

Local Bank Financial Constraints and Firm Access to External Finance

DANIEL PARAVISINI*

July 2006

Abstract. This paper shows that financial constraints of local banks in emerging markets lead to underinvestment and credit constrained borrowers. I find that local bank lending is sensitive to an exogenous expansion in the availability of external financing. Using novel data to measure risk and return on marginal lending, I show that the profitability of loans does not decline during lending expansions. The resulting credit expansion leads to an increase in total borrower debt, holding investment opportunities constant. Overall, financial shocks to constrained banks are found to have a quick, persistent and amplified effect on the aggregate supply of credit. (JEL: G21, E50, D82)

* Columbia University GSB. This paper was formerly circulated under the title: “Constrained Banks, Constrained Borrowers: Bank Liquidity Constraints and Firm Access to External Finance”. I thank Abhijit Banerjee, Esther Duflo, Sendhil Mullainathan and Antoinette Schoar for invaluable comments and discussions. This work also benefited greatly from the thoughts of all the participants of the finance seminars at Columbia GSB, Kellogg (Northwestern), Universitat Pompeu Fabra, Smith (Maryland), Sloan (MIT), Stanford GSB, Stern (NYU), Stockholm School of Economics, Stockholm University, Tepper (CMU), UT Austin, Yale SOM; the banking seminars at the New York Federal Reserve Bank, the Board of Governors of the Federal Reserve Bank and the WFA; and the development economics seminar at MIT. I am grateful for comments from the editor, an anonymous referee, Adam Ashcraft, Darrell Duffie, Iván Fernández-Val, Andrew Hertzberg, Arvind Krishnamurthy, Owen Lamont, Alexis León, Greg Nini, Jun Pan, Francisco Pérez-González, Tano Santos, Sheridan Titman and Jeffrey Zwiebel.

Local Bank Financial Constraints and Firm Access to External Finance

July 2006

Abstract. This paper shows that financial constraints of local banks in emerging markets lead to underinvestment and credit constrained borrowers. I find that local bank lending is sensitive to an exogenous expansion in the availability of external financing. Using novel data to measure risk and return on marginal lending, I show that the profitability of loans does not decline during lending expansions. The resulting credit expansion leads to an increase in total borrower debt, holding investment opportunities constant. Overall, financial shocks to constrained banks are found to have a quick, persistent and amplified effect on the aggregate supply of credit.

The question of how financing frictions in the banking sector affect lending behavior and economic activity has long been of concern to the literature on financial institutions. Most recent empirical work on the lending channel and credit crunches has focused on two issues: whether financing frictions exist and, if so, whether shocks to the financial position of a bank have any real effect on investment.¹ The question of whether constrained financial intermediaries lead to underinvestment has, however, received little attention. This is a fundamental empirical question since, as pointed out by Allen and Gale (2004), the effect of contracting imperfections in the intermediation markets on the efficiency of investment is theoretically ambiguous. On the one hand, financial frictions may be incentive-efficient if they arise as a solution to an agency problem between the owners of capital and bank managers (Hart and Moore (1995), Jensen (1986), Stulz (1990)). On the other hand, even if bank managers act in the best interest of current shareholders, frictions may lead to underinvestment when there is asymmetric information about the value of bank assets (Myers and Majluf (1984), Stein (1998)).

To provide compelling empirical evidence that frictions in financial intermediation markets lead to underinvestment, three hypotheses must be tested. First, that banks face frictions in their access to external financing. Second, that these financing frictions prevent banks from undertaking profitable investment opportunities. And third, that the lending opportunities forgone by constrained banks are not be arbitrated by other unconstrained financial intermediaries. In this paper I show empirically that the three hypotheses hold true in the context of local banks in emerging markets. The potential effects of constrained financial intermediaries on the efficiency of investment are first order in this context, due to the

prevalence of local bank finance in corporate investment and the lack of alternative financing sources for informationally difficult borrowers.²

To identify the effect of access to external financing on lending and test for financing constraints, I exploit a shock to the financial position of local banks by a government lending program in Argentina. The amount, timing and cross bank distribution of financing were governed by a predetermined bureaucratic formula, unrelated to bank marginal cost of capital or investment opportunities. The results indicate that there is an immediate expansion of lending of \$0.66 for every dollar of additional external finance received by banks. The magnitude of the lending response is underestimated by a factor of 2 when the confounding effect of other shocks to the demand and supply of credit is unaccounted for. Also, the lending response is larger for smaller and less capitalized banks, which are likely to face more binding constraints.

Exploiting the monthly panel structure of the data I assess the timing and duration of the lending response. The average cumulative expansion of lending is around \$1.2 per dollar of additional external finance, which is achieved within 3 months, and it is still significant after 2 years of the external financing shock. The results indicate that the lending response to a shock to the financial position of a constrained bank is quick, persistent and involves a multiplier effect. These findings are not consistent with the Modigliani-Miller proposition for banks and suggest that banks were financially constrained before experiencing the finance expansion.³

To assess whether constraints affect the efficiency of bank investment, I look at the risk and return of bank marginal loans. Using novel loan level data from a Public Credit Registry to construct the credit history of every bank borrower, I measure the actual default risk of the loans issued by the bank during the external financing expansion. The results show that loans

financed during periods of increased available external finance are not more likely to default than loans issued in other periods. Also, bank interest rate revenues do not decline during lending expansions. The fact that proxies for the risk and return of the bank loan portfolio were unaltered by the expansion in available external finance is inconsistent with a free cash flows interpretation of the results. The evidence supports the hypothesis that financial frictions lead to underinvestment by constrained local banks.

Finally, I address the issue of whether financial constraints of local banks affect the overall availability of credit to their borrowers. The hypothesis that firms have access to alternate sources of financing has an empirical implication that is testable using loan level data. Namely, that an improvement of the financial position of a bank should not affect borrower debt, all else being equal. On the contrary, I find that there is a positive and significant expansion in the amount of firms' total borrowing when their lenders experience an exogenous expansion in external financing.

