentially induced by bank consolidation. The variable *SHBIDBK* is the share of credit issued by banks that are bidders in each firm-year. Similarly, the variable *SHTARBK* is the share of credit issued before the deal by banks that are targets. If a merger occurs between time $t-1$ and time t we assign the time index t to the merger shock variables *SHTARBK* and *SHBIDBK*. Finally, we define a third M&A variable, *SHBOTH*, as the share of credit issued by banks that were involved in the same merger or acquisition.

As Table II shows, on average the firms in our sample experience adverse credit shocks that amount to 19% (6%) of their credit from their lenders being bidders (targets) in M&As. The average shock in the case of firms borrowing from two banks that merged together is 1.5% of the firm's credit.

The evidence in other studies shows that bank M&As increase the probability of relationship termination. It could be the case that aggregating all bank M&As without distinguishing whether the relationship between the merging bank and the firm is terminated or not produces noisy estimates and thereby confounds opposite effects for different customers. For this reason we construct variables that directly measure the share of each firm's credit at time $t-1$ provided by banks that are involved in M&As between $t-1$ and time t and whose relationships with the firm are no longer in existence after time t (*SHM&ATER*). Symmetrically, we compute the share of credit provided by banks that are involved in M&As and whose relationships with the firm are not terminated (*SHM&ANOT*). Finally, as relationships can be discontinued for reasons that are unrelated to M&As, we compute the share of credit from banks that are not involved in M&As but whose relationships with the firm are terminated (*SHNOM&AT*). Firms whose lenders do not merge and whose relationships are not discontinued are the control group. In all cases we employ pro forma information on relationships, that is, we regard a relationship as continuing if the firm obtains credit at time t from at least one of the banks that merges between $t-1$ and t.

The share of credit that the average firm obtains from banks that terminate the relationship after a merger is less than 1% (see Table II). Considering only observations for which termination occurs (8.7%), the average share affected is 9%. The average share from banks that merge and do not terminate their relationship is approximately 26%.

We exclude from the matched Credit Register–CADS sample firms with zero or negative equity capital or missing data on sales because their credit dynamics could reflect default or the impact of bankruptcy procedures. We also drop a small number of very large firms with sales of more than 100 billion lire (approximately 50 million dollars in 1999) because they are likely to receive a substantial share of their funding from international capital markets.

The resulting unbalanced panel contains more than 85,000 observations or more than 16,000 firms. The firms in the sample have average total assets of 19.3 billion lire and median total assets of 13.5 billion lire. On average, their outstanding loans are 12.6 million, 4.6 of which are credit lines, used and

Table II

Definitions of Variables and Descriptive Statistics

The sample period covers the years 1993 to 1999. *TOTCR* is the end-of-year firm-level outstanding total credit in million lire. *CLINES* is the end-of-year firm-level credit lines available. *INVRATE* is investment divided by previous-year total assets. *TOTCRTA* is total outstanding credit divided by end-of-previous-year total assets. $SHBIDBK_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were bidders in M&As. $SHTARBK_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were targets in M&As. $SHBOTH_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that merged. $SHM\&ATER_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that lent to the firm prior to the merger and terminated the relationship. $SHM\&ANOT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were involved in M&As but whose relationship continued after the merger. $SHNOM\&AT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks not involved in M&As but whose relationship with the firm was terminated. Firm control variables are the following. *SHLARGEBK* is the share of credit from banks with total assets of at least 14 trillion lire. *SIZE* is the log of firm's gross total assets. *SALESGROWTH* is the rate of growth of sales in the current year. *FIXASSETS* is fixed tangible assets divided by total assets. *CASHFLOW* is net operating income divided by previous-year total assets. *LIQUIDITY* is cash and other liquid assets divided by previous-year total assets. *ZSCORE* is a score that measures credit risk, obtained with linear discriminant analysis; higher values indicate less risk. *MKTENTRY* is the share of branches of banks that were not present in the market in the previous year. *MKTHERF* is the loan market Herfindahl–Hirschman index of concentration. The market is defined as the province in which the firm has its headquarters. Small firms are firms with less than 5 billion lire of total assets; high credit risk firms are those in the bottom 20% of the z-score distribution.

	All Firms		Small Firms		High Credit Risk Firms		Firms with 1–3 Lenders	
Sample	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
				Dependent variables				
TOTCR	6,501	8,267	2,809	3,149	8,310	8,548	3,777	5,760
CLINES	2,341	3,146	1,067	1,150	2,294	2,963	1,682	2,640
INVRATE	0.051	0.095	0.063	0.113	0.047	0.085	0.058	0.107
TOTCRTA	0.341	0.215	0.363	0.226	0.427	0.203	0.272	0.214
				Bank M&As shock variables				
SHBIDBK	0.194	0.231	0.193	0.245	0.200	0.211	0.184	0.291
SHTARBK	0.061	0.149	0.057	0.150	0.060	0.131	0.058	0.182
SHBOTH	0.014	0.072	0.010	0.064	0.014	0.068	0.006	0.057
SHM&ATER	0.008	0.051	0.008	0.057	0.008	0.043	0.008	0.064
SHM&ANOT	0.261	0.267	0.252	0.278	0.267	0.242	0.240	0.329
SHNOM&AT	0.024	0.094	0.024	0.094	0.026	0.084	0.026	0.121
SHLARGEBK	0.649	0.305	0.631	0.320	0.666	0.267	0.640	0.383
				Control variables				
SIZE	9.533	0.811	8.689	0.604	9.604	0.789	9.161	0.876
SALESGROWTH	0.077	0.413	0.093	0.389	0.081	0.461	0.094	0.572
FIXASSETS	0.217	0.157	0.201	0.153	0.224	0.173	0.217	0.177
CASHFLOW	0.114	0.095	0.129	0.115	0.106	0.087	0.117	0.108
LIQUIDITY	0.058	0.088	0.062	0.091	0.043	0.073	0.066	0.103
ZSCORE	0.515	2.467	0.505	2.283	−1.135	1.849	1.242	2.831
MKTENTRY	0.008	0.013	0.007	0.013	0.007	0.013	0.008	0.017
MKTHERF	0.069	0.030	0.072	0.033	0.069	0.030	0.073	0.036
No. of obs.	85,407		20,102		16,441		9,731	

unused. Their average ratio of investment to total assets is 5.1%. The median number of lenders is 8.

II. The Effect of Bank M&As on Credit

A. The Empirical Model

In the first regression model total credit of firm i at time t is a function of the merger activity of banks lending to firm i at time $t-1$, firm characteristics, and local market controls. Since we measure the impact of M&A shocks on the firm's total credit and not on each credit relationship or loan, the estimated effect captures not only changes in the behavior of the merged banks but also the reaction of the borrower and rival banks. If the merged bank reduces the amount of credit it is willing to provide to a firm but the firm is able to find another lender under the same conditions, our estimated effect will be nil. The equation is specified as

$$\begin{aligned} LNTOTCR_{it} = \alpha &+ \sum_k \beta_k(L_{t-k})SHBIDBK_{it-k} \\ &+ \sum_k \psi_k(L_{t-k})SHTARBK_{it-k} + \sum_k \varphi k(L_{t-k})SHBOTH_{it-k} \\ &+ \gamma_1 SIZE_{it-1} + \gamma_2 SALESGROWTH_{it} \\ &+ \gamma_3 FIXASSETS_{it-1} + \gamma_4 CASHFLOW_{it-1} \\ &+ \gamma_5 LIQUIDITY_{it-1} + \gamma_6 ZSCORE_{it-1} \\ &+ \gamma_7 MKTHERF_{it-1} + \gamma_8 MKTENTRY_{it-1} + x_i + z_t + e_{it}. \end{aligned} \tag{1}$$

The lag operator L_{t-k} indicates that the bank M&A variables enter the regression with a lag structure to ensure completion of the post-merger transition period. Equation (1) is a reduced form resulting from firm-level demand for credit and credit supply conditions. The dependent variable is the log of total credit (*LNTOTCR*); we take the natural log to reduce heteroskedasticity. The interpretation of the coefficients of the merger shock variables turns out to be straightforward: The β_k, ψ_k, and φ_k are semi-elasticities that measure the percentage change in credit following a merger shock, measured as a percentage of the firm's credit sources.[3] For example, if the share of credit a firm gets from a bank that is a bidder in a merger is 50%, a β_1 of -0.10 would mean that the firm faces a reduction of 5% in total credit outstanding the year after the merger.

