Journal of Applied Economics, Vol. VIII, No. 1 (May 2005), 53-79

CONSEQUENCES OF FIRMS' RELATIONAL FINANCING IN THE AFTERMATH OF THE 1995 MEXICAN BANKING CRISIS

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Submitted May 2001; accepted May 2004

This paper shows that, in the aftermath of the 1995 banking crisis, relational financing was a two-edged sword for firms listed on the Mexican Securities Market. On the negative side, only bank-linked firms observed on average a dependence on cash stock to finance their investment projects. On the positive side, the banking connection was important to boost their profit rates during the 1997-2000 period, at least for financially healthy firms. These econometric results are derived from dynamic panel data models of investment and profit rates, which are estimated by the Generalized Method of Moments, where level and difference equations are combined into a system.

JEL classification codes: L25, D82, N26
Key words: relational financing, banking crisis, internal capital markets

I. Introduction

The Mexican banking crisis provides an interesting case that allows scrutinizing the impact of relational financing under conditions of financial turmoil. The Mexican economy experienced a severe banking and currency crisis in 1995, which practically paralysed the domestic financial system from 1995 to 2000. However, the real annual GDP growth observed in the 1997-

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2000 period was, on average, slightly above 5%, despite that several banks were intervened and others were sold out due to a huge problem of non-performing loans and poor capitalization ratios.

Some papers studying this period, like Lederman et al. (2000) and Krueger and Tornell (1999), have argued that the access of Mexican firms that produce tradable goods to U.S. financial markets was a key factor in explaining the recovery after 1995. However, the outstanding performance in the real sector during the 1997-2000 period would not have been possible without financial flows from the tradable to the non-tradable sector. In this paper, it is hypothesized that the existence of business networks and bank ties might have contributed to the recovery of profits and to the formation of a stronger internal capital market which made the speedy recovery of the Mexican economy possible. In particular, the econometric model presented here analyses: (i) the influence of bank ties on large firms' profitability before and during the period of financial paralysis (1995-2000), and (ii) how such linkages influenced investment decisions.

Babatz (1998), and Gelos and Werner (2002) estimate similar investment models for the Mexican case, although they analyze a different time period. In both cases, these authors were concerned with the consequences on the economy's real activity when moving towards financial liberalization.[1] Therefore, a key contribution of this paper is to test some of the consequences of relational financing in an emerging economy that enters into a stage of financial disruption.[2]

An econometric analysis with bank loans in the 1993-1999 period is presented by La Porta et al. (2003). These authors find that, after controlling

[1] While the latter paper includes also small and medium firms, in the former paper the dataset is based on firms listed in the Mexican Securities Market (BMV, for its Spanish acronym), as it is done here.

[2] Castillo (2003) also estimates investment equations for Mexican listed firms in the 1993:I-2001:II period. However, his study suffers from important drawbacks: seasonality in quarterly data is not properly handled; it does not uses GMM estimations and hence the endogeneity problem is not addressed; different regression are run with a split sample, and thus Wald tests for detecting different financial patterns cannot be applied; his models do not consider lagged investment as usually done in dynamic equations. Likewise, the issue of banking ties is not emphasized in his paper.

for size, profitability and leverage, related parties received better terms on average (lower interest rates, less collateral, longer maturities, fewer personal guarantees) than unrelated parties, despite that the former parties had much higher default rates and lower recovery rates. The models estimated here complement their analysis, in so far as the consequences of these practices on publicly-held firms' investment in physical capital and profitability are studied. In the aftermath of the crisis, it is not necessarily the case that the preferential treatment allowed more access to external financing or higher profits for firms with bank ties. Thus, the looting suggested in La Porta et al. might simply be a reflection of wealthier financier-industrialists but poorer and financially distressed firms.

Theoretically, there is no straightforward prediction as to how relational financing would alter the impact of the banking crisis on a firm. Banking ties could have a positive impact on firms' profitability if the ties enabled the firms to drain banks' financial resources. In an integrated financial strategy, a business network with a financial arm might decide to heavily subsidise the network's firms in anticipation of a government bail out program. If, alternatively, the firms in a business network put their financial health at risk by trying to rescue their group's troubled banks, the relational financing would have a negative impact on profits.

With regard to investment decisions on fixed assets, banking ties are especially important when there are financial constraints in the economy. In a normal macroeconomic setting, when the economy moves toward a period of limited external financing, the financial bottlenecks that exist for firms in general may not be as strong for firms with banking ties. However, when the financial stringency is caused, in part, by the fragility of banks' outstanding loans, this may result in firms with banking ties having to rely more on their retained earnings. Firstly, a troubled bank may have difficulties to finance even their closest firms. Secondly, the international financial markets, who may be the only source of external funding available, could discount a firms' link with troubled banks.

Despite that firms with banking ties may experience financial bottlenecks, these firms can have larger profits relative to 'independent' firms, as long as they do not carry a heavy debt burden. This is so, because the ties will still

help to ensure relatively cheap credit for the firms even though its supply has become more limited; in fact, this is precisely the result observed for the economic recovery period (1997-2000).

The remaining of the paper is structured as follows. Section II reviews briefly the literature on relational financing. Section III explains the database variables and has some descriptive statistics for the investment ratio and profit returns. Section IV presents the dynamic profit and investment equations, the econometric methodology and the interpretation of results. Finally, section V presents the paper's conclusions.

II. Brief Review of the Literature

Relational financing has been shown to be important for both developed and emerging economies alike. In the former case, relational credit between banks and small and medium-sized firms has been useful even when securities markets are already well-developed, as Petersen and Rajan (1994) and Gande et al. (1998) show for the United States. A similar situation is presented with venture capital. This form of external funding is important for start-up firms engaged in risky activities. Moreover, in earlier stages of economic development, related banking has been crucial for fostering economic growth, as described by Hoshi and Kashyap (2001) for the Japanese economy, and by Lamoreaux (1994) for the United States economy. In all these cases, relational financing becomes a viable and constructive institution when tacit information is involved in a borrower-lender relationship.

On the other hand, as emphasized by some authors trying to explain the 1997 East Asian crisis (McKinnon and Pill, 1999; and Rajan and Zingales, 1998), relational financing, when it is based on market power considerations or policy-induced rents for the financier, can make intermediaries more prone to moral hazard, soft-budget constraints, and inefficient and unfair crony capitalism. All in all, these diverse experiences and theories suggest that the relative benefits of relational financing vis-à-vis arm's length financing in terms of efficiency and stability have to do with the macroeconomic setting, the economy's judiciary and legal environment, and the firms' corporate governance.