This paper provides evidence that the two fundamental assumptions of the lending channel literature hold for local banks in emerging markets. First, local banks can be financially constrained. Existing research provides evidence that shocks to the financial system affect the supply of credit (Kashyap and Stein (2000), Peek and Rosengren (1997) among others). This paper contributes to the literature by showing that lending is also sensitive to shocks when both the marginal cost of capital of banks and bank investment opportunities are held constant. And second, local bank credit is difficult to substitute. Financial constraints of banks limit the supply of credit and lead to underinvestment even in a context where large and potentially unconstrained multinational banks are present. The results imply that the extent to which the financial system will propagate the real effects of liquidity shocks, and the magnitude of the

resulting aggregate amplification, will hinge crucially on the cross sectional distribution of financial constraints in the banking sector.

The results imply that improved access to capital markets of local financial intermediaries may have a first order effect on the efficiency of investment. Since the work of Modigliani and Miller (1958), considerable research in corporate investment has been devoted to assess whether a substantial misallocation of resources results from conflicts between the owners of capital and firms. The results presented here provide the first direct evidence that this misallocation can be exacerbated in emerging markets due to conflicts between the owners of capital and financial intermediaries.

The paper proceeds as follows. Section I provides the institutional background on the Argentine banking sector in the late 90s, discusses the analytical framework for testing bank liquidity constraints, and describes the source of the liquidity shock. Section II describes in detail the empirical strategy of the paper, emphasizing how the government program rules are exploited to create an exogenous instrument for bank external finance. Section III describes the data sources and variable definitions. Section IV presents the results and Section VI concludes.

I. Setting and Conceptual Background

A. The Argentine Banking System

This paper measures the extent of financial constraints among locally owned banks in the context of the Argentine financial system. The Argentine banking sector regulatory and supervisory system during the second half of the 1990s became an archetype for regulation design in emerging markets in the last decade. The banking regulation pioneered the adoption of Basel II recommendations in 1995, and by 1998 the overall regulatory environment was

ranked second among emerging market economies, behind Singapore (Calomiris and Powell (2000), Mishkin (2000), (2001), World Bank (1998)). Thus, the exploration of empirical banking market issues in the Argentine setting during this period provides insights into the working of the financial sectors in emerging markets under the new Basel Accord rules.⁴

The information disclosure regulation rules of the Argentine regulatory system also make it particularly suitable for empirical research in banking and credit issues in emerging markets. Since 1998, the Central Bank collects information on every credit transaction of firms and individuals with more than \$50 in total debt (Escude, Burdisso, Catena, D'Amato, McCandless and Murphy (2001)). This information is publicly disclosed and identifies uniquely by name and tax identification number both the lender and the borrower in each transaction. This information allows measuring the actual probability of default of marginal bank investments, which is crucial to answer the underinvestment question addressed in this paper.

The Argentine banking system was characterized in 1999 by a significant participation of foreign owned banks, which held 48% of the assets of the financial system. This percentage is high relative to other emerging markets, where 19% of the total banking assets are foreign owned (see Mian (2006)). The average bank had \$1.1 billion in assets, slightly below the consolidated assets of the average U.S. bank in 1996 (\$1.2 billion, see Ashcraft (2006)). Following a wave of privatizations during the mid 90s, the fraction of government owned assets in the banking system was low by international standards (30% of the assets of the top ten banks, compared to 42% in a broad country sample according to La Porta, Lopez-de-Silanes and Shleifer (2002)). The rest of the assets of the banking system were held by smaller, locally owned banks.

Measuring the extent and consequences of financing frictions among local banks is particularly relevant in emerging markets. In first place, financial constraints are more likely to be prevalent among local banks, since unlike large foreign banks, these do not have large internal capital markets from which to draw funding (Berger, Klapper, Miller and Udell (2003), Stein (1997)). Also, recent evidence suggests that borrowers of local banks may have little access to other sources of funding even when banking markets are open to foreign investment (Mian (2006)). As a consequence, shocks to the banking sector can have a disproportionate effect on investment by local bank borrowers in emerging markets.

The macroeconomic environment in Argentina during the late 90s is particularly suitable for studying bank liquidity issues. The banking system was operating amidst increasing liquidity and stalling investment opportunities. Real GDP grew at an annual average of 0.1% between 1998 and 2000, while total bank deposits experienced an average yearly growth of 9.1% during the same period. These conditions stack the cards against finding evidence of banks being constrained in the resources available for investment.

B. Testing for Financing Constraints of Banks

The empirical literature on the lending channel is focused on providing evidence of the failure of the Modigliani-Miller (MM) proposition for banks: changes in the financial position of an unconstrained bank will not affect its lending behavior. The usual empirical specification looks at the relationship between loan growth and variables that affect bank sources of capital:

$$\ln L_{it} - \ln L_{it-1} = \alpha_i + \alpha_t + \beta_0(\ln D_{it} - \ln D_{it-1}) + \gamma \mathbf{x}_{it} + \varepsilon_{it} \quad (\text{I-1})$$

where L_{it} are total loans of bank i at month t , D_{it} is a proxy for sources of capital net of reserve requirements, α_i (α_t) are bank (month) fixed effects, \mathbf{x}_{it} is a set of controls and ε_{it} is a stochastic error term. Under the null hypothesis of no financial frictions, $\beta_0=0$. Changes in sources of

capital net of reserve requirements are commonly proxied with changes in monetary policy, deposit growth, internal cash, and stock prices (see for example Bernanke and Gertler (1995), Hubbard (1995), Jayaratne and Morgan (2000), Ostergaard (2001), and Peek and Rosengren (1997)). The MM argument holds even when insured deposits, priced below the market rate, are used as a source of variation. Changes in deposits are inframarginal and do not affect the marginal cost of financing, which is given by market priced sources of financing (e.g. subordinated debt, equity).