In a second specification *LNTOTCR* is replaced with credit lines available (*LNCLINES*), whether drawn, fully or partially, or not. In Italy, as in other

[3] Denoting by $E(TOTCR|X)$ the conditional expectation of total credit ($TOTCR$) on the set of regressors of equation (1), X, when one of the merger shock variables x_j is increased by one unit the percentage change in $E(TOTCR|X)$ is approximated by: $(100^{*}\partial \mathrm{E}(TOTCR|X)/\partial x_j)/(1/E(TOTCR|X)) = 100 * \partial \log[E(TOTCR|X)]/\partial x_j$. Under the assumption that X is independent from the stochastic term e_{it} we have: $100 * \partial \log[E(TOTCR|X)]/\partial x_j = 100 * \partial \mathrm{E}(\log(TOTCR|X))/\partial x_j = \beta_j$, where β_j is the estimated coefficient of x_j.

European countries, credit lines are usually determined by contractual arrangements between the firm and the bank over relatively long intervals. There are no explicit charges to the firm for holding unused credit lines.[4] Normally, borrowers draw from their credit lines within the available maximum balance. If liquidity needs exceed the maximum granted, the firm can borrow more but it will face high cost, in terms of both fees and the interest rate it must pay. In general, borrowers tend to maintain substantial excess credit lines when their liquidity needs are low rather than taking the risk of overdrawing in the future. The median value of the ratio of credit lines used to credit lines granted is 0.31 in our data.

When a bank wants to limit credit supply quickly, an effective way to do so is to reduce the credit lines available to the firm. Nevertheless, a supply shift may not necessarily be apparent in credit lines granted if it occurs mainly via higher interest rates or a worsening of other terms and conditions. Total loans and credit lines granted provide complementary information. In the regression in which *LNCLINES* replaces *LNTOTCR* the bank merger shock variables are all computed as shares of the firm's total credit lines issued (used or unused) by banks that were involved in M&As.

As M&As change the size of banks, we need to separate the dynamic effect of the merger from the effect of a change in bank size on borrowers' credit. We control for the effect of bank size by including the variable $SHLRGBK_{t-k}$ and its lags in all regressions. This variable measures the share of credit that each firm obtains from large banks in each period. A bank is considered large if it has gross total assets of at least 14 trillion lire.[5]

An additional motivation for including this variable is that in the case of Italy there is evidence of increasing specialization within the banking industry. As in the United States, large banks have been focusing their business away from traditional lending. If banks that are most active in M&As are large and if these banks tend to reduce credit because of business refocusing, our results could be driven by a spurious correlation between M&A activity and bank size.

We include the following firm characteristics and firm-specific supply conditions. The variable *SIZE* is the log of total assets. The variable *SALESGROWTH* is the current-year rate of growth of sales, which proxies for current growth opportunities. The ratio of gross operating income to total assets (*CASHFLOW*) is a measure of operating performance. It also captures the availability of internally generated funds as a substitute for credit. The share of fixed assets (*FIXASSETS*) and the share of liquid assets (*LIQUIDITY*) control for the availability of collateral and for the demand for liquidity, respectively. These factors may influence the ability of the firm to get credit or its demand for external funds. Firms with more liquidity will demand less credit from banks since they

[4] The liquidity risk incurred by the bank is compensated by a fee that is proportional to the maximum amount that the firm actually draws on the credit line in each quarter.

[5] The threshold is consistent with the current Bank of Italy classification. Small banks are defined as those below 14 trillion. Other banks are further divided into medium, large, and major. We employ different thresholds and the results are unchanged.

would divest these assets first, as suggested by the pecking order hypothesis (Myers (1977)). The variable *ZSCORE* is a measure of credit risk that CADS provides to participating banks. It is obtained by linear discriminant analysis. Higher values of *ZSCORE* indicate lower credit risk.[6]

Local market credit supply conditions are likely to affect the availability of credit to firms in that market, especially for those for which reputation and local soft information matters. These conditions may change as a consequence of factors other than bank M&As. Furthermore, the likelihood that a firm finds alternative credit sources depends on the competitiveness of the local banking industry. We define local markets as provinces and consider the province in which the firm has its legal headquarters (95 provinces). We include in the regression the Herfindahl index of loan market concentration (*MKTHERF*) and a measure of entry by outside banks (*MKTENTRY*). Entry is measured as the share of branches in each province that is held by banks not present in that province in the previous year. We expect significant effects of these variables only for firms that operate on a relatively small scale.[7]

To limit potential endogeneity problems with respect to the effects of the merger shock variables, with the exception of *SALESGROWTH*, all the firm control variables are end-of-previous-year values. A vector of firm individual effects x_i controls for any characteristic that does not change over time, such as industry and location. Year dummy variables control for general demand and supply shifts that affect all firms. Descriptive statistics are in Table II.

Shocks to banks can have heterogeneous effects on borrowers facing higher switching costs, including those that are more dependent on relationship-based loans. On the one hand, adverse selection problems induced by firm opaqueness or other firm characteristics can limit mobility across banks. On the other hand, borrowers that have stronger bargaining positions, for example, because of size, may be able to extract merger-generated benefits in terms of greater availability of credit and/or better prices and covenants.

The empirical analysis is repeated employing three subsamples. The first subsample consists of small firms, as size is a standard proxy for the importance of relationship lending and for firm opaqueness. Small firms are those with less than 5 billion lire (approximately 2.5 million U.S. dollars at the 1999 exchange rate) of total assets in the first year they appear in the sample. Compared with the full sample, these firms have an average higher investment rate, sales growth, operating income, and credit rating. Considering the entire panel, their average size in terms of total assets is 7.4 billion lire, and they borrow from 6.2 banks (the median is six banks). The average of the bank M&A shock variables is very similar to that of the full sample.

[6] The system is based on two models. The first model is a linear function of nine indicators obtained from balance sheet data and it distinguishes between "normal" and "not normal" firms. A second discriminant function of 10 indicators is then employed to improve the accuracy of the classification procedure for the class of "not normal" (poor performing) firms (see Altman, Marco, and Varetto (1994)).

[7] Considering all the corporations and partnerships in the Credit Register in 2000, 50% borrowed from a bank branch located in the same municipality and 80% in the same province.

The second subsample consists of firms borrowing from no more than three banks. The number of lenders is measured at the end of the first year the firm appears in the sample. We select this benchmark because the median number of lenders in our data is 8 and there are too few cases of single-bank borrowers. The average number of lenders for this subsample is 4.3 because some firms start new relationships over time. Their average size is not small (14.7 billion lire of total assets) and their median size is 9.5 billion.

The third subsample consists of firms in the bottom 20% of the *ZSCORE* distribution. The *z* score is measured at the end of the first year the firm appears in the data set to avoid endogeneity problems with respect to the bank M&A shocks. Although observable creditworthiness is not a measure of a barrier generated by asymmetric information problems, it is a factor that limits the ability of firms to find alternative sources of credit. On average, high credit risk firms are larger than the full sample (20.1 billion lire of total assets), they hold 8.3 billion of bank debt, and they borrow from 8.9 banks. Descriptive statistics for the subsamples are reported in Table II.

B. Results

Table III shows the results of the estimation of equation (1). We first include five lags of the bank M&A variables and generally do not find statistically significant coefficients for the bank M&A variables after the third lag. Since the results are robust to the use of different lag structures, we report only those that correspond to the three-lag specification.

Firms borrowing from bidders experience a reduction in total credit in the 3 years following the shock (column 1). The coefficients of $SHBIDBK_{t-k}$ indicate an 8% reduction in credit. Since the merger shock variables are weighted dummy variables, the economic magnitude of the impact of M&As on credit should be evaluated at the sample means. The average of *SHBIDBK* (the share borrowed from banks that are bidders) is 19%. Consequently, the effect is an approximate 1.5% reduction in total credit. Borrowers of target banks experience a reduction in credit in the 3 years following the merger. The coefficients of $SHTARBK_{t-k}$ indicate that credit is 10% lower. At the sample mean of *SHTARBK* (0.06) the effect is a 0.6% reduction in the firm's total credit.