III. Database and some Descriptive Statistics

A. Database

The database contains a panel of non-financial firms listed on the Mexican Securities Market (BMV). It has information on balance sheets and income statements for an unbalanced panel of 176 firms over the 1990-2000 period.[3] Each firm in the database has at least four years of information; this is necessary to have an adequate lag structure for the explanatory variables and their instruments. In some years, a subset of firms was not quoted on the stock exchange (even though their information was made public since they issued bonds or commercial paper in BMV); consequently, Tobin's Q cannot be calculated for the entire unbalanced panel. The sample covers two contrasting periods: financial liberalization (1990-1994) and financial paralysis (1995-2000); a comparison between the two periods allows testing for whether there was a structural change during the 1995 banking crisis. The sample also divides firms into two categories: independent and bank-linked firms. A bank tie exists when at least one of the firm's board members belongs to the directorate of one or more banks.

B. Descriptive Statistics

Firms' performance with regard to their investment and profitability is calculated in Tables 1 and 2. Despite the limitations behind a descriptive analysis, mean values are helpful to detect if there is some tentative evidence of a pattern change as the economy moves from financial liberalization (1990-1994) to financial crisis (1995-1996), and then to economic recovery (1997-2000). Likewise, the possibility of a different financial structure can also be explored when analyzing mean values according to the type of firm:

[3] The precise definition for all the variables is presented in the Appendix. All monetary variables are expressed in real terms; the consumer price index used to adjust for inflation is available in the web pages of INEGI and Banco de México. The bank linkage dummy variable is constructed from the list of boards of directors presented in the Annual Financial Facts and Figures, published by BMV.

independent or bank linked. Both the structural changes through time and the different behavior according to type are observed in these tables when referring to the point estimates. However, no statistical validation can be offered in this exercise; not only because of the need of using control variables to make inferences but also because standard errors are relatively large.

Table 1. Mean Values for the Investment Ratio

Period	Full sample			Refined sample		
	All firms	Bank-linked	Indep.	All firms	Bank-linked	Indep.
1991-1994	0.457	0.512	0.345	0.218	0.213	0.229
	(4.132)	(4.902)	(1.678)	(0.169)	(0.159)	(0.188)
1995-1996	0.043	0.030	0.075	0.133	0.126	0.153
	(0.228)	(0.182)	(0.313)	(0.120)	(0.113)	(0.134)
1997-2000	0.161	0.173	0.138	0.153	0.150	0.159
	(0.610)	(0.730)	(0.245)	(0.140)	(0.141)	(0.136)

Notes: Standard errors in parenthesis. Investment ratios are measured as gross investment to lagged net fixed assets ratio; the refined sample does not include firm-year observations with zero depreciation, negative investment and investment ratios above 0.75.

With these caveats, it can be observed from Table 1 that the disparity (standard errors) in investment ratios is specially pronounced in the period of financial liberalization either for the full sample or for the reduced sample (where firm-years observations with either negative or extremely large values are removed). This result might imply that the easy access to financing allowed some firms to be very aggressive in their expansion strategies, while others remained conservative; in particular, such disparity is much wider for firms with banking ties. Moreover, the table shows a cyclical pattern with a sharp fall in the 1995-1996 period and a slight recovery for the remaining years. According to point estimates, banking linkage made a difference since the mean value is higher for firms with bank ties in the 1991-1994 and 1997-2000 periods in comparison with independent firms when the full sample is analyzed; however, such a pattern is reversed for the crisis years. In contrast,

when referring to the refined sample mean values for 'independent' firms where slightly higher than those observed for bank-linked firms throughout the sampling period.

Table 2. Mean Values for the Profit Return

	Full sample			Refined Sample		
Period	All firms	Bank-linked	Indep.	All firms	Bank-linked	Indep.
1991-1994	0.025	0.020	0.032	0.065	0.065	0.064
	(0.097)	(0.101)	(0.091)	(0.042)	(0.040)	(0.046)
1995-1996	0.031	0.030	0.033	0.079	0.074	0.088
	(0.115)	(0.102)	(0.138)	(0.051)	(0.048)	(0.056)
1997-2000	0.036	0.030	0.047	0.087	0.081	0.099
	(0.209)	(0.161)	(0.283)	(0.178)	(0.085)	(0.284)

Notes: Standard errors in parenthesis. Profit rates are measured as net earnings to total assets; the refined sample does not include firm-year observation with negative earnings.

It is shown in Table 2 that standard errors are also very high for the profit return variable, and that such dispersion increased during the economic recovery period, in both the full and reduced samples. Although there is not a substantial difference in the rates of return according to type, mean values indicate that, in general, independent firms were slightly more profitable. Moreover, there is no cyclical pattern for these rates like the one observed for the investment ratios. Profitability increases slightly but steadily over time, although for bank linked firms the mean profit return is not modified when moving from crisis to recovery in the sample that includes firms with severe financial distress. Notice that independent firms in the 1997-2000 period had the highest average profitability but also that the within group disparities were very pronounced.

IV. Econometric Equation Models

The Generalized Method of Moments (GMM) introduced by Hansen

(1982) is used to estimate the profit and investment equations described below. The econometric models use a system specification, where equations in levels and differences are jointly estimated, as suggested by Arellano and Bover (1995) for dynamic panel models. The econometric literature recognizes the existence of an endogeneity bias in the estimated coefficients when the explanatory variables are simultaneously determined with the dependent variable or when there is a two-way causality relationship. This joint endogeneity calls for an instrumental variable procedure to obtain consistent estimates. Therefore, a dynamic GMM technique is attractive since the panel nature of data allows for the use of lagged values of the endogenous variables as instruments, as suggested by Arellano and Bond (1991).

Furthermore, a panel data set makes possible to control for firm specific components of the error term. Firm-specific components represent unobserved factors whose omission biases the statistical results when using pooled OLS. In particular, such components are removed when taking first differences in the regression equation expressed in levels. This in turn removes the need of additional orthogonality conditions when estimating the coefficients by GMM. According to Blundell and Bond (1998) the difference estimator has statistical problems when the dependent and explanatory variables are very persistent over time. This makes these variables to be weak instruments for the equation in differences. In this scenario, the system estimator of Arellano and Bover (1995) can be implemented. An efficient GMM estimator can be achieved when lagged differences of the endogenous variables are used to instrument the equation in levels in combination with the level instruments suggested above for the equation in differences.