The main concern with the standard specification is that the sources of variation in sources of capital, D_{it} , are potentially correlated with other factors affecting either the supply or the demand of credit. For example, an increase in deposits might decrease the risk profile of the bank and reduce the cost of capital, or signal better future lending prospects and a higher marginal returns on lending. In both cases, changes in deposits will be correlated with lending even when banks are unconstrained. Empirical work has approached this difficult identification issue several ways: 1) controlling explicitly for bank investment opportunities (Tobin's q , or GDP growth); 2) looking for larger sensitivities of lending to D among banks that are more likely to be constrained according to size, equity capital, holdings of liquid assets or other observable characteristics (Ashcraft (2006), Kashyap and Stein (2000), Kishan and Opiela (2000)); and 3) by looking at changes in the composition of bank finance within firms when banks receive external finance shocks (Gan (2006), Kashyap, Lamont and Stein (1994), Kashyap, Stein and Wilcox (1993), Khwaja and Mian (2005)).

Even with these refinements, the link between the observed lending sensitivities and financial constraints is not straightforward. Measurement errors in q and bank specific changes in investment opportunities may induce a correlation between investment and cash flow

(Erickson and Whited (2000), Gomes (2001), Poterba (1988)). The cross sectional predictions are also consistent with models without financing frictions, and appear in the data among unconstrained non-financial firms (Alti (2003), Kaplan and Zingales (1997), (2000), Moyen (2004)). And large shocks to deposits or asset prices may affect both bank sources of capital and the cost of capital, which renders it difficult to disentangle the source of the change in lending behavior. Ideally, to test for financial constraints one requires a source of variation in the financial position of a bank that can be decoupled from other factors affecting the demand and supply of bank credit. This paper adopts the ‘natural experiment’ approach of the more recent investment-cash flow literature (Blanchard, Lopez-de-Silanes and Shleifer (1994), Lamont (1997), Rauh (2006)). I will exploit the fact that local banks in Argentina received small and limited amounts of financing from the government during 1999 as a source of variation in bank external finance to test the financing constraints hypothesis. The details of the source of variation are discussed further in the empirical methodology section.

C. Testing for Underinvestment

There are two potential explanations for the empirical observation that banks expand lending due to an exogenous increase in external financing. First, because the additional financing eases financing constraints and allows banks to undertake good projects they would otherwise not be able to (Fazzari, Hubbard and Petersen (1988), Myers and Majluf (1984), Stein (1998)). Second, because additional cash allows managers to pursue wasteful lending opportunities (Hart and Moore (1995), Jensen (1986), Stulz (1990)). The *underinvestment* and *free cash flows* views have distinct predictions on the profitability of marginal investments when available finance increases. In the underinvestment view, marginal investment is always profitable. The free cash flows view predicts that there will be overinvestment ex post in states

of the world “when the level of free cash flow relative to investment opportunities is higher than expected” (Stein (2003)).

Distinguishing empirically between these alternatives requires measuring the profitability of marginal investment when additional external finance is available to the banks. Measuring the marginal profitability of bank lending is a difficult task due to the dynamic nature of lending and lending relationships. The return on any individual loan can only be assessed with data on the actual cash flows generated by the loan. In this paper I will measure two components of loan profitability. Loan level data allows measuring changes in the actual timing and rates of loan defaults. And bank interest revenue data allows measuring changes in the interest cash flows. These will provide a conservative measure of the profitability of marginal loans, since the returns derived from the private information about borrowers obtained through the relationship are not considered (Bharath, Dahiya, Saunders and Srinivasan (2006), Petersen and Rajan (1995)). A conservative measure of profits can be exploited to rule out the free cash flows hypothesis. Profitable marginal loans issued during external financing expansions, holding investment opportunities constant, will be consistent only with the underinvestment hypothesis.

II. Empirical Methodology

This section describes the government program that is exploited as a source of variation in external financing to test for financing frictions. I then develop an empirical strategy to address the concern that program financing is potentially correlated with bank investment opportunities or cost of capital. Finally, I describe how the empirical strategy is implemented.

A. Source of the External Finance Shock: MYPES program

The Credit Program to Small and Medium Sized Firms (MYPES for its acronym in Spanish) was implemented in Argentina between 1993 and 1999 and provided financial intermediaries limited amounts of 3 year financing at the average deposit rate in the banking system.⁵ The program was funded by the Inter-American Development Bank (IDB) and had the objective of encouraging formal intermediary institutions to expand lending to small businesses. In the development agency jargon, the MYPES is an *on-banking* or *on-lending* program. The common feature of on-banking programs is to make financing available to existing financial intermediaries, conditioned to a proportional amount to be lent to a narrowly defined group of borrowers. Using the MYPES program to identify financial constraints has the methodological advantage that it can be repeated in other institutional en economic contexts. On-lending programs are a widespread policy tool in both developed and emerging markets. For example, the World Bank alone allocates between 5 and 20% of its annual loan portfolio through local financial intermediaries, and allocated more resources through this channel than through any other individual program (Barger (1998), Bratanovic (2002)).

The MYPES required banks to issue \$1 of loans to eligible borrowers for every \$0.75 of program financing received. Firms with less than 20 workers and less than \$200,000 in annual sales were eligible to receive program loans. Program financing was allocated in 12 waves between 1993 and 1999. A month prior to the beginning of each wave, the Central Bank announced publicly the amount to be distributed and banks submitted an application to participate. Resources in a wave of the program were allocated among all participating banks according to an administrative formula based on bank characteristics. The formula assigned a higher fraction of the resources in a wave to banks with a smaller average size of loans and a

higher proportion of loans in poor provinces. Each participating bank was assigned a point score according to these characteristics and received financing in proportion to this score.⁶ Banks had three months to use the allocated resources or pay a penalty proportional to the unused balance. In practice, all banks used all the allocated resources in every wave. The maximum duration of a loan was three years.