The economic magnitude of the effects of the bank M&A shocks is small at the sample mean. However, if one considers only the observations for which $SHBIDBK_{t-1}$ is greater than 0, the average share affected is 0.27, in which case the economic effect would be a 3% reduction in credit. Similarly, excluding the firm-years for which $SHTARBK_{t-1}$ is 0, the average share of credit affected by lenders being targets is 0.20, with an estimated reduction in credit of around 2%.

The variable *SHBOTH* is never statistically significant, which suggests that firms borrowing from both of the banks participating in the merger are better insulated from negative shocks, compared with customers of either bidders or targets. This finding is not consistent with strong market power effects because we would expect that firms borrowing from two banks merging together would be those that are affected the most.

Table III

Effect of M&As on Credit, All Firms, and Subsamples

The sample period covers the years 1993 to 1999. The dependent variable is the log of end-of-year firm-level outstanding total credit. Firm and year fixed effects are included in every regression (coefficients not shown). Robust standard errors are given below coefficients; standard errors are clustered at the firm level. $SHBIDBK_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were bidders in M&As. $SHTARBK_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were targets in M&As. $SHBOTH_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that merged. *SHLARGEBK* is the share of credit from banks with total assets of at least 14 trillion lire. *SIZE* is the log of firm's gross total assets. *SALESGROWTH* is the rate of growth of sales in the current year. *FIXASSETS* is fixed tangible assets divided by total assets. *CASHFLOW* is net operating income divided by previous-year total assets. *LIQUIDITY* is cash and other liquid assets divided by previous-year total assets. *ZSCORE* is a score that measures credit risk, obtained with linear discriminant analysis; higher values indicate less risk. *MKTENTRY* is the share of branches of banks that were not present in the market in the previous year. *MKTHERF* is the loan market Herfindahl–Hirschman index of concentration. The market is defined as the province in which the firm has its headquarters. Small firms are firms with less than 5 billion lire of total assets; high credit risk firms are those in the bottom 20% of the z-score distribution.

Sample	All Firms	Small Firms	High Credit Risk Firms	Firms with 1–3 Lenders
Dependent Variable	(1) *LNTOTCR*	(2) *LNTOTCR*	(3) *LNTOTCR*	(4) *LNTOTCR*
Bank M&A shocks				
$SHBIDBK_{t-1}$	−0.079***	−0.106*	−0.032	−0.157**
	0.029	0.055	0.053	(0.073)
$SHBIDBK_{t-2}$	−0.085***	−0.098*	−0.004	−0.198**
	0.030	0.056	0.056	(0.080)
$SHBIDBK_{t-3}$	−0.087**	−0.114**	0.014	−0.201***
	0.029	0.054	0.055	(0.072)
$SHTARBK_{t-1}$	−0.111***	−0.011	−0.131*	−0.196**
	0.038	0.065	0.073	0.098
$SHTARBK_{t-2}$	−0.101**	−0.026	−0.078	−0.235**
	0.041	0.083	0.073	0.113
$SHTARBK_{t-3}$	−0.102**	−0.064	−0.048	−0.195*
	0.041	0.081	0.075	0.110
$SHBOTH_{t-1}$	−0.021	−0.171**	0.024	−0.032
	0.044	0.082	0.071	0.192
$SHBOTH_{t-2}$	−0.000	−0.106	0.102	0.028
	0.051	0.095	0.082	0.212
$SHBOTH_{t-3}$	−0.009	−0.130	0.050	−0.023
	0.064	0.135	0.085	0.240
$SHLARGEBK_{t-1}$	0.289***	0.144*	0.248**	0.293**
	(0.042)	(0.083)	0.105	0.119
$SHLARGEBK_{t-2}$	−0.043	−0.136*	−0.025	0.012
	(0.036)	(0.073)	0.083	0.099
$SHLARGEBK_{t-3}$	−0.165***	−0.070	0.021	−0.122
	(0.035)	(0.063)	0.073	0.083
Firm controls				
SIZE	0.885***	0.761***	0.861***	0.740***
	0.033	0.058	0.073	0.135
SALESGROWTH	0.089***	0.117***	0.038	0.106**
	0.020	0.036	0.063	0.047

(*continued*)

Table III—*Continued*

Sample	All Firms	Small Firms	High Credit Risk Firms	Firms with 1–3 Lenders
Dependent Variable	(1) *LNTOTCR*	(2) *LNTOTCR*	(3) *LNTOTCR*	(4) *LNTOTCR*
FIXASSETS	1.178***	1.617***	0.794***	1.239***
	0.109	0.219	0.193	0.391
CASHFLOW	0.329***	0.239	0.314*	0.074
	0.116	0.157	0.188	0.321
LIQUIDITY	−0.951***	−0.526**	−0.694***	−0.911*
	0.134	0.234	0.208	(0.472)
ZSCORE	−0.100***	−0.085***	−0.056***	−0.085***
	0.008	0.015	0.015	(0.024)
MKTENTRY	−0.004	0.531	0.493	−0.184
	0.300	0.637	0.462	(0.999)
MKTHERF	0.242	−0.724	−0.869	1.146
	0.476	1.127	0.943	(1.555)
CONSTANT	−0.732**	0.460	−0.179	0.049
	0.339	0.531	0.761	(1.329)
No. of obs.	85,407	20,102	16,441	9,731
Adj. R^2	0.738	0.702	0.728	0.698

Significance levels are: *between 5% and 10%, **between 1% and 5%, and ***1% or less.

The share of credit issued by large banks has a positive statistically significant effect after 1 year but a negative significant effect after 3 years. The coefficients do not suggest a systematic decrease in credit availability for firms that had a large share of loans from large banks.

The coefficients of most of the firm characteristics are statistically significant and have the expected signs. Firm size has a positive effect on the volume of credit. Firms whose sales grow faster tend to have more loans. The share of fixed assets is positively correlated with the volume of credit, whereas liquidity is negatively correlated, as expected. The variable *CASHFLOW* has a positive coefficient, indicating that firms that are more profitable are able to get more credit (this effect dominates over the demand-side effect that firms with fewer profits demand more credit). The coefficient of *ZSCORE* is negative and statistically significant. Higher z scores, indicating lower credit risk, are correlated with lower bank credit, controlling for other factors including firm total assets. The reason is that leverage is one of the key factors employed in the discriminant analysis that generates the z score, and higher bank debt increases leverage and the probability of default. The local market structure variables have no effect on total credit.

C. Subsamples

The results of the sample splits are reported in columns 2–4 of Table III.[8] Small firms are subject to a reduction in total credit if one or more of their

[8] For robustness purposes we apply the criteria on a year-by-year basis and the results are unchanged.

lenders are bidders in a merger or acquisition (column 2, Table III). There is no statistically significant effect on credit if the lenders are targets, as opposed to a negative temporary effect for the entire sample.

One noteworthy difference with respect to the results from the full sample is that small firms experience a temporary reduction in outstanding credit if two of their lenders merge together. The latter finding is specific to small firms and is consistent with the prior that small firms are potentially more subject to market power, at least in the short run.

Column 3 of Table III reports the results of the regressions for the high credit risk firms. Although the signs of the coefficients of $SHBIDBK_{t-k}$ and $SHTARBK_{t-k}$ are negative, they are not statistically significant, with one exception. The coefficients of the $SHBOTH_{t-k}$ are insignificant.

Finally, as shown in column 4, firms borrowing from up to three banks face a reduction in total credit, whether the shock originates from their lender being a bidder or a target. In the first case the coefficients range from -0.16 for the first lag to -0.2 for the third. The corresponding reduction in credit is of the order of 3% at the sample mean. In the case of lenders being targets the coefficients are all around -0.2, which is equivalent to a credit reduction of 1.2%.