A. Profit Equation

A firm's profits are, in part, the outcome of decision-making based on the macroeconomic context and the prevailing financial situation in the economy. This is especially the case once one controls for the idiosyncratic effects of each firm's economic activity. Following Lincoln, Gerlach and Ahmadjian (1996), the model presented below treats firm's bank ties as an exogenous component of corporate governance, given the fact that certain business

practices of corporate governance can be considered fixed on a short-run basis. Firms' profit performance is given by:

$$ROA_{i,t} = \alpha_0 + \alpha_1 DU_{i,t} + \alpha_2 ROA_{i,t-1} + \alpha_3 DU_{i,t} ROA_{i,t-1} + \alpha_4 \frac{D_{i,t-1}}{K_{i,t-1}} + \alpha_5 Z_{i,t} + f_i + d_t + \mu_{i,t} \quad (1)$$

where $ROA_{i,t}$ is the return on assets, $K_{i,t-1}$ is the stock of fixed assets at the beginning of the period, $D_{i,t-1}$ is accumulated liabilities at the beginning of the period, $Z_{i,t}$ is a vector of additional control variables, such as exports to sales ratio (X_{it}/NS_{it}), lagged sales rate of growth ($\Delta \ln NS_{i,t-1}$) and logarithm of assets ($\ln A_{i,t}$); f_i is the firm-fixed effects variable, d_t is the time-fixed effects variable, $\mu_{i,t}$ is the error term, and $DU_{i,t}$ is a dummy variable used to capture structural differences for specific firm-year observations.[4] In particular, $DU_{i,t}$ represents either banking linkages ($B_{i,t}$) or years within the financial paralysis period 1995-2000 ($T_{i,t}$). The dummy $B_{i,t}$ takes the value of one if in the year-firm observation there is a bank link and zero otherwise. A control for a structural change in 1995 or 1997-2000 can also be introduced into the above equation with a year dummy variable $T_{i,t}$.

The profit variable used for ROA is measured using net earnings, instead of operating earnings, in order to capture in the regression the effect of firms' financial operations and banking connections. In equation (1), a positive inertia coefficient implies that firm's competitive advantage change slowly over time, regardless of variations in the conditions represented by the other control variables.[5] In particular, the financial liquidity, organizational capabilities, and network of clients and suppliers, among other things, can guarantee a certain level of profits for the firms.[6] By introducing the interaction term

[4] Besides controlling for fixed effects at the firm level, the model also takes into consideration fixed effects at the economic sector level.

[5] Muller (1986) presents a comprehensive study on profit persistence for US manufacturing firms.

[6] According to the resource-based theory of the firm (Barney, 1991), a competitive advantage is sustained through time because there is heterogeneity across firms in their stock of resources and their distinctive capabilities, and these two items are scarce and imperfectly mobile. In particular, it is especially difficult for other firms to replicate a firm's networks of clients and suppliers.

$T_{i,t} \times ROA_{i,t-1}$, the model highlights the possibility that the inertia coefficient changed after the banking crisis. If the estimated coefficient for inertia were reduced, then it would be possible to assert that the firm's financial operations and networks may have been disrupted by the banking crisis. On the contrary, should the extent of inertia increase after 1995 then, perhaps, firms were able to exploit more intensively their liquidity and networks. This would be the case if firms required their suppliers to finance their working capital expenses, or if firms were able to extract additional rents from clients in an oligopolistic setting.

The constant term is allowed to be modified for bank-linked firms through the use of the dummy variable $B_{i,t}$. Thus, if the associated coefficient is positive it means that, irrespectively of previous profits, these firms were able to undertake certain operations that allowed them to have larger profits in comparison with other firms listed on the BMV. An explanation would be that relational banking ties made possible lucrative investment projects by providing the needed financing or by reducing interest on self-granted loans. This effect would be independent of the size of the firms' leverage ratio, which is controlled directly by an explanatory variable.

With regard to the control variables, it is predicted that profit rates would be negatively associated with firm's lagged leverage ratio ($D_{i,t-1}/K_{i,t-1}$) due to agency costs. The lagged rate of sales growth ($\Delta \ln NS_{i,t-1}$) and the log of company's assets ($\ln A_{i,t}$) could be both positively associated with profits, because of either an increase in market power or the exploitation of economies of scale. Moreover, if domestic demand were constrained then the export to sales ratio would also be positively related with profits.

B. Estimation Results for the Profit Rate Equation Model

The GMM-system estimation results presented in Table 3 have p-values that suggest absence of misspecification for the Sargan test of over-identifying restrictions, which tests the validity of instruments.[7] Furthermore, it can be

[7] The level instruments for the difference equation include two, three and four lags, while the equation in levels presents only one lagged value for the instruments expressed in differences. It is important to recall that only the Sargan test based on the two-step GMM estimator is heteroskedasticity-consistent, as pointed out by Arellano and Bond (1991).

Table 3. Estimation Results for the Profitability Equation (GMM-System, One-Step Estimation). Dependent Variable: $ROA_{i,t} = NP_{i,t}/A_{i,t}$.