The MYPES program was small relative to the size of the financial system: it allocated around \$90 million among participating banks, which represented 0.1% of total loans in 1995. This implies that the program had a small impact on aggregate liquidity in the banking system and was unlikely to influence interest rates or the cost of capital. The amount of financing was sizeable relative to banks that participated in the program: financing represented about 1.8% of stock and 10.6% of the flow of loans during the months of implementation. Nevertheless, at all times banks held liabilities at the market price (e.g. subordinated debt). The fact that government finance was allocated in predetermined and limited amounts then guarantees that the external finance provided by the program is infra-marginal and unlikely to affect the marginal cost of financing of the bank. This is a crucial identification assumption that will be tested empirically in section IV.

B. Identification Strategy

To identify the effect of bank liquidity on bank outcomes the paper exploits the variation in banks' available external finance induced by the MYPES program. The relationship of interest, between the total resources available to finance investment and bank lending, is given by the following variation to the standard specification (I-1):

$$\ln L_{it} - \ln L_{it-1} = \alpha_i + \alpha_t + \beta_0 (\ln F_{it} - \ln F_{it-1}) + \mathbf{x}_{it} \gamma_1 + \varepsilon_{it} \quad (\text{II-1})$$

The variable of interest on the right hand side of the equation, F_{it} , represents all the sources of capital net of regulatory reserve requirements of bank i at month t (from now on, sources of capital).⁷ The test for financial constraints consists in estimating the sensitivity of bank lending to changes in sources of capital holding other determinants of the demand and supply of credit constant. The test is implemented by estimating β_0 through 2SLS using an exogenous source of variation in sources of capital. A positive estimate of this sensitivity, β_0 , will contradict the null hypothesis of no financial constraints.

The fundamental identification assumption of this test is that the source of variation in sources of capital is not correlated with changes in the marginal cost of capital or investment opportunities of the bank. There are several reasons why the *actual* amounts of finance received from the MYPES program may not constitute an exogenous source of variation in sources of capital in this setting. I discuss in turn each of these reasons and the potential biases they may introduce, and then describe the empirical strategy used to address them.

The Targeting Rule

External financing received by banks was conditional on banks expanding lending to the target group of borrowers. This raises the concern that unconstrained banks may have expanded lending in order to comply with the allocation rule and retain access to a subsidized source of finance in the future. I will provide arguments and show evidence contrary to this interpretation. Enforcement of targeting rules in directed lending programs is not attempted or ineffective in general. It is not attempted because the monitoring of directed lending programs has been shaped by the typical failure of these programs to spend the allocated budgets. The common practice is to set up administrative monitoring systems aimed at measuring budget execution performance (Barger (1998)). And it is ineffective because banks can exploit resource

fungibility. In a recent study of an on-lending program targeted to the export sector credit in Pakistan, Zia (2006) shows that 50% of the on-lending resources allocated to exporting firms are misallocated, in the sense that crowd out existing finance of the export sector and have no effect on output or productivity of the target sector.

The MYPES program was not an exception to these general features of on-lending programs. The government agency that was the sole responsible of monitoring the MYPES program execution monitored target firms' debt only *after* these received program financing. This means banks could re-label debt of existing eligible clients as 'program loans' to comply with the targeting rule and at the same time retain freedom to allocate resources to their preferred use. Figure 1 shows preliminary evidence that suggests such re-labeling took place in the case at hand. The figure shows the monthly evolution of total bank debt of a sample of firms that received credit labeled as 'program loans'. The horizontal axis measures the time relative to the date each firm received a program loan. The graph shows how receiving a program loan had no effect on the amount of debt a firm had from the program bank. Instead, program loans substituted dollar for dollar other preexisting debt of existing bank clients. Section IV provides additional and systematic evidence that the lending expansion was directed to firms that did not meet the targeting criteria.

Endogenous timing and Size of Program Waves

The second concern is that the government may have timed the program to coincide with periods when the banking sector was in need of additional liquidity, e.g. due to deposit shortages. In this case the estimate of β_0 will be biased downwards: the true effect of an additional dollar of external financing provided by the program on bank lending is attenuated by the concurrent effect of the drop in deposits. The pattern of yearly flows of program

financing observed in panel 1 of Figure 2 suggests that some program waves might have been timed to supply liquidity to the banking system during deposit shortages. The amount of financing provided to banks through the program peaked during 1995 and 1996, which coincide with the aftermath of the Tequila Crisis and a period of massive deposits drains from the Argentine banking system.

To deal with this issue I exploit the fact that there was a surge in program financing in 1999 that was unrelated to banking sector liquidity. The government was compelled by the IDB to finish spending resources allocated by the program during 1999. Compliance with this requirement was made necessary to qualify for future IDB funding. As a result, all the resources remaining in the MYPES budget were lent to banks in four waves from December 1998 through November 1999 (waves 9 through 12 in panel 2 of Figure 2). The four waves in rapid succession during the one year period were required to accommodate a contractual clause in the MYPES program. The clause established that resources had to be allocated in 12 installments, and only 8 had been used by mid 1998.

Using program financing provided during this ‘administrative rush’ period to estimate β_0 has two advantages that are corroborated in the results section. First, the timing and amount of the financing waves were unrelated to liquidity needs of the banking system during that period. In fact, total deposits grew steadily and outpaced output and lending throughout the entire period through 2001. And second, the program provides four shocks to bank sources of capital (net of reserve requirements) within a short period of time during which macroeconomic and banking sector conditions did not vary substantially. Thus, the preferred estimates of β_0 will be obtained using the final four waves of the program as a source of variation of bank sources of capital.

Endogenous Bank Self-selection

Since bank participation in the program was voluntary, it is likely that banks with tighter cash positions or better investment opportunities applied for program financing. The fact that only local banks applied for program financing is consistent with this possibility. Self selection into the program introduces a correlation between external financing provided by the program and bank lending behavior that would bias an estimate of the sensitivity of lending to liquidity using 2SLS in specification (II-1). A downward bias would result if banks chose to participate as a consequence of deposit withdrawals. An upward bias would result if banks self-selected to participate as a result of improved returns to lending.