D. Credit Lines

We estimate equation (1) replacing total credit with *LNCLINES*. In the interest of brevity we do not report these results. The merger shock variables are weighted by the shares of credit lines instead of total credit in this specification. The results differ from those obtained in the regression of total credit because the coefficients of the M&A variables are generally not significant for the full sample and the subsamples. Only *SHTARBK* has a barely significant positive effect after 1 year (but not robust to the number of lags in the regression), and negative after 3 years.

The coefficients of the control variables are mostly consistent with those of the total credit regression. Two exceptions are noteworthy. The coefficient of *ZSCORE* is positive when the dependent variable is credit lines granted. This result is consistent with our interpretation of credit lines granted as a variable that changes mainly in response to supply factors. The second difference is that market entry has a statistically significant negative effect on credit lines granted in some of the regressions. This finding is consistent with a number of theoretical studies that show how banking competition may increase adverse selection problems, reducing credit availability (e.g., Dell'Ariccia, Friedman, and Marquez (1999)).

The absence of M&A effects on credit lines granted is consistent with bank mergers having an impact on the cost of credit or the other loan terms and conditions rather than a direct quantity rationing effect. Although borrowers are able to find alternative credit sources, as suggested by the fact that the negative shock vanishes over time, bank M&As appear to generate some frictions in credit markets and adjustment costs for borrowers involved. This interpretation is consistent with the evidence on the impact of M&As on interest rates in Sapienza (2002).

E. Further Tests

For robustness purposes we estimate an alternative specification of the credit equations. The dependent variable is the ratio of credit to 1-year lagged total assets. Employing the ratio should ensure that our results are robust to potential biases because of undue weight of large firms, even in the presence of firm fixed effects and a firm size control variable. The results from our main specification suggest that the relationship between the level of credit and the merger variables is nonlinear. For this reason we include first- and second-order terms of the M&A variables. When only the first-order terms are included, the signs are consistent with our main results but the coefficients are not statistically significant.

In the quadratic model the derivative of $SHBIDBK_{t-1}$ at the mean is -0.007, significant at the 10% level. Although the first two lags are not significant at the mean, the third-lag derivative is close to the effect estimated for the log model (a 1.5% reduction in credit). At the sample mean the value of the ratio of total credit to lagged total assets is 0.34. A 1.5% reduction in the numerator is equivalent to a decrease in the ratio to 0.335, which is in line with the effect estimated with the ratio model. Similarly, the first- and second-lag derivatives of *SHTARBK* are negative but not significant. The third-lag derivative is -0.016 and is 5% significant. This value is of the same order of magnitude as that of the log model. The nonlinearity of the model and the presence of a large number of zeros for the M&A variables could explain the difference in the level of significance of the coefficients in the two specifications.

To ensure that our main results are not driven by large differences in firm size across observations we estimate equation (1) on a number of subsamples split by size, measuring size in each year instead of the first year the firm appears in the sample. Firms with total assets above 30 billion lire are not affected by M&A shocks. The signs of the merger variables tend to become mostly positive, especially for firms above 60 billion of total assets. The results are the strongest for the subsample of medium-sized firms (between 5 and 30 billion of total assets). The coefficients of the three lags of both the variables *SHBIDBK* and *SHTARBK* are negative, significant, and close in magnitude to the effects of the full sample. The estimation with the subsample of the smallest firms (below 5 billion of total assets) yields negative and larger coefficients for the first and second lags of *SHTARBK*, with the other M&A variables being not significant.

III. The Effects of Relationship Termination on Credit

A. The Empirical Model

Employing a negative binomial regression model, we regress the number of terminated relationships for each firm as a function of the bank M&A shocks, the number of relationships at $t-1$ and various control variables. We find that the variable *SHTARBK* is associated with a higher number of relationships interrupted in the following year, consistent with prior evidence in the literature.

The variable *SHBOTH* has a positive and statistically significant effect on termination, whereas *SHBIDBK* has a small negative effect. We do not report these results in the interest of brevity.[9] Similar results obtain with a probit model of whether the firm faces relationship termination in each year.

The termination of a relationship can have a negative impact on the availability of credit if firms face costs in starting new relationships and/or securing more credit from their other lenders. Even positive net present value borrowers may face frictions in replacing discontinued credit sources. The estimated reduction in total credit discussed in Section II.B is the average effect of bank M&A shocks, pooling borrowers that experienced termination with those that did not (continuing borrowers). Since the two effects could differ substantially, we estimate them separately according to the following regression model:

$$\begin{aligned} LNTOTCR_{it} = \alpha &+ \sum_k \beta_k(L_{t-k})SHM\&ATER_{it-k} \\ &+ \sum_k \psi_k(L_{t-k})SHM\&ANOT_{it-k} + \sum_k \varphi_k(L_{t-k})SHNOM\&AT_{it-k} \\ &+ \gamma OTHERCONTROLS_i + x_i + z_t + e_{it}. \end{aligned} \tag{2}$$

The variable *SHM&ATER* indicates the share of the firm's total outstanding credit at time $t-1$ that is issued by a bank involved in a merger and that no longer lends to the firm at time t. The variable *SHM&ANOT* is the share of the firm's total outstanding credit at time $t-1$ issued by a bank that has merged but still lends to the firm at time t. Finally, *SHNOM&AT* is the share of credit issued at time $t-1$ by banks that are not involved in M&As but no longer lend to the firm at time t. In all cases termination is defined as the interruption of any kind of loan or credit line (used or unused) issued by the bank to the firm considered. To limit the number of regressors, in this regression model we do not distinguish between the termination of relationships between the firm and banks that are bidders or targets.[10] We estimate equation (2) once with *LNTOTCR* and once with *LNCLINES* as the dependent variable. The control variables are the same as in equation (1).

B. Results

As Table IV shows, the termination of relationships by banks involved in M&As is followed by a 100% reduction in the total credit issued under those relationships after the first year. The estimated coefficient is not statistically different from -1. It is 0.36–0.38 after 2 and 3 years, respectively. On an average, relationship termination is followed by an initial credit reduction of the same magnitude as the loans issued under that relationship. The effect tends to

[9] The results of a probit model on relationship-level data are consistent with those in Sapienza (2002).

[10] The results are not substantially different when we distinguish termination by bidders, targets, etc.

Table IV

Effect of Relationship Termination on Credit, All Firms, and Subsamples

The sample period covers years 1993 to 1999. The dependent variable is the log of end-of-year firm-level outstanding total credit. Firm and year fixed effects are included in every regression (coefficients not shown). Robust standard errors are given below coefficients; standard errors are clustered at the firm level. $SHM\&ATER_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that lent to the firm prior to the merger and terminated the relationship. $SHM\&ANOT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were involved in M&As but whose relationship continued after the merger. $SHNOM\&AT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks not involved in M&As but whose relationship with the firm was terminated. Firm control variables are the following. *SHLARGEBK* is the share of credit from banks with total assets of at least 14 trillion lire. *SIZE* is the log of firm's gross total assets. *SALESGROWTH* is the rate of growth of sales in the current year. *FIXASSETS* is fixed tangible assets divided by total assets. *CASHFLOW* is net operating income divided by previous-year total assets. *LIQUIDITY* is cash and other liquid assets divided by total assets. *ZSCORE* is a score that measures credit risk, obtained with linear discriminant analysis; higher values indicate less risk. *MKTENTRY* is the share of branches of banks not present in the market in the previous year. *MKTHERF* is the loan market Herfindahl–Hirschman index of concentration. The market is defined as the province in which the firm has its headquarters. Small firms are firms with less than 5 billion lire of total assets; high credit risk firms are those in the bottom 20% of the z-score distribution.