		(1)	(2)	(3)	(4)	(5)	(6)
$ROA_{i,t-1}$	(b1)	0.455 ***	0.439 ***	0.442 ***	0.406 ***	0.365 ***	1.087 ***
$T_{i,t\ (1995)}\ ROA_{i,t-1}$		0.328 ***	0.289 ***	0.251 ***	0.282 ***	0.394 ***	-0.164 ***
$T_{i,t\ (1997\text{-}2000)}\ ROA_{i,t-1}$	(b2)	-0.125 *	-0.106 *	-0.100	-0.136 *	-0.294	-0.362 ***
$B_{i,t}$	(b3)	0.011	0.001	0.010	0.008	-0.060	-3.468
$T_{i,t\ (1995)}\ B_{i,t}$		0.003	-0.000	-0.008	-0.002	0.002	0.285
$T_{i,t\ (1997\text{-}2000)}\ B_{i,t}$	(b4)	0.029 **	0.019 *	0.018 *	0.026	-0.025	0.119
$D_{i,t-1}/K_{i,t-1}$		-0.001 **	-0.001 ***	-0.001 **	-0.000	-0.002	0.044
X_{it}/NS_{it}			0.016				
$DlnNS_{i,t-1}$				0.011 *			
Ln ($A_{i,t}$)				0.002			
Constant		0.024	0.032 **	0.001	0.061	0.067	2.459
No. observations		678	678	678	678	1,098	851
No. firms		133	133	133	133	172	152
Joint Chi-square (P-value)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sargan test (P-value)		(0.999)	(0.999)	(1.000)	(0.998)	(0.617)	(0.990)
Serial correlation (P-value)							
-First order		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.276)
-Second order		(0.530)	(0.622)	(0.698)	(0.475)	(0.190)	(0.156)
-Third order		(0.133)	(0.110)	(0.141)	(0.114)	(0.677)	(0.326)
Linear restrictions (P-value)							
-Ho: b1 + b2 = 0		(0.001)	(0.000)	(0.000)	(0.007)	(0.759)	(0.000)
-Ho: b3 + b4 = 0		(0.034)	(0.273)	(0.039)	(0.092)	(0.597)	

Notes: Columns (1-5): NP_{it} = net earnings; column (6): NP_{it} = operating earnings; column (4): with sectors. column (5): full sample. Numerical results come from the one-step covariance estimators, except the p-value of the Sargan test that corresponds to second-step estimates. Heteroskedasticity corrected standard deviations are used to calculate the p-values (coefficients with p-values up to 0.01, 0.05 and 0.10 are marked by ***, ** and *). The b's in the first column identify the variables used in the Wald tests. Instruments for the difference equation (the instruments are included if the variable is present in the model equations): all variables in levels dated t-2, t-3, t-4. Instruments for the level equation (dummies, and instruments in differences): all variables dated t-1. Series period: 1993-2000, longest time series: 8, shortest time series: 1.

seen that there is no persistent serial correlation, and that only first order serial correlation is not rejected; hence, it can be stated that the models are properly specified. Results shown in Table 3 come from the one-step estimation, which yields reliable standard errors.

The profit equation was estimated with the full sample and a refined database where firm-year observations with negative profits were removed, reducing the dataset from 1,098 to 678 observations. In a normal macroeconomic context, the ideal is to use the full sample in order not to reduce the available information. However, when the economy exhibits such a dramatic shock and there is an extended period of financial fragility for many firms, it is very difficult to explain firm's performance with the profit equation formulated above. Drastic changes in profits, from a negative to a positive value, can hardly be explained through inertia and firms' competencies. As it will be explained below, in the complex Mexican scenario, some firms were induced to divest and others to merge in order to improve their financial position. Thus, although both types of samples were used in the estimations, the results with the refined database were emphasized since the theoretical literature does not offer a good understanding of the firm's strategy in case of severe financial distress. Therefore, inferences derived from these results are limited to the case of large firms which are relatively healthy; as a side cost, the understanding of firm's performance during this troublesome period is narrowed.

In columns (1) - (4) and (6) the dependent variable includes only firm-year observations with positive returns on total assets, while in column (5) the data set includes also firm-year observations with negative profits. Notice that when the full sample is used, most coefficients are not statistically significant; although, even in this case, the model is properly specified according to the GMM procedure for panel data. In this regard, the model with the reduced sample exhibits a better goodness of fit. In all the results that use the net earnings ratio as the dependent variable (ROA), included those that use the full database, the coefficient for the inertia in profits is positive and increases for the year of the banking crisis (1995), being both coefficients statistically significant. Moreover, according to the t-statistics and the Wald tests (Ho: $b_1 + b_2 = 0$) in columns (1), (2), and (4), the inertia coefficient for the economic recovery period is still positive and statistically different from zero, but it is lower than the inertia observed for the 1993-

1994 period.[8] That is, in general, there seems to be a decrease in the level of inertia for financially healthy firms once the economy entered into the recovery phase.[9]

When the banking crisis deepened in 1995, the estimation results show that listed Mexican firms took advantage of their built-in capabilities, such as their better access to financial resources and their network of clients and suppliers. This interpretation is inferred from the fact that most firms listed on the BMV are large for national standards and are inserted in some form of business network; thus, these features could have helped these firms to sustain profits despite the observed depressed demand. Furthermore, the drop in the inertia coefficient for the profit regression in the 1997-2000 period indicates that the crisis and the interruption of traditional sources of external financing in the domestic markets might have handicapped the working of such networks. Consequently, only on a temporary basis, these firms were capable of taking advantage of their connections, liquidity and monopoly power to sustain profitability.

With respect to the differential intercept for firms with banking linkages $B_{i,t}$, there does not appear to be a statistically significant difference in the levels of profitability for the pre-crisis years and 1995, once adjusted for all the variables included in the model.[10] Nonetheless, the second set of Wald tests (Ho: $b_3 + b_4 = 0$) presented in columns (1), (3), and (4) indicates that such linkages were important during the economic recovery period. In other words, firms with banking ties took advantage of this feature to boost profits, either because relational financing allowed them to invest in more profitable projects, or because banks offered some discounts on how much interest was

[8] In column (3) the results show no statistical difference for the inertia estimation found in the 1993-1994 period and that of the 1997-2000 period.

[9] Different time frames were considered for the structural changes in the intercept and the inertia variable, such as 1993-1994 and 1995-2000 or 1993-1994, 1995-1996, and 1997-2000. Results are not presented here since those models were not properly specified according to serial correlation tests.