The time series variation in the amount of resources allocated to different waves of the program, or wave size variation, provides a plausible exogenous determinant of bank participation in the program. In the Appendix, I provide a formal model of the participation decisions of banks to show that when program participation involves a fixed cost, an increase in the amount of resources in a wave will induce higher program participation rates. Moreover, an increase in wave size will induce a higher increase in the probability of participation among banks that receive a higher share of the wave resources according to the administrative allocation rule. Thus, the time series variation in wave size together with the cross sectional allocation rule induce time series and cross sectional variation in the participation decision of banks. These predictions are consistent with the participation patterns observed in the data. Figure 2 shows a substantial and positive time series correlation between the number of participating banks and amount of resources in a wave. Also, the average participating bank allocated more than twice of its loan portfolio in poor regions than non-participating banks

−15.4% versus 6.3%, and has an average loan size that is just 25% the average loan size of non-participating banks —\$76,000 versus \$318,000.

The previous argument provides the rationale for the following identification strategy to estimate β_0 : controlling for unobserved bank heterogeneity (bank fixed effects) and all period specific shocks to the banking system (month fixed effects), the non-linear interaction between wave size, and pre-program bank average loan size and fraction of lending in poor areas, provides a valid instrument for bank sources of capital. This non-linear interaction constitutes a valid instrument for sources of capital in (II-1) as long as it is uncorrelated to the time series variation of bank specific funding requirements, an assumption that is corroborated in the results section later.

The intuition behind the identification strategy can be conveyed through an analogy with a differences-in-differences estimation. A given increase in wave size induces a larger increase in the probability of participation among banks that receive a larger share of the wave. The effect of the expansion of available external finance can be estimated comparing the amount of lending across banks that receive high and low wave shares. Since the cross sectional variation in the shares is driven by pre-determined bank characteristics, the direct effect on outcomes is controlled for with bank fixed effects. And the month dummies control for any cyclical determinant of loan supply or demand that might be correlated with the time series variation in wave size. The coefficient of interest is estimated solely from the variation that results from banks switching in and out of the program due to changes in wave size.

C. Empirical Implementation

The empirical strategy exploits the theoretical prediction that the probability of participation in the program for any given bank is a function of the amount of financing the bank expects to

receive from the program, conditional on participation. Expected financing can be derived theoretically as a non-linear function of wave size, and the region and loan size scores, Z_{region} and Z_{size} , used by the program administrators to allocate resources in a wave across participating banks (see Appendix). The scores are time invariant, assigned according to loan size and regional distribution of the loan portfolios in 1995, and thus their direct cross sectional effect on bank lending is absorbed by the bank fixed effects.⁸ The strategy is implemented by using the *expected* amounts of financing each bank will receive at each moment in time as an instrument for bank sources of capital in (II-1).

Any non-linear interaction between wave size, s , Z_{region} and Z_{size} , would provide a valid instrument for changes in sources of capital. However, a two step procedure that first estimates the expected amount of financing and then uses the expected finance an instrument produces more precise estimates for β_0 (Wooldridge (2002)). All the results in the paper are shown using the two-step procedure, and in unreported results they are found to be robust to alternate functional form specifications for the instrument.

The expected amount of financing in each wave is obtained by first estimating a probability model of participation. The probability bank i participates in wave w of the program is a function of wave size (A_w), the region and loan size scores of bank i (Z_{region_i} , Z_{size_i}), and the scores of all other potential participants ($Z_{region_{-i}}$, $Z_{size_{-i}}$):

$$p_{iw} = \Pr[\eta_{iw} < A_w G(Z_{region_i}, Z_{size_i}, Z_{region_{-i}}, Z_{size_{-i}})] \quad (\text{II-2})$$

To estimate of the probability of participation, \hat{p}_{iw} , I assume that η is normally distributed, and that $G(\cdot)$ is a parametric function (2nd degree polynomial) of the region and size scores, normalized by the sum of the scores of all participating banks. Again, the empirical strategy is robust to these particular distributional and functional form assumptions.

The second step is to calculate the expected amounts of financing using the estimated probabilities of participation and the cross sectional allocation formula. Program administrators allocated the resources across banks in proportion to the ratio of their score points relative to the sum of the scores of all participating banks. That is, if A_w represents the amount of resources and n_w is the number of banks in a wave w , the amount of financing allocated to bank i , F_{iw} , is given by:

$$C_{iw} = A_w \left[\frac{Zregion_i}{2 \cdot \sum_j^{n_w} Zregion_j} + \frac{Zsize_i}{2 \cdot \sum_j^{n_w} Zsize_j} \right] \quad (\text{II-3})$$

The actual amount of program financing, C_{iw} , is a function on the sum of the region and size scores of the *actual* participating banks, which are endogenously self-selected. Instead I use the sum of the characteristics of all banks —participating and non-participating— weighted by the (exogenous) predicted probability of participation. Using this expected sum gives the expected financing to bank i conditional on participation in wave w :

$$\hat{C}_{iw} = A_w \left[\frac{Zregion_i}{2 \cdot \sum_j^N \hat{p}_{jw} Zregion_j} + \frac{Zsize_i}{2 \cdot \sum_j^N \hat{p}_{jw} Zsize_j} \right] \quad (\text{II-4})$$

Finally, the unconditional expected financing by wave is given by $\hat{p}_{iw} \hat{C}_{iw}$. The expected financing by month, \hat{C}_i , is calculated assuming, first, that banks drew the allocated program finance in equal parts during the three months following the date a wave begins; and second, that the principal was repaid in 36 equal monthly payments.⁹

III. Data Sources and Variable Definitions

The data for this paper is obtained from three sources. First, monthly balance sheets and earnings reports for all the banks in the Argentine financial system between January 1995 and December 2001. Each observation in this database consists of fully detailed financial statements for bank i at month t . The descriptive statistics of selected variables from the financial statements are shown in column 1 of Table I. Government owned banks are excluded from the sample. The average bank held \$1.1 billion in assets during the sample period. The cross sectional asset distribution is skewed due to the presence of large, foreign owned banks. Local banks hold above half of the total assets in the banking system and the average local bank has \$0.7 billion in assets (column 2 of Table I).