Sample	All Firms	Small Firms	High Credit Risk Firms	Firms with 1–3 Lenders
Dependent Variable	(1) *LNTOTCR*	(2) *LNTOTCR*	(3) *LNTOTCR*	(4) *LNTOTCR*
$SHM\&ATER_{t-1}$	−1.037***	−0.453	−1.545***	−1.081**
	0.190	0.298	0.539	0.460
$SHM\&ATER_{t-2}$	−0.361**	0.240	−0.228	−0.223
	0.175	0.313	0.283	0.399
$SHM\&ATER_{t-3}$	−0.382**	0.087	−0.042	−0.578
	0.168	0.299	0.311	0.389
$SHM\&ANOT_{t-1}$	−0.069**	−0.082*	−0.046	−0.135**
	0.024	0.045	0.044	0.062
$SHM\&ANOT_{t-2}$	−0.083***	−0.102**	−0.018	−0.201***
	0.025	0.046	0.046	0.070
$SHM\&ANOT_{t-3}$	−0.079***	−0.113***	−0.000	−0.179***
	0.024	0.047	0.044	0.063
$SHNOM\&AT_{t-1}$	−0.555***	−0.459***	−0.651***	−0.026
	0.097	0.176	0.225	0.246
$SHNOM\&AT_{t-2}$	−0.427***	−0.247	−0.421*	−0.181
	0.094	0.165	0.245	0.229
$SHNOM\&AT_{t-3}$	−0.070	−0.128	0.107	0.131
	0.099	0.158	0.210	0.239
$SHLARGEBK_{t-1}$	0.274***	0.141*	0.228**	0.282**
	0.042	0.083	0.102	0.117
$SHLARGEBK_{t-2}$	−0.037	−0.130*	−0.019	0.017
	0.035	0.071	0.081	0.097
$SHLARGEBK_{t-3}$	−0.164***	−0.079	0.029	−0.122
	0.034	0.062	0.072	0.082
Firm controls included in all regressions (not shown)				
No. of obs.	85,406	20,101	16,441	9,731
Adj. R^2	0.740	0.702	0.732	0.702

Significance levels are: *between 5% and 10%, **between 1% and 5%, and ***1% or less.

be absorbed after 3 years. Considering the sample average of $SHM\&ATER_{t-1}$ (0.008), the economic effect of termination is negligible (a reduction in credit of less than 1%). Nevertheless, considering only the firm-year observations for which $SHM\&ATER_{t-1}$ is greater than zero, the average share affected by termination is around 9% of credit. The estimated coefficient indicates that these firms would have 9% less credit after termination. The fact that the shock is absorbed is consistent with firms being able to compensate for the severed relationship.

The immediate reduction in credit following termination by merged banks is about twice as large as in the case of termination by banks not involved in M&As. A Wald test rejects the null of equal coefficients for $SHM\&ATER_{t-1}$ and $SHNOM\&AT_{t-1}$. A possible explanation is that in the absence of mergers, relationships naturally observe turnover for a number of different reasons and the estimated coefficient averages over cases in which the relationship is severed by the bank and cases in which the firms leaves the bank voluntarily. Voluntary termination in the absence of shocks should have a negligible adverse effect on credit availability. In the subsequent years, the effect of relationship termination approaches 0.

The coefficients of $SHM\&ANOT_{t-k}$ are negative and significant. Continuing relationships with banks involved in M&As are associated with a modest (7–8%) reduction in the outstanding credit secured by the merged bank(s). Again, the reduction lasts for 3 years. At the sample mean of *SHM&ANOT* (0.26), credit remains 1.8% lower for 3 years after the merger.

The effect of termination for small firms is negative but not significant (Table IV, column 2). The coefficients are smaller than for the full sample, conflicting with the expectation that small firms are especially vulnerable to bank shocks. The pattern for continuing relationships with merged banks is the same as that found for the full sample and the coefficients are not statistically different.

In the case of high credit risk firms, the impact of *SHM&ATER* on credit is not statistically different from 100%, but lasts only 1 year. The termination of relationships without banks being involved in mergers is associated with a negative effect that is not statistically different from the estimated reduction for the entire sample. None of the coefficients of *SHM&ANOT* and its lagged values are statistically different from 0.

Finally, firms with one to three lenders experience a negative and temporary impact of termination associated with M&As (not statistically different from 100%). The effect of termination with banks not involved in M&As is negative and coefficients are in the range of -0.13 and -0.18.

The data do not support the conjecture that firms that are small, more risky, and dependent on fewer banks are especially sensitive to the consequences of bank M&As compared with the full sample. One possible explanation could be that multiple banking helps insulate borrowers from shocks to their lenders, even in the case of three banks. To assess this possibility further analysis would be required on very small borrowers, possibly with one lender. This is not possible because of the few small-borrower observations available in our sample.

C. Credit Lines

The impact of relationship termination on credit lines is negative and statistically significant, consistent with our findings for total credit (Table V). However, the estimated effects tend to be smaller. It could be the case that firms have less elastic demand for credit lines and are willing to accept a worsening of conditions in the short run. This interpretation is consistent with the result (not shown) that used credit lines decline, possibly reflecting greater costs of new credit lines. In addition, other work shows that borrowers with longer relationships pay lower interest rates and are less likely to pledge collateral (Berger and Udell (1995), Degryse and Van Cayseele (2000), Harhoff and Körting (1998)).

Having one's lender merge and continue the relationship is not associated with a reduction in credit lines granted, consistent with our prior findings for equation (1). The negative impact of termination on credit lines available holds across the subsamples, although the statistical significance of the second and third lags declines, perhaps reflecting a greater effort to stabilize credit lines by firms with higher switching costs.

D. Further Tests

For robustness purposes we estimate the credit equation for termination replacing the log of total credit with the ratio of credit to total assets (see Section II.E). Table VI provides the results of the ratio specification. The results show a robust and large termination effect, both in the case of clients of banks that merged and of banks that did not merge. Considering the first lag of *SHM&ATER*, the derivative at the sample mean is -0.18, indicating that 1 percentage point increase in the share of terminated loans would be followed by a 0.18% decline in the ratio of credit to total assets. The results for the subsamples are robust to this change in specification.

E. Does Credit Quality Drive Termination and Credit Volumes?

A possible reason for the decline in credit volume after the termination of a relationship could be that termination reflects a worsening of the firm's creditworthiness that is not adequately controlled for in the regression. That is, an omitted variable that represents a negative innovation in the quality of the borrower may determine both termination and the reduction in loans. However, as we discuss below, the results of a number of tests are consistent with our results not being driven by an unobserved deterioration in credit quality.

Although on an average firms that experience relationship termination are slightly riskier and less profitable, this is already observed in the data at the time of termination and is controlled for in the regression. Regressing current profitability (operating margin divided by total assets) on dummies for termination following M&As, on dummies for with no M&As, and on time fixed effects, we find that the terminated firms are less profitable (by around 1%) than those not terminated, regardless of the involvement of lenders in M&As.

Table V

Effect of Relationship Termination on Credit Lines, All Firms, and Subsamples

The sample period covers years 1993 to 1999. The dependent variable is the log of end-of-year firm-level outstanding total credit. Firm and year fixed effects are included in every regression (coefficients not shown). Robust standard errors are given below coefficients; standard errors are clustered at the firm level. $SHM\&ATER_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that lent to the firm prior to the merger and terminated the relationship. $SHM\&ANOT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were involved in M&As but whose relationship continued after the merger. $SHNOM\&AT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks not involved in M&As but whose relationship with the firm was terminated. Firm control variables are the following. *SHLARGEBK* is the share of credit from banks with total assets of at least 14 trillion lire. *SIZE* is the log of firm's gross total assets. *SALESGROWTH* is the rate of growth of sales in the current year. *FIXASSETS* is fixed tangible assets divided by total assets. *CASHFLOW* is net operating income divided by previous-year total assets. *LIQUIDITY* is cash and other liquid assets divided by total assets. *ZSCORE* is a score that measures credit risk, obtained with linear discriminant analysis; higher values indicate less risk. *MKTENTRY* is the share of branches of banks not present in the market in the previous year. *MKTHERF* is the loan market Herfindahl–Hirschman index of concentration. The market is defined as the province in which the firm has its headquarters. Small firms are firms with less than 5 billion lire of total assets; high credit risk firms are those in the bottom 20% of the z-score distribution.