[10] A model was also estimated using differentiated intercepts for independent firms in 1995 and in 1997-2000; however, third order serial correlation was detected. Thus, the final model assumes that only for firms with bank ties the intercept can be differentiated along the sampling period.

charged to the firms; and perhaps for those firms with a debt burden relatively low, profit returns were even higher that the rates observed in 'independent' firms.[11]

An additional regression is run that uses operating earnings instead of net earnings in order to confirm whether the changes in the profit inertia were partially due to the firms' financial and fiscal operations -see Table 3, column (6)-. If the coefficients for lagged net and operating earnings were identical, it would imply that the inertia is caused mainly by the firms' real operations, since the former profit variable is defined after taxes and after financial expenses (or revenues); however, this scenario was discarded by the estimations.[12] The fact that the estimated inertia when using operating earnings is lower for 1995 than for the pre-crisis years indicates that the human, organizational and network capabilities of listed firms were not enough *per se* to sustain profits during the crisis. On the contrary, the higher coefficient estimated for that year when using net earnings suggests that these firms had to rely on financial and/or fiscal strategies to boost their profits. Moreover, the lack of significance of the debt ratio and bank linkages when using operating earnings in column (6) shows that these variables influence earnings not related to the firms' real operations.[13]

In summary, this subsection presents important econometric evidence of two sorts: (i) Firms' financial strategies were used to shield profits during

[11] It is important to clarify that the dataset does not include the bank linkage for those firms whose associated bank experienced government intervention. As such, the econometrics cannot capture properly the influence of extreme cases, where conventional wisdom suggests that banks heavily subsidized related firms before being intervened. This feature of the dataset creates a bias against the hypothesis that rates of return might have increased for bank-linked firms during the 1995 crisis.

[12] A caveat is in order since the two estimations do not use the exact same sample. Moreover, the coefficient estimated for the lag of the dependent variable is very close to one when using operating earnings, this may imply a unit root problem.

[13] The model was also estimated specifying the possibility of a different coefficient for the lagged return on assets, which varies depending on whether firms do or do not have banking linkages, and depending also on the time period. Irrespectively of the control variables used, the model was either not properly specified according to the serial correlation tests, or exhibited a poor goodness of fit as shown by the failure of the Wald tests to reject the hypothesis of no joint significance.

1995 through the use of their network of clients and suppliers; however, the prolongation of the banking and currency crises disrupted such strategies. (ii) Despite that the leverage ratio is negatively associated with profits, banking ties resulted helpful in the economic recovery period to boost profits; and hence the overall impact of the bank linkage on profit returns depends on the firms' accumulated debt.

C. Investment Equations

The aim of this subsection is to specify two investment equation models where the influence of the banking and currency crisis in 1995 is formally studied. The first is a traditional model used to test whether the significance of financial restrictions varies over time and across types of firms. The second model tests whether internal capital markets (based on the pooled cash stock of firms associated to the same bank) help to explain the weakening of firm-level financial bottlenecks.[14]

The Traditional Model

The traditional way to analyze the asymmetric information theory of investment is to test whether investment in those firms that, a priori, were considered less affected by asymmetric information problems are less sensitive to variations in cash stock (or cash flow). Under a normal macroeconomic setting, firms associated with banks are assumed to face weaker financial constraints due to the presence of an internal capital market and related credit, yet this sensitivity results might be reversed under a scenario characterized by banks' financial fragility. Furthermore, a larger coefficient for the investment-cash stock relationship during the 1995-2000 period would be evidence that a firm's financial constraints tightened. Investment behavior in a traditional model is given by:

[14] It is common to assume that the estimations from an Euler equation represent a manager's rational investment decisions. However, it is still not clear that the typical characterization of the maximization problem is flawless. Consequently, in this paper it was preferred to follow a more modest approach by estimating an ad hoc regression equation, which, in any case, is conventionally used in the literature.

$$\frac{I_{t,i}}{K_{i,t-1}} = \alpha_0 + \alpha_1 \frac{I_{i,t-1}}{K_{i,t-2}} + \alpha_2 \frac{Y_{i,t}}{K_{i,t-1}} + \alpha_3 \frac{Y_{i,t-1}}{K_{i,t-2}} + \alpha_4 FR_{i,t-1} \quad (2)$$

$$+ \alpha_5 DU_{i,t} FR_{i,t-1} + f_i + d_t + \mu_{i,t}$$

where $I_{i,t}$ is gross investment in fixed assets, $K_{i,t-1}$ is the stock of fixed assets at the beginning of the period, $Y_{i,t}$ is firm's production (or net sales), $FR_{i,t-1}$ indicates internal financial resources at the beginning of the period; f_i is the firm-fixed effects variable, d_t is the time-fixed effects variable, $\mu_{i,t}$ is the error term, and $DU_{i,t}$ is a dummy variable used to capture variations in the impact of internal financial resources for specific firm-year observations. In particular, $DU_{i,t}$, which stands for dummies $B_{i,t}$ or $T_{i,t}$, takes the value of one if the year-firm observation is a priori financially restricted and zero otherwise.

The financial restrictions variable $FR_{i,t-1}$ introduced in the model is cash stock $CS_{i,t-1}$ or cash flow $CF_{i,t-1}$, as a measure of the firm's internal funds available to finance its investment projects. The cash stock available at the beginning of the period is used here. This is because the current year's projects are financed with resources accumulated in previous years. Furthermore, it is normalized by the stock of fixed assets at the beginning of the period ($K_{i,t-1}$).[15] A year dummy variable $T_{i,t}$ is used to test whether a change in financial structure took place in 1995. Finally, the production ratio $Y_{i,t}/K_{i,t-1}$ is included as a proxy for the firm's expected marginal profitability of capital and growth opportunities. The model uses current and lagged values of the production rate.

In an analysis across firms, when the dummy variable specifies banking linkages $B_{i,t}$, it can be asserted that the bank ties remove the financial restrictions caused by asymmetric information when the sum of the two coefficients associated to cash stock is zero. In an analysis across periods, when the dummy is defined in terms of the time period $T_{i,t}$, it can be argued that during the financial paralysis period the change in financial sources helped to overcome bottlenecks when the sum of coefficients associated to the financial constraint variables is close to zero. Finally, the coefficient for lagged

[15] Some authors argue that cash flow measures investment opportunities rather than the availability of internal funds. On the other hand, the cash stock can be interpreted as the "cash on hand" to be used to finance firm's investment projects.

investment is expected to be positive but smaller than one, reflecting the inertia behind adjustment costs in the capital stock.