The second source of data is the Public Credit Registry database, or CDSF for its acronym in Spanish. Each observation in this database represents a loan or credit commitment j , issued to firm k by bank i at month t . I will use indicators i, j, k and t consistently along the paper to indicate bank, loans, firm, and months respectively. Both firms and banks have unique tax code identifiers that allow constructing a panel dataset, and also linking the CDSF data with the bank financial statements. The CDSF contains monthly data on all firms or individuals with more than \$50 of debt with a financial institution in Argentina. For every loan, the database includes debtor ID number, the issuing bank ID number, the principal outstanding, the amount and type of collateral posted and a code describing the repayment situation. The repayment situation code ranges from 1 to 6, where 1 represents a good standing loan and 5 and 6 represent defaulted loans. The categories are precisely defined in terms of the days behind in payment, debt refinancing and bankruptcy filings.¹⁰

The CDSF data is used to construct measures of the actual performance of all loans issued during the sample period. A loan originated at time t can be observed at time $t+T$ and its repayment status assessed. This assures that the performance measures are in fact linked to the incremental (marginal) investments of banks during the external finance shocks. Finally, it is important to note that the CDSF reports both loans and contingent credit lines, but these cannot be distinguished from each other in the data. Thus, firm level measures of debt will include all available credit. Bank level measures of lending will include both actual loans obtained from bank balance sheets, and total loans and commitments obtained from aggregating the CDSF data at the bank-month level.

The measurement of default rates is limited at 24 months after the loan is issued to avoid censoring due to data limitations (maximum $T=24$). The CDSF data is not available during 2002 and loans issued in December 1999 can be followed at most for 24 months. To check whether this limit introduces a substantial measurement error of default rates, I estimate the monthly hazard function of the default rate —the probability that a loan issued at month t defaults at month $t+T$, conditional on not having defaulted at $t+T-1$. The kernel estimation, plotted in Figure 3, is performed over the sub-sample of loans in the CDSF with at least three years of observable repayment history (issued between January and August 1998). The plot shows that the hazard rate peaks before 12 months, and the cumulative hazards indicate that 85% (45%) of the loans that default, do so within 24 (12) months of being issued. This indicates that the 24 month window allows measuring the default rate without a substantial measurement error.

Column 1 of Table II shows the descriptive statistics of all the loans and credit commitment expansions (from now on called loans for conciseness) issued between January 1998 and

December 1999. There were 750,526 loans issued to 222,146 firms and individuals. The average loan had a principal of \$16,691 and 12.3% of this principal was secured with collateral. Regarding loan performance, 16.8% of all the loans were defaulted within 24 months after being issued. Loan recipients had on average \$58,551 in bank debt, and 14.1% of the loans were issued to borrowers with some non-performing debt in their repayment histories.

The third source of data is the MYPES database, collected and managed by the Ministry of Economy in Argentina. This database is used to obtain information on the timing and size of the program waves used to estimate the expected financing instrument described in the empirical strategy section. The last two rows of Table I show the descriptive statistics of the expected financing variable in levels and as a proportion of loans outstanding. Expected external financing represents about 7.6% of the stock of loans of participating banks during the sample period. An unreported regression of actual program financing on expected program financing, bank and month fixed effects indicates that the coefficient on expected program financing is close to one and statistically significant. This indicates that the expected financing instrument is a good proxy for actual financing both in the time series and cross section, and that the cross sectional allocation rule was strictly enforced.

IV. Results

A. The Effect of Expected Program Financing on Sources of capital (First Stage)

The first empirical test of interest is one that shows that the expected external financing instrument has a significant and direct impact on bank sources of capital. This is a necessary condition for the 2SLS estimation of β_0 in specification (II-1), the main relationship of interest and the basis for the proposed test of financing frictions.

I estimate a regression of bank sources of capital on the expected external finance instrument, bank and month dummies and other controls. This regression corresponds to the first stage of the 2SLS estimation of (II-1) and is given by:

$$\ln F_{it} - \ln F_{it-1} = \alpha_i + \alpha_t + \varphi (\ln \hat{p}_{it} \hat{C}_{it} - \ln \hat{p}_{it-1} \hat{C}_{it-1}) + \mathbf{x}_{it}' \gamma_2 + \eta_{it} \quad (\text{IV-1})$$

Since most of the variables of interest considered in this paper are likely to have trends (loans, sources of capital), all specifications will present these variables in first differences. The remaining potential serial correlation will be accounted for non-parametrically by estimating standard errors in all specifications in the paper allowing for clustering at the bank level. All standard error estimation will be robust to heteroskedasticity. Month fixed effects (α_t) allow controlling for macroeconomic conditions affecting the demand or supply of bank credit that affect the entire cross section of banks in any given month. The inclusion of bank fixed effects (α_i) assure that all bank specific effects on outcomes are controlled for, since the results are derived from the within bank time series variation of available finance. Moreover, a bank fixed-effects specification with the variables in differences accounts for differential bank specific trends in all variables.

Intuitively, the parameters are estimated from the comparison of outcomes of bank i at time t , when the bank is more likely to receive external financing from the program, to outcomes of banks i at time $t-1$ and $t+1$, when external financing is less likely to become available. And the variation in the probability of receiving program financing is driven by wave size variation, which is plausibly uncorrelated with changes in the marginal cost of financing of the bank or investment opportunities. Thus, all the variation in bank outcomes that is observed as a result can be solely attributed to changes in the availability of external financing.

Panel 1 of Table III shows the results of the first stage estimation. The estimated φ is 0.068 (Std. Dev.=0.021), indicating there is a positive and significant relationship between expected external financing and bank sources of capital (column 1). The only determinants of bank sources of capital that are not accounted for in (IV-1) are time varying bank specific shocks. These bank specific shocks can be due to, for example, the exposure of individual bank loan portfolios to industry or regional shocks. The inclusion of a wide range of time varying bank controls to the first stage regression —lagged log of assets, deposits, cash flows, and net income (\mathbf{x}_{it})— does not affect either the significance or the magnitude of the point estimate of φ (column 2). This implies that expected financing instrument is uncorrelated to the excluded, and potentially endogenous variables.