Sample	All Firms	Small Firms	High Credit Risk Firms	Firms with 1–3 Lenders
Dependent Variable	(1) *LNCLINES*	(2) *LNCLINES*	(3) *LNCLINES*	(4) *LNCLINES*
$SHM\&ATER_{t-1}$	−0.721***	−0.577***	−0.759***	−0.531**
	0.077	0.133	0.186	0.218
$SHM\&ATER_{t-2}$	−0.292***	−0.271**	−0.207	−0.130
	0.071	0.118	0.193	0.166
$SHM\&ATER_{t-3}$	−0.190***	−0.252	−0.065	−0.271
	0.067	0.165	0.152	0.228
$SHM\&ANOT_{t-1}$	0.019	0.001	0.027	0.021
	0.012	0.022	0.032	0.030
$SHM\&ANOT_{t-2}$	0.002	0.008	0.028	−0.037
	0.013	0.025	0.034	0.035
$SHM\&ANOT_{t-3}$	0.001	0.000	0.052	−0.031
	0.013	0.023	0.034	0.031
$SHNOM\&AT_{t-1}$	−0.520***	−0.469***	−0.469***	−0.335**
	0.051	0.095	0.118	0.146
$SHNOM\&AT_{t-2}$	−0.286***	−0.381***	−0.190*	−0.034
	0.052	0.072	0.098	0.119
$SHNOM\&AT_{t-3}$	−0.157***	−0.282***	−0.188*	−0.060
	0.048	0.073	0.099	0.171
$SHLARGEBK_{t-1}$	−0.024	−0.049	−0.053	0.070
	0.026	0.045	0.055	0.083
$SHLARGEBK_{t-2}$	0.012	−0.005	0.015	0.000
	0.023	0.043	0.046	0.077
$SHLARGEBK_{t-3}$	0.027	0.004	0.072	0.007
	0.020	0.036	0.044	0.051
Firm controls included in all regressions (not shown)				
No. of obs.	85,044	20,031	16,388	9,595
Adj. R^2	0.810	0.804	0.790	0.787

Significance levels are: *between 5% and 10%, **between 1% and 5%, and ***1% or less.

Table VI

Effect of Relationship Termination on Credit to Total Assets, All Firms, and Subsamples

The sample period covers years 1993 to 1999. The dependent variable is the log of end-of-year firm-level outstanding total credit. Firm and year fixed effects are included in every regression (coefficients not shown). Robust standard errors are given below coefficients; standard errors are clustered at the firm level. $SHM\&ATER_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that lent to the firm prior to the merger and terminated the relationship. $SHM\&ANOT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks that were involved in M&As but whose relationship continued after the merger. $SHNOM\&AT_{t-k}$ is the lag-k value of the share of the firm's credit issued by banks not involved in M&As but whose relationship with the firm was terminated. Firm control variables are the following. *SHLARGEBK* is the share of credit from banks with total assets of at least 14 trillion lire. *SIZE* is the log of firm's gross total assets. *SALESGROWTH* is the rate of growth of sales in the current year. *FIXASSETS* is fixed tangible assets divided by total assets. *CASHFLOW* is net operating income divided by previous-year total assets. *LIQUIDITY* is cash and other liquid assets divided by total assets. *ZSCORE* is a score that measures credit risk, obtained with linear discriminant analysis; higher values indicate less risk. *MKTENTRY* is the share of branches of banks not present in the market in the previous year. *MKTHERF* is the loan market Herfindahl–Hirschman index of concentration. The market is defined as the province in which where the firm has its headquarters. Small firms are firms with less than 5 billion lire of total assets; high credit risk firms are those in the bottom 20% of the z-score distribution.

Sample	All Firms	Small Firms	High Credit Risk Firms	Firms with 1–3 Lenders
Dependent Variable	(1) *TOTCRTA*	(2) *TOTCRTA*	(3) *TOTCRTA*	(4) *TOTCRTA*
$SHM\&ATER_{t-1}$	−0.187***	−0.194***	−0.299***	−0.178***
	0.024	0.054	0.057	0.066
$\frac{1}{2}(SHM\&ATER_{t-1})^2$	0.361***	0.376***	0.635***	0.326**
	0.060	0.133	0.192	0.150
$SHM\&ATER_{t-2}$	−0.082***	−0.128**	−0.176***	−0.017
	0.025	0.053	0.066	0.083
$\frac{1}{2}(SHM\&ATER_{t-2})^2$	0.162**	0.279***	0.398*	0.016
	0.066	0.130	0.223	0.192
$SHM\&ATER_{t-3}$	−0.056**	−0.095*	−0.034	−0.191**
	0.025	0.051	0.070	0.079
$\frac{1}{2}(SHM\&ATER_{t-3})^2$	0.123*	0.299**	0.165	0.363*
	0.068	0.143	0.228	0.191
$SHM\&ANOT_{t-1}$	0.005	0.003	0.014	0.011
	0.006	0.014	0.019	0.019
$\frac{1}{2}(SHM\&ANOT_{t-1})^2$	−0.019	−0.018	−0.046	−0.040
	0.015	0.031	0.046	0.040
$SHM\&ANOT_{t-2}$	−0.005	−0.004	−0.005	−0.013
	0.007	0.014	0.020	0.020
$\frac{1}{2}(SHM\&ANOT_{t-2})^2$	0.012	0.007	0.031	0.014
	0.016	0.032	0.052	0.043
$SHM\&ANOT_{t-3}$	−0.013*	−0.023	0.000	−0.006
	0.006	0.014	0.019	0.020
$\frac{1}{2}(SHM\&ANOT_{t-3})^2$	0.029*	0.040	0.008	0.000
	0.016	0.033	0.049	0.044
$SHNOM\&AT_{t-1}$	−0.134***	−0.113***	−0.117***	−0.038
	0.014	0.032	0.038	0.045

(*continued*)

Table VI—*Continued*

Sample	All Firms	Small Firms	High Credit Risk Firms	Firms with 1–3 Lenders
Dependent Variable	(1) *TOTCRTA*	(2) *TOTCRTA*	(3) *TOTCRTA*	(4) *TOTCRTA*
$\frac{1}{2}(SHNOM\&AT_{t-1})^2$	0.245***	0.232***	0.200	0.074
	0.034	0.084	0.124	0.099
$SHNOM\&AT_{t-2}$	−0.082***	−0.081***	−0.040	−0.009
	0.015	0.034	0.042	0.049
$\frac{1}{2}(SHNOM\&AT_{t-2})^2$	0.161***	0.175**	0.130	0.015
	0.036	0.089	0.127	0.109
$SHNOM\&AT_{t-3}$	−0.032**	−0.021	−0.005	−0.003
	0.014	0.032	0.040	0.046
$\frac{1}{2}(SHNOM\&AT_{t-3})^2$	0.070**	0.028	0.081	0.014
	0.035	0.083	0.129	0.104
$SHLARGEBK_{t-k}$ and firm controls included in all regressions (not shown)				
No. of obs.	84,405	19,632	16,128	9,624
Adj. R^2	0.742	0.731	0.682	0.732

Significance levels are: *between 5% and 10%, **between 1% and 5%, and ***1% or less.

However, when we regress the change in profitability (between $t-1$ and t) on the termination dummies and the year fixed effects, the firms that experience termination of relationships with merged banks are slightly more profitable, although the coefficient is barely significant. In contrast, those that experience termination of relationships with banks that do not merge are less profitable. Regressing the change in the operating margin between t and $t+1$ on the termination dummies and time fixed effects we find that it is not predicted by either type of termination. The firms appear to be different in a persistent way, partly because of differences in their size, and these factors are mainly absorbed by the firm fixed effects.

Other tests are inconsistent with unobservable changes in credit quality driving our results. It is reasonable to argue that banks involved in M&As should not have more information than lenders that are not involved in consolidation. If anything, they have less information if local branch managers are fired or soft information is lost. If the termination were driven by an unobserved (to the econometrician) deterioration in the firm's creditworthiness, the probability of severing a relationship with the same firm would be correlated across lenders. Instead, in our data the correlation between the two types of terminations is 0.03, suggesting that the two phenomena are not generally driven by a common omitted variable.