The Network Model

If, indeed, bank-linked firms' investments are less sensitive to fluctuations in their stock of cash then this could be explained by a transfer within a network formed by all firms associated to the same bank. If there were not only a bank tie effect but also a network effect, it would follow then that investment in associate firms should be positively related to the network's aggregate resources, and especially to those of cash-rich affiliates.[16] As a first approximation to the problem, all firms with bank ties are considered constrained, and the sum of cash stocks (flows) from all associate firms included in the database are assumed to be a potential sources of funding. From this perspective a network's cash stock can be transferred toward investment projects in financially constrained firms. Moreover, this consolidated cash stock works also as a back-up in case the internally generated cash in each firm is not enough to service debt obligations. That is, the network's cash stock may function as virtual collateral for associate firms, increasing in that way the willingness of outside lenders to grant additional credit. Investment behavior with network financing is given by:[17]

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha_0 + \alpha_1 \frac{I_{i,t-1}}{K_{i,t-2}} + \alpha_2 \frac{Y_{i,t}}{K_{i,t-1}} + \alpha_3 \frac{Y_{i,t-1}}{K_{i,t-2}} + \alpha_4 FR_{i,t-1} \qquad (3)$$

$$+ \alpha_5 AFR_{i,t-1} + f_i + d_t + \mu_{i,t}$$

where $AFR_{i,t-1}$ is the network-level financial variable, which in this case is the pooled cash stock $CSO_{i,t-1}$,or the pooled cash flow $CFO_{i,t-1}$ for each bank

[16] Undoubtedly, it is not an easy task to specify the nature of firm's financing. In a more detailed model, it would be convenient to define, a priori, the channels used to transfer resources within these networks. In particular, it might be useful to classify firms within the network into cash-rich and liquidity-constrained categories, as well as to precise the type of funds that were in fact transferred to constrained firms.

[17] This equation is an extension of the model presented in Shin and Park (1999).

network at the beginning of the period ($AFR_{i,t-1} = AFR_{k,t-1}$ if k and i belong to the same network and $AFR_{i,t-1} = 0$ if the firm is classified as independent). In this exercise, the pooled cash stock is defined by grouping of firms who are all connected with the same banks.[18]

Additional extensions to the model are implemented using the same dummy variables for time period and banking linkage as in model (2). These variables allow building new interaction terms with both FR and AFR, and then to test for the influence of banking ties on the sensitivity of firm's investment to stock of cash, both before and after the banking crisis.

D. Estimation Results for the Investment Rate Equation Models

GMM-system estimation results for investment equations (2) and (3) are presented in Table 4. These results come from the one-step estimation procedure, which yields reliable standard errors. All models were run with the one-year lagged cash flow ratio and the one-year lagged cash stock ratio as proxies for the financial restriction variable; however, the latter ratio showed a better fit according to the estimated coefficients' p-values. Therefore, only estimations with cash stock are presented. Notice that four sets of regressions -(1), (3), (4) and (5)- are well specified according to the Sargan and serial correlation tests, and diagnostic tests only reject the absence of first order auto-correlation. The coefficients for the investment rate models presented in the table, with the exception of column (2), were estimated with a refined database.

In columns (1) and (2), the same simple model was estimated, but with different samples: while the former estimates use the refined database, the latter estimates are based on the full sample. In the refined database, firm-year observations with a negative cash flow ratio were removed, together with those reporting a zero annual depreciation or an investment ratio below zero or above 0.75.[19] Besides the fact that the Sargan test of over-identifying

[18] A similar exercise is explored in Castañeda (2003), but using a group membership criteria based on the interlocking of directorates in non-financial firms.

[19] The upper limit was set to exclude those firm-year observations where mergers and acquisitions might have taken place, and which cannot be explained with the traditional investment model. On the contrary, the lower limit excludes those firms who were divesting

Table 4. Estimation Results for the Investment Equation with Financial Constraints and Banking Ties (GMM-System One-Step Estimation). Dependent Variable: $I_{i,t}/K_{i,t-1}$.

		(1)	(2)	(3)	(4)	(5)
$I_{i,t-1}/K_{i,t-2}$		0.167 **	0.123 *	0.162 **	0.015	0.129 *
$Y_{i,t}/K_{i,t-1}$		0.021 ***	0.145 *	0.013 *	0.018 *	0.011 **
$Y_{i,t-1}/K_{i,t-2}$		-0.017 **	-0.102 **	-0.009	-0.015	-0.006
$CS_{i,t-1}/K_{i,t-1}$	(b1)	0.295 ***	4.590 ***	0.339 **	1.521 *	0.342 ***
$T_{i,t\ (1995-2000)}\ CS_{i,t-1}/K_{i,t-1}$	(b2)	-0.272 ***	-4.609 ***	-0.327 **	-0.836	-0.330 **
$B_{i,t}\ CS_{i,t-1}/K_{i,t-1}$	(b3)			-0.307 *	-1.627 **	-0.310 *
$T_{i,t\ (1995-2000)}\ B_{i,t}\ CS_{i,t-1}/K_{i,t-1}$	(b4)			0.432 ***	1.027	0.415 **
$CSO_{i,t-1}/H_{i,t-1}$	(b5)				0.129 ***	-0.000
$T_{i,t\ (1995-2000)}\ CSO_{i,t-1}/H_{i,t-1}$	(b6)				-0.176 ***	0.000
Constant		0.112 ***	-0.198 **	0.153 ***	0.131 ***	0.160 ***
No.observations		499	1,097	499	322	499
No. firms		120	172	120	87	120
Joint Chi-square (P-value)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sargan test (P-value)		(0.815)	(0.077)	(1.000)	(1.000)	(1.000)
Serial correlation (P-value)						
-First order		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
-Second order		(0.316)	(0.414)	(0.523)	(0.730)	(0.613)
-Third order		(0.898)	(0.003)	(0.460)	(0.783)	(0.450)
Linear restrictions (P-value)						
-Ho: b1 + b2 = 0		(0.291)	(0.866)	(0.260)	(0.102)	(0.292)
-Ho: b1 + b3 = 0				(0.809)	(0.449)	(0.825)
-Ho: b1 + b2 + b3 + b4 = 0				(0.002)	(0.000)	(0.000)
-Ho: b5 + b6 = 0					(0.276)	(0.203)

Notes: Column (2): full sample; column (4): standardization: $H_{i,t-1} = KO_{i,t-1}$; column (5): standardization: $H_{i,t-1} = K_{i,t-1}$. Numerical results come from the one-step covariance estimators, except the p-value of the Sargan test that corresponds to second-step estimates. Heteroskedasticity corrected standard deviations are used to calculate the p-values (coefficients with p-values up to 0.01, 0.05 and 0.10 are marked by ***, ** and *). The b's in the first column identify the variables used in the Wald tests. Time fixed effects (not shown) were estimated when most coefficients were significant, as in column (2) and (4). Instruments for the difference equation (the instruments are included if the variable is present in the model equations): all variables in levels dated t-2,t-3,t-4. Instruments for the level equation (dummies, instruments in differences): all variables dated t-1. Series period: 1993-2000, longest time series: 8, shortest time series: 1.