To verify that the observed correlation is driven by economy-wide factors affecting the lending behavior of all banks, I check that the expected financing instrument is a good predictor of changes in sources of capital *only for banks that are likely to receive program financing*. Columns 3 and 4 of Table III report the estimated φ in the subsamples of banks that have high and low average predicted probability of participation in the program, \hat{p} . Changes in expected external financing have a positive and significant effect on the sources of capital of banks with a high probability of participation in the program, and no effect on low-probability of participation banks. This confirms that the correlation observed in column 1 is not driven by aggregate factors beyond those captured by the month fixed effects.

Given the average sources of capital, expected external finance and predicted probability of participation of banks in the sample, the point estimate of φ implies that on average bank sources of capital increased by \$1 for every dollar of program financing received. The first stage results taken together indicate that changes in expected external financing had an exogenous

and strong influence on the financial position of banks. I exploit this fact next to test for financing constraints.

B. Financing Frictions Test: Sensitivity of Lending to Available External Finance

Baseline Results

I use specification (II-1) to obtain the 2SLS estimate of the sensitivity of bank loans to changes in sources of capital, β_0 , exploiting expected program financing as source of variation in the amount of external financing available to banks. Under the null hypothesis of no financial constraints β_0 is equal to zero: optimal bank investment is independent of the financial position of the bank when finance is frictionless. Panel 1 of Table IV shows the OLS and 2SLS estimates of β_0 for different samples and specifications. The first two columns present the estimates using the entire sample period between 1995 and 2000, and estimates in columns 3 and 4 use the sample period reduced to include only the final four waves of the program (1998-2000). The 2SLS estimate of β_0 is positive and significant in both samples. The positive estimate implies that changes in the availability of external financing to banks affect lending, and that the null hypothesis of no financing frictions is rejected.¹¹

The estimate of β_0 using the last four waves of the program (0.745 with Std. Dev. 0.139) is significantly larger than the estimate using the entire sample (0.474 with std. dev. 0.260). As indicated in section II, the availability of program finance during the initial waves of the program was potentially correlated with negative shocks to deposits to the banking system. Such a correlation can produce the downward bias of the 2SLS estimate of the sensitivity of lending to changes in external financing in the full sample. Because the timing of the final four waves was driven by the ‘administrative rush’, the changes in sources of capital induced by these

waves were plausibly uncorrelated with bank liquidity needs. In what follows, the preferred estimates based on the 1998 through 2000 sample period will be reported.¹²

The preferred estimate of β_0 using the reduced sample implies a substantial lending response to an exogenous change in external financing: an elasticity of 0.745 suggests that loans increase by \$0.66 for every dollar of additional external financing, calculated at the average loans and sources of capital in the sample. The impact on total credit is larger when commitments are also considered. The estimated β_0 using the log of loans plus commitments as the dependent variable (0.65 with Std. Dev. 0.27, shown in panel 2 of Table IV), implies an expansion of \$0.90 in total loans and commitments per dollar of additional financing. The results indicate that the magnitude of the lending response is substantial, and considerably underestimated when the endogeneity of the variation in sources of capital is not accounted for.

Ex-Ante Measures of Constraints

Ex-ante observable bank characteristics can be correlated in the cross section with financing constraints. Bank size and the equity to capital ratio have been used in previous empirical research on the lending channel as proxies for access to financing. The rationale is that asymmetric information issues that increase the cost of external finance may be more severe among smaller banks and banks with less equity capital. I test whether observable bank characteristics are correlated with the sensitivity of the supply of credit to external finance using the following specification:

$$\ln L_{it} - \ln L_{it-1} = \alpha_i + \alpha_t + \beta_0 (\ln F_{it} - \ln F_{it-1}) + \beta_0^C (\ln F_{it} - \ln F_{it-1}) \text{ConstrainedBank}_i + \varepsilon_{it} \quad (\text{IV-2})$$

In this variation of specification (II-1), ConstrainedBank_i is a dummy equal to one if a bank is constrained according to bank size or capitalization (lowest quartile of the asset and equity to capital ratio distributions respectively), depending on the specification. The parameter of the

interaction term, β_0^C , represents the difference in the sensitivity of lending to external finance of the sub-set of constrained banks relative to the unconstrained ones.

The estimated β_0^C is positive in all specifications (columns 5 through 6 of Table IV), which indicates that smaller and less capitalized banks exhibit a larger sensitivity of lending to an expansion in external finance as expected. The measured interaction coefficient is significant only in specifications where the dependent variable also includes commitments (panel 2). This result seems to suggest that the use of balance sheet data may lead to underestimate the cross sectional variation in the supply of credit.

Lagged Effects on the Supply of Credit

The baseline results suggest that changes in the availability of external finance will have a strong immediate impact on the supply of credit of constrained banks. The estimated coefficient β_0 measures the elasticity of bank loans to contemporaneous changes in sources of capital due to the expansion in external financing. This measurement may underestimate the total effect on the supply of credit if an expansion in available finance has a lagged impact on lending. A lagged effect may occur, for example, if the process of finding suitable lending projects and screening loan applications is time consuming, or if contemporaneous expansions in lending induce an expansion in future bank deposits from the banks clients.