We separate out those cases in which firms are terminated only by banks involved in M&As, but the firms borrow from multiple banks. The cases of termination only by merged banks should be less influenced by the potential problem of an unobserved change in creditworthiness if the firm has continuing relationships with other lenders. We construct a dummy variable, D, that is equal to 1 if the firm has a relationship terminated with a nonmerged bank,

and 0 otherwise. We replace the variable *SHM&ATER* with the two variables $TER1 = SHTERM\&A * D$ and $TER2 = SHTERM\&A * (1-D)$ in the regression and drop all firm-years for which the number of lenders is equal to 1. The coefficient of *TER1* is negative and significant, and greater than 1 in absolute value. The second and third lags are negative, significant, and larger than the combined coefficient. The coefficient of *TER2* is −0.78, and is statistically different from −1. When all observations are included, the coefficient is −0.87. The coefficients of the second and third lags are negative, but not significant. These results support the conjecture that even when M&As are followed by termination without any other bank severing the relationship, they are followed by a reduction in credit, though less persistent.

We test directly whether including a measure of future profitability could change the estimated effect of termination. We add to the regressors the contemporaneous and one-lead operating margin divided by total assets (*CASHFLOW*) since it is the performance measure that should be influenced the least by the volume of bank credit that the firm has (leverage, *z*-score, etc., are directly affected by outstanding credit). Deterioration in credit quality would eventually show up in the balance sheet and income statement. The main results are unchanged.

Finally, we estimate a two-step model based on Heckman (1979). Following the method suggested by Wooldridge (1995) for fixed-effects panel data models, the probability of termination is estimated with a probit model on *SHBIDBK*, *SHTARBK*, *SHBOTH*, and the other control variables, plus the lagged number of bank relationships since firms with many relationships have a higher probability of termination. We estimate the probit separately on each yearly cross-section. In the second step the selection correction terms based on the Mills ratios and their lags are included in the credit equation, together with the variables *SHM&ATER*, *SHM&ANOT*, *SHNOM&AT*, and their lags. The variable *SHM&ATER* retains a negative and significant effect on credit for the first lag, with a coefficient of −0.94. The second and third lags have negative but statistically insignificant coefficients. Termination without M&As maintains a negative coefficient, but is barely significant for the first and second lag. When only the contemporaneous correction terms for selection are included, the results are fully consistent with our main results, both in terms of economic magnitude and statistical significance. Relaxing the functional form assumption for the selection term and using a fourth-degree polynomial in the propensity score (see Heckman et al. (1998)), we obtain results that are fully consistent with our main findings.

IV. The Effect of M&As on Investment

Our second test focuses on the impact of bank M&As on investment and on the sensitivity of investment to cash flow. Bank M&As appear to have a negative impact on credit volumes but the economic magnitude of the effect is relatively small. Moreover, the negative effect of M&As on outstanding credit but not on credit lines is consistent with an increase in the cost of credit or in temporary

frictions in credit supply conditions, for example, new credit standards and longer approval procedures.

In the end, we wish to know whether the real decisions of firms are affected by changes in credit availability and/or the cost of credit following bank M&A shocks. If the observed reduction in credit reflects shifts in credit supply to the firm that are large enough to affect real decisions, we should observe an impact on the degree to which the firm is financially constrained. As suggested by the literature, firms that are more constrained in their access to external financing have a higher sensitivity of investment to the availability of internal funds (Fazzari, Hubbard, and Petersen (1988)). In the analysis below we estimate the effect of having one's lender(s) involved in M&As on the sensitivity of investment to cash flow.

A. The Empirical Model

In this section we modify equation (1) by replacing credit with the investment rate (investment flow divided by previous-year total assets) and adding a vector of interaction terms between the bank M&A variables and a proxy for cash flow. If bank M&As affect credit availability, the coefficients of the interaction terms should be statistically different from 0. Our approach is similar to Hoshi, Kashyap, and Scharfstein (1991).

We compare the same firms over time and relate changes affecting their lenders to (potential) changes in the firms' financing constraints. An advantage of using panel data is that we can control for variables that are relatively stable over the period considered for each firm and that are usually difficult to measure, for example, investment opportunities.

Specifically, we estimate the model

$$\begin{aligned} INVRATE_{it} = \alpha &+ \sum_k \beta_k(L_{t-k})SHBIDBK_{it-k} \\ &+ \sum_k \psi_k(L_{t-k})SHTARBK_{it-k} + \sum_k \varphi_k(L_{t-k})SHBOTH_{it-k} \\ &+ \sum_k \xi_k[(L_{t-k})SHBIDBK_{it-k} * CASHFLOW_{it-k}] \\ &+ \sum_k \delta_k[(L_{t-k})SHTARBK_{it-k} * CASHFLOW_{it-k}] \\ &+ \sum_k \theta_k[(L_{t-k})SHBOTH_{it-k} * CASHFLOW_{it-k}] \\ &+ \gamma OTHERCONTROLS_i + x_i + z_t + e_{it}. \end{aligned} \tag{3}$$

The investment rate of firms (*INVRATE*) is computed as the ratio of gross fixed investment to total assets at the end of the previous year. We test hypotheses about the vectors ξ_k, δ_k, and θ_k being statistically different from 0. In equation (3) the sensitivity of investment to cash flow can differ between firms that experience bank consolidation and those that do not. If bank M&As increase financing constraints the investment–cash flow sensitivity should be

greater for firms whose lenders have been involved in M&As than for those whose banks have not.[11]

The investment equation is estimated using within-group fixed effects and time dummy variables to control for changes in the user cost of capital under the assumption that such changes are the same for all firms.

B. Results

For the sake of brevity the results are not reported as most of the coefficients on the key variables are not significant. Consistent with the findings in the literature, investment increases with the availability of internally generated funds (*CASHFLOW*). The coefficient is equal to 0.05 for firms not borrowing from banks involved in M&As and is similar to the findings of Houston and James (2001) in the case of firms borrowing from multiple banks. Controlling for other characteristics, firms borrowing from banks involved in M&As either as bidders or targets have a higher investment rate in the year after the merger. A negative effect after 3 years obtains if the lender(s) is(are) a target.

Moreover, having one's lender(s) involved in M&As is associated with a reduction in the sensitivity of investment to cash flow in the year following the merger. The coefficient of the interaction term between the M&A shock variables and *CASHFLOW* is negative and statistically significant for the first lag. The economic magnitude of the differential effect is significant. At the sample mean of $SHBIDBK_{t-1}$ (0.195) the cash flow sensitivity coefficient is 0.043, compared with 0.05 for firms whose lenders do not merge. At the sample mean of $SHTARBK_{t-1}$ the sensitivity is 0.046, again smaller than the benchmark. An increase in sensitivity obtains in the case of the third lag of *SHBOTH*, but the coefficient is significant at the 10% level.

The coefficients of the other variables in the investment equations are generally consistent with the results in the literature. In particular, investment is positively related to the expansion of sales, as expected, and firms that are relatively larger, with higher leverage and a larger share of fixed assets tend to invest less most likely because they are older and have less unexploited investment opportunities.

The investment equation is estimated for the three subsamples of firms with higher switching costs, that is, greater asymmetric information problems. There are no significant effects of bank M&As on the investment sensitivity to cash flow in these subsamples. The coefficients measuring the sensitivity of investment to cash flow of small firms and of firms with few lenders (1–3 banks) are higher than for the full sample.[12]

[11] We recognize that a higher sensitivity of investment to cash flow cannot be unequivocally interpreted as a measure of financing constraint, as suggested by Kaplan and Zingales (2000). Nevertheless, our data are consistent with the prevailing findings in the literature, for example, that small firms have a higher sensitivity (see Hubbard (1998)).

[12] The coefficient decreases for firms with a large number of lenders, as expected, and becomes statistically insignificant. This suggests that those firms do not rely on internally generated funds to finance investment (not shown).

One potential explanation for the absence of statistically significant effects could be that our subsamples are mixing firms that are constrained with firms that have access to other financial resources or that are generally not financially constrained. We further restrict the sample to firms that should already be constrained before the bank M&As, keeping those that are in the top 20% of the distribution of leverage in the first year they appear in the sample. Even in this case, we do not find any effect of bank M&As.