restrictions for the instruments suggests that the model in column (2) has a misspecification problem, the high value of the coefficient associated to cash stock (4.59) is rather surprising.[20] In contrast, the same coefficient in column (1) has a fractional value, as it is traditionally observed in these models. Undoubtedly, the high sensitivity of investment to cash stock estimated in the model presented in column (2) is the product of the extreme observations in the investment ratio.[21]

Neither the investment equation models used here for analyzing financial constraints nor those derived from explicit microeconomic foundations are designed to capture the effects of an aggressive divestment policy, as the one observed for many firm-years observations in the Mexican case during the sample period.[22] Despite that an intuitive explanation can be offered for such a high coefficient, it was decided to estimate the remaining models with the refined database due to a lack of solid theoretical background.[23] Obviously,

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their fixed assets. In the period of study, there were 28 cases of mergers and acquisitions for the firms included in the sample according to news found in different issues of *Expansión* magazine.

[20] The same result is obtained when the model uses cash flow instead of cash stock.

[21] Notice in Table 4, column (2) that the constant coefficient becomes negative when negative investment ratios are included in the sample. This indicates that the estimates associated to the cash stock variables are heavily influenced by these observations.

[22] The number of observation that are lost in the refined database is 598. They are spread through all the sampling period, although there are more observation with a negative investment ratio in the years 1994-1996. Nonetheless, when using time-dummy variables interacted with cash stock to differentiate the crises years (1995, 1995-96), the high coefficient still remains. It is important to recall that the more stringent is the deletion criteria, the more observations are removed from the unbalanced panel when constructing GMM instruments.

[23] Firms experiencing a negative cash flow may decide to reduce their operations and sell physical assets, either because cash is needed to pay for working capital and financial obligations, or because it has been simply decided to reduce the profile and size of the company. There is a multiplying effect because the reduction of one peso in cash stock is associated with a divestment larger than one. This can be caused by the lumpiness of fixed asset, where the manager is forced to sell assets with a value higher than the financial needs. Alternatively, a firm reducing its operations may decide to sell sizable physical assets, perhaps induced by the need to liquidate outstanding debt.

this more narrow focus has a cost, since the results can only be interpreted for large and healthy Mexican firms, missing the possibility of getting a better understanding of how listed firms in general were able to overcome the crisis.

In column (1) the dummy in the interaction term $T_{i,t}(CS_{i,t-1}/K_{i,t-1})$ is defined in terms of the time period 1995-2000, which makes a dynamic interpretation possible. Notice that all the coefficients are statistically significant and the sign for the lagged cash stock ratio is positive as suggested by the financial constraint hypothesis. The most interesting result from this estimation is that the banking crisis did not exacerbate the financial constraint for the average firm listed on the BMV, but instead these constraints were removed as suggested by the Wald test during the 1995-2000 period. This paradoxical result might be explained by the change in the firms' financial structure and the existence of an internal capital market among firms associated to a particular network. It is possible that the control rights exerted by the parent company or by affiliates with surplus budgets diminished conflicts of interest in a lender-borrower relationship, and hence, in a network structure, information asymmetries were less stringent. Accordingly, the investment-cash stock sensitivity might have been reduced because listed firms decided to use their internal capital market more actively since 1995.[24]

In order to provide a more rigorous test for this statement, the model is reformulated in column (3) by allowing the interaction term of the financial restriction to vary across firms and across time, using $B_{i,t}(CS_{i,t-1}/K_{i,t-1})$ and $T_{i,t}B_{i,t}(CS_{i,t-1}/K_{i,t-1})$. The importance of network membership before 1995 is evident in column (3), where banking linkages are used as the grouping criteria. Despite that a policy of financial liberalization was implemented at the beginning of this sampling period, firms linked to banks through the interlocking of directorates resulted much less financially constrained than 'independent' firms. Additionally, the sum of the corresponding coefficients was not statistically different from zero according to the Wald test (Ho: $\beta_1 + \beta_3 = 0$). Moreover, the remaining Wald tests show that this situation

[24] Similar results are obtained with the full sample -see column (2)-, and thus it cannot be argued that the reduced cash stock investment sensitivity during financial paralysis is the result of having only healthy firms, some of them multinationals, with a better access to foreign financing than the remaining firms in the full sample. Moreover, even in the refined database, there was some dependency on cash stock during financial liberalization.

was reversed for the 1995-2000 period. While 'independent' firms did not have to rely any longer on retained earnings for their investment projects (Ho: $\beta_1 + \beta_2 = 0$), bank-linked firms had certain dependence on cash stock since the point estimate of 0.137 was statistically different from zero (Ho: $\beta_1 + \beta_2 + \beta_3 + \beta_4 = 0$ is rejected). These econometric results are in line with the presumption that the banking crisis harmed the financial assessment of firms with banking ties. As opposed to the 'independent' firms, where financial constraints were removed from 1995 onwards by taking advantage of international financing, trade or network credit, firms with banking ties had to rely more on their own resources. A tentative explanation is that for the latter firms the access to international financing was somewhat limited, since the market took into consideration the troublesome banking connection, or alternatively, during this period banks were more heavily scrutinized and thus were unable to finance investment in linked firms.

The significance of the interaction term with the banking tie dummy in the first half of the 90's only implies that these ties were important to reduce financial constraints. It is not possible to tell whether this result is explained by the existence of relational credit, or because of the fact that those firms operate with the support of an internal capital market. Therefore, a more detailed analysis of the workings of internal capital markets under a bank-linked network structure is needed to offer a more conclusive answer.

The distinctive feature in the models of columns (4) and (5) in Table 4 is that they introduce the lagged pooled cash stock $CSO_{i,t-1}$ for each banking-group as a proxy for the influence of the internal capital market on the associate firms' investment. While in column (4) pooled cash stock is standardized by the sum of the pooled firms' capital stock at the beginning of the period ($KO_{i,t-1}$), in column (5), the sum of pooled cash stock is standardized by the firm's own capital stock at the beginning of the period ($K_{i,t-1}$). This last specification assumes that the pool of financial resources available in the internal capital market should have more influence in the firm's investment when that pool is larger relatively to the size of the firm's physical assets.