This hypothesis can be tested by estimating specification (II-1) including lagged changes in sources of capital:

$$\begin{aligned} \ln L_{it} - \ln L_{it-1} = & \alpha_i + \alpha_t + \beta_0(\ln F_{it} - \ln F_{it-1}) + \\ & + \beta_1(\ln F_{it-1} - \ln F_{i(t-1)-1}) + \beta_2(\ln F_{it-2} - \ln F_{i(t-2)-1}) + \dots + \beta_T(\ln F_{it-T} - \ln F_{i(t-24)-1}) + \varepsilon_{it} \end{aligned} \quad (\text{IV-3})$$

A coefficient for the sensitivity of lending T months after the change in sources of capital, β_T , can be estimated using as instrument the expected external financing variable lagged T

months, $\hat{\rho}_{i-T} \hat{C}_{i-T}$. Intuitively, this elasticity would measure the marginal sensitivity of bank loans at time t induced by an expansion in external financing occurred at $t-T$. The cumulative percentage impact of a change in sources of capital on lending after s periods can be estimated by adding the lagged elasticities β_1 through β_s . Cumulative elasticities represent the total percentage increase in lending at time $t+s$ relative to loans at time t , as a proportion of a percentage point increase in sources of capital at time t . Table V shows the estimated marginal and cumulative effects, standard errors and significance levels for up to 24 months (shown only for each quarter for conciseness). The marginal effect with zero lags corresponds to the contemporaneous elasticity reported in the baseline results.

The estimates confirm that an expansion in external financing has a positive and significant instantaneous effect on lending. The result also indicate that there is an additional incremental effect up to around three months after the expansion. The point estimate of β_3 in column 1 (0.48, significant at 17% confidence) implies that lending expands by an additional \$0.42 at month $t+3$ for each dollar of external financing received at t . The estimated cumulative effects are all positive and remain significant up to 21 months after the expansion in available financing (columns 3 and 4). The average cumulative elasticity throughout the two year period is 1.3, which implies that total lending expanded on average by more than \$1.2 per dollar of additional external finance.

The results taken together suggest that an expansion in the availability of finance will have a substantial positive effect on the supply of credit of constrained banks. The lending response is quick: the bulk of the credit supply response occurs within one quarter of the shock to available finance. The lending response is also persistent and involves a multiplier effect, in the sense that total lending increases more than dollar for dollar with the expansion of available funds.¹³

C. Underinvestment or Free Cash Flows?

I previously argued that the effects of financing frictions faced by banks on the efficiency of investment are theoretically ambiguous. Limited financing may prevent empire-building bank managers from over investing, in which case an exogenous expansion in external financing would lead banks to pursue unprofitable investments. On the other hand, financial constraints may be inefficient in the sense that they prevent banks from investing in profitable loans. Distinguishing between the two hypotheses requires measuring the profitability of the marginal loans during credit expansions. I focus on two components of loan profitability: probability of default and interest revenue. I first use the loan level data to look at whether loans issued during the lending expansion are significantly riskier (more likely to default) than loans issued in other periods by the same banks. Then I check whether bank interest revenue changes during the lending expansions. Under the free cash flow interpretation, marginal loans should be riskier and/or have lower return, when banks expand the supply of credit.¹⁴

The effect of the lending expansion on default rates is measured using the following specification:

$$DefaultT_{ijt} = \alpha_i + \alpha_t + \alpha_s + \psi_T(\ln F_{it} - \ln F_{it-t}) + \omega_{ijt} \quad (IV-4)$$

Each observation represents a loan j issued by bank i at time t . $DefaultT_{ijt}$ is a dummy equal to one if loan j defaults between t and $t+T$, where T is set to 12 or 24 months. As before, F_{it} represents sources of capital and coefficient of interest, ψ_T , is estimated through 2SLS using expected external finance, $\hat{p}_{iw}\hat{F}_{iw}$, as an instrument. Thus, ψ_T measures the change in the average default rate of loans issued during lending expansions. The estimated effects of a loan expansion on loan default rates, shown in panel 1 of Table VI, are not statistically different from zero ($\psi_{12}=0.0007$ and $\psi_{24}=-0.0005$). Loans issued during external finance expansions are

neither more likely to default nor more likely to default earlier than loans issued in other periods.

Using interest revenue data from bank income statements I repeat the estimation of the previous subsection using as dependent variable a measure of bank interest revenues or profits scaled by the amount of loans outstanding of bank i at month t .

$$\text{Interest Revenue}_{it}/\text{Loans}_{it} = \alpha_i + \alpha_t + \gamma(\ln F_{it} - \ln F_{it-1}) + \omega_{it} \quad (\text{IV-5})$$

The coefficient of interest, γ , measures the change in interest revenue per dollar of lending during credit supply expansions. The estimated coefficient is small and statistically indistinguishable from zero (column 3 of Table VI), which indicates that there is no change in interest revenue per dollar of loan during credit expansions. Together with the result on default rates, the evidence indicates that the marginal profitability of loans did not decline during credit expansions. This is inconsistent with the free cash flows hypothesis, where constraints are in place to prevent bank management from undertaking unprofitable investments.

Focusing on risk and interest revenue proxies can potentially underestimate the true effect of the lending expansion on profitability, especially for new borrowers. In Petersen and Rajan (1995) banks may accept short term losses when lending to new borrowers in order to obtain informational rents later in the relationship. Such underestimation is not a concern for the purposes of this paper because it reinforces the argument that the profitability of lending did not decline during lending expansions. Still, I verify that the above results hold in the subsample of borrowers with a pre-existing relationship with the bank, among which the bias is less likely (Panel 2 of Table VI). The results are confirmed: marginal loans to existing bank borrowers issued during lending expansions are not more likely to default.

A potential concern with the previous results is that the power of the tests is insufficient to find a significant effect on defaults rates or interest revenue. However, a standard error of ψ_{12} in the default equation of 0.0015 would allow detecting an increase in the probability of default of 0.1 percentage points at a 1% confidence level. The test can rule out a substantial range of interest rate increases, considering that the average expected financing increase was around 7% of loans. Further, the interest revenue test obtains significant estimates of γ in specifications where the predictions are theoretically unambiguous. For example, an increase in inframarginal subsidized financing increases the profitability of lending regardless of whether banks are constrained or not. Consistent with this prediction, the estimate of γ in specification (IV-4) is positive and significant when interest revenue net of financial expenses is used as the dependent variable (column 4 of Table VI).

D. A Test of Financially Constrained