C. Relationship Termination and Investment

Finally, we estimate equation (3), replacing the bank M&A variables with the relationship termination variables. The results are consistent with those above. Firms that face relationship termination with merging banks appear to be unaffected. Firms whose relationships are severed by banks that do not merge invest less after 2 years but the negative effect vanishes thereafter. The first two interaction terms are positive but not significant, whereas the third is negative and nearly insignificant by standard levels. Firms whose lenders merge but do not interrupt the relationship have a lower sensitivity of investment to cash flow after 1 year, and no effect in the following years.

Relationship termination affects small firms only marginally, as shown by the positive and statistically significant coefficient of the interaction term between *CASHFLOW* and the second lag of *SHNOM&AT*. However, the effect is temporary. The coefficients of the interactions with termination by merged banks are positive but not significant, suggesting that either these firms are able to find other sources of funding or relationship termination could be the result of the firm's decision. Finally, no effect is found in the data for high credit risk borrowers and for those that have one to three lenders. In conclusion, there is no robust evidence of an increase in financing constraints on investment following the involvement of a firm's lender in M&As.

V. Concluding Remarks

We study the impact and medium-term effect of bank M&As on both firm-level credit volumes and the sensitivity of investment to cash flow. The analysis shows that corporate borrowers experience a reduction in outstanding credit that is around 8–10% of the pre-merger share of credit borrowed from the banks that merged. Relationship termination has a larger adverse impact on credit volumes, specifically, a reduction in credit of around 100% of the amount issued under the interrupted relationship. The effects of the M&A shocks last 3 years. Because of multiple lending, the average share of credit borrowed from each bank is small in our data, as is the economic effect of M&As. We do not find any evidence of effects of bank M&As on firm investment or on the sensitivity of investment to internally generated funds.

The results are consistent with consolidation in the banking industry being a source of temporary shocks to corporate borrowers' credit supply, especially when M&As are followed by termination of some relationships, possibly reflecting frictions in credit markets.

REFERENCES

Altman, Edward. I., Giancarlo Marco, and Franco Varetto, 1994, Corporate distress diagnosis: Comparisons using linear discriminant analysis and neural networks (the Italian experience), *Journal of Banking and Finance* 18, 505–529.

Amel, Dean, Colleen Barnes, Fabio Panetta, and Carmelo Salleo, 2004, Consolidation and efficiency in the financial sector: A review of the international evidence, *Journal of Banking and Finance* 28, 2493–2519.

Berger, Allen N., Rebecca E. Demsetz, and Philip E. Strahan, 1999, The consolidation of the financial services industry: Causes, consequences, and implications for the future, *Journal of Banking and Finance* 23, 135–194.

Berger, Allen N., Anil K. Kashyap, and Joseph M. Scalise, 1995, The transformation of the U.S. banking industry: What a long, strange trip it's been, *Brookings Papers on Economic Activity 2*, 55–218.

Berger, Allen N., Leora F. Klapper, and Gregory F. Udell, 2001, The ability of banks to lend to informationally opaque small businesses, *Journal of Banking and Finance* 25, 2127–2167.

Berger, Allen N., Richard J. Rosen, and Gregory F. Udell, 2005, The effects of market size structure on competition: The case of small business lending, Unpublished manuscript, Federal Reserve Board.

Berger, Allen N., A. Saunders, J. M. Scalise, and Gregory F. Udell, 1998, The effects of bank mergers and acquisitions on small business lending, *Journal of Financial Economics* 50, 187–229.

Berger, Allen N., and Gregory F. Udell, 1995, Relationship lending and lines of credit in small firm finance, *Journal of Business* 68, 351–382.

Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein, 2005, Does function follow organizational form? Evidence from the lending practices of large and small banks, *Journal of Financial Economics* 76, 237–269.

Calomiris, Charles W., and Jason Karceski, 2000, Is the bank merger wave of the 1990s efficient? Lesson from nine case studies, in Steven N. Kaplan, ed. *Mergers and Productivity* (University of Chicago Press/NBER).

Cole, Rebel A., Lawrence G. Goldberg, and Lawrence J. White, 2004, Cookie cutter vs. character: The micro structure of small business lending by large and small banks, *Journal of Financial and Quantitative Analysis* 39, 227–252.

Degryse, Hans, Nancy Masschelein, and Janet Mitchell, 2005, SMEs and bank lending relationships: The impact of mergers, CEPR Discussion Paper no. 5061 (Centre for Economic Policy Research, London).

Degryse, Hans, and Patrick Van Cayseele, 2000, Relationship lending within a bank-based system: Evidence from European small business data, *Journal of Financial Intermediation* 9, 90–109.

Dell'Ariccia, Giovanni, Ezra Friedman, and Robert Marquez, 1999, Adverse selection as a barrier to entry in the banking industry, *RAND Journal of Economics* 30, 515–534.

Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen, 1988, Financing constraints and corporate investment, *Brookings Papers on Economic Activity* 1, 141–195.

Group of Ten, 2001, *Report on the consolidation in the financial sector* (Bank for International Settlements, Basel, Switzerland).

Harhoff, Dietmar, and Timm Körting, 1998, Lending relationships in Germany—Empirical evidence from survey data, *Journal of Banking and Finance* 22, 1317–1353.

Heckman, James J., 1979, Sample selection bias as a specification error, *Econometrica* 47, 153–161.

Heckman, James J., Hidehiko Ichimura, Jeffrey Smith, and Petra Todd, 1998, Characterizing selection bias using experimental data, *Econometrica* 66, 1017–1098.

Hoshi, Takeo, Anil K. Kashyap, and David S. Scharfstein, 1991, Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups, *Quarterly Journal of Economics* 106, 33–60.

Houston, Joel F., and Christopher M. James, 2001, Do relationships have limits? Banking relationships, financial constraints and investment, *Journal of Business* 74, 347–374.

Houston, Joel F., Christopher M. James, and Michael D. Ryngaert, 2001, Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders, *Journal of Financial Economics* 60, 285–331.

Hubbard, R. Glenn, 1998, Capital market imperfections and investment, *Journal of Economic Literature* 36, 193–224.

Jayaratne, Jith, and John D. Wolken, 1999, How important are small banks to business lending? New evidence from a survey of small firms, *Journal of Banking and Finance* 23, 427–458.

Kang, Jun-Koo, and Rene M. Stulz, 2000, Do banking shocks affect borrowing firm performance? An analysis of the Japanese experience, *Journal of Business* 73, 1–23.

Kaplan, Steven N., and Luigi Zingales, 2000, Investment-cash flow sensitivities are not valid measures of financing constraints, *Quarterly Journal of Economics* 115, 707–712.

Karceski, Jason, Steven Ongena, and David C. Smith, 2005, The impact of bank consolidation on commercial borrower welfare, *Journal of Finance* 60, 2043–2082.

Myers, Stewart C., 1977, The determinants of corporate borrowing, *Journal of Financial Economics* 5, 147–175.

Ongena, Steven, David C. Smith, and Dag Michalsen, 2000, Firms and their distressed banks: Lessons from the Norwegian banking crisis, *Journal of Financial Economics* 67, 81–112.

Peek, Joe, and Eric S. Rosengren, 1998, Bank consolidation and small business lending: It's not just bank size that matters, *Journal of Banking and Finance* 22, 799–819.

Petersen, Mitchell A., and Raghuram G. Rajan, 1995, The effect of credit market competition on lending relationships, *Quarterly Journal of Economics* 110, 407–443.

Rhoades, Stephen A., 1998, The efficiency effects of bank mergers: An overview of case studies of nine mergers, *Journal of Banking and Finance* 22, 273–291.

Sapienza, Paola, 2002, The effects of banking mergers on loan contracts, *Journal of Finance* 57, 329–368.

Sharpe, Steven A., 1990, Asymmetric information, bank lending and implicit contracts: A stylized model of customer relationships, *Journal of Finance* 45, 1069–1087.

Stein, Jeremy, 2002, Information production and capital allocation: Decentralized versus hierarchical firms, *Journal of Finance* 57, 1891–1921.

Strahan, Philip E., and James P. Weston, 1998, Small business lending and the changing structure of the banking industry, *Journal of Banking and Finance* 22, 821–845.

Wooldridge, Jeffrey, 1995, Selection corrections for panel data models under conditional mean independence assumptions, *Journal of Econometrics* 68, 115–132.