Only in column (4) is there evidence of a working internal capital market for the financial liberalization period since the coefficient on lagged pooled cash stock $CSO_{i,t-1}/KO_{t-1}$ is significantly positive, as expected from theory. It appears that the aggregated cash stock of firms associated with particular

banks helped to spur investment for the average member firm during the financial liberalization period. Thus, this model presents empirical evidence that validates the hypothesis of financial relaxation in network firms due to the workings of an internal capital market built around a banking connection. However, a Wald test (Ho: $\beta_5 + \beta_6 = 0$) rejects the existence of this form of network-financing during the financial paralysis period. It is also noticeable that in the latter period, firms with bank ties show –both in columns (4) and (5)- a positive and statistically significant investment-cash stock sensitivity, as it was previously indicated with the estimations presented in column (3).

Furthermore, it is important to emphasize that the econometric findings do not indicate that the internal capital market ceased to exist during the crisis years. It is possible that exporting firms were issuing international bonds in order to finance their own investment, as well as the investment of other firms within the same network; therefore, in this scenario, pooled cash stock could not be associated to the firm's investment, despite the use of a network connection to channel the funds raised abroad. Even if this feature is true, it needs not to appear in this econometric model since the aggregation of the data at yearly level -instead of quarterly data- may not be capturing a very dynamic internal market. Likewise, the internal capital markets prevailing in the financial paralysis period might have been structured under the basis of firms' linkage other than a similar banking connection.

In summary, regression estimates in this subsection show three key results: (i) There was a structural change during the financial paralysis period in comparison with the financial liberalization period; however, somewhat paradoxically, financial constraints were lessened up, at least for 'independent' firms. (ii) Before the crisis, bank ties helped to overcome financial bottlenecks, but after the crisis, financial markets interpreted the bank linkage as a bad signal on firms' financial health. (iii) Internal capital markets played, undoubtedly, a role during the financial liberalization period; however, the source of the firms' liquidity during the recovery period remains an open question.

V. Conclusions

This paper shows that having a banking connection might be a liability

for firms in the aftermath of a banking crisis, despite that, traditionally, it has been argued that bank linkages alleviate financial bottlenecks in normal times. In the Mexican case, it is observed that limits were imposed to the financing of investment projects in bank-related firms; however, this shortcoming was offset, in part, by the positive influence of the bank linkages on firms' profitability, especially for those firms not carrying a large debt burden from the financial liberalization period.

Likewise, the paper presents econometric evidence that firms' financial operations through their networks of clients and suppliers may be helpful to boost profit rates on a very short-term basis when a crisis hits the economy. Yet, the evidence also shows that if such crisis is extended for some years, it is not longer feasible for large firms to pursue an extraction of rents from associated firms or other stakeholders. However, the presumption that an internal capital market acquired a more active role while substituting for domestic credit financing after 1994 cannot be fully validated with the available database; thus, two possibilities deserve further exploration to solve this paradox: incorporating data on international capital markets and making the use of suppliers' credit in the estimated equations explicit.

Appendix. Construction and Definition of Variables

It is important to clarify that since 1984 the financial information of firms listed on the BMV has been re-expressed to reflect the effects of inflation. Thus, fixed assets, inventories and depreciation are restated by determining current replacement costs. Moreover, under these accounting principles, a firm adjusts the value of the debt due to inflation, despite that new debt has not been granted. For this study, the firms' balance sheet, income, and cash flow statements for the 1990-2000 sample period are expressed in real terms using prices of 2000. The 176 firms of the unbalanced panel add up to 1,460 year-firm observations.

A. Definition of Variables

I_{it} = Gross investment = $K_{it} - K_{i,t-1} + DEP_{it}$, where DEP_{it} is annual depreciation; K_{it} = Net capital stock; Y_{it} = Production; NS_{it} = Net sales;

FR_{it} = Financial restrictions variables CF_{it}, CS_{it}; CF_{it} = Cash flow; CS_{it} = Cash stock; AFR_{it} = Group level financial restriction CSO_{it}, CFO_{it}; CSO_{it} = Pooled cash stock; CFO_{it} = Pooled cash flow; KO_{it} = Pooled capital stock; X_{it}/NS_{it} = Exports to sales ratio, where X_{it} is foreign sales; ROA_{it} = Return on assets = NP_{it}/A_{it}, where NP_{it} is net profits and A_{it} is total assets; D_{it} = Total liabilities; DU_{it} = Dummy variables to partition the sample according to liquidity constraints B_{it}, T_{it}; B_{it} = Dummy for banking linkages; T_{it} = Time dummy for financial paralysis period (1995 or economic recovery period).

B. Construction of Variables from Primary Sources

Codes: (SIVA; Infosel): K_{it} = Net capital stock: net assets in plant, equipment and real estate, valued at current replacement cost (S12; 1,150); NS_{it} = Net sales (R01; 1,238); Y_{it} = Production: Net sales minus decrease in inventories (RO1-C19; 1,238-1,312); X_{it} = Net foreign sales (R22; 1,262); DEP_{it} = Depreciation: depreciation and amortization of year t (C13; 1,305); CS_{it} = Cash stock: cash and temporary investments (S03; 1,141); CF_{it} = Cash flow: cash generated from operations (C05; 1,293). This is equal to net income plus capital amortization and depreciation, plus increase in pension reserves, minus the increase in receivables, minus the increase in inventories, plus the increase in payables, plus the increase in mercantile credit; NP_{it} = Net earnings (R18; 1,255), or operating earnings (R05; 1,242); A_{it} = Total assets (S01; 1,139); D_{it} = Total liabilities (S20; 1,159); CSO_{it} = Pooled cash stock is built with the summation of the cash stock of the other firms that are linked to the same bank; CFO_{it} = Pooled cash flow is built with the summation of the cash flow of the other firms that are linked to the same bank; KO_{it} = Pooled capital stock is built with the summation of the net fixed assets of the other firms that are linked to the same bank; B_{it} = Dummy for banking linkages: assigns a value of one if the firm has a banking linkage and a value of zero otherwise. Criteria for banking linkages: A firm is linked with a bank if at least one of its board members sits on the board of a bank; T_{it} = Time dummy for financial paralysis period: assigns a value of one for 1995 and onwards and a value of zero otherwise.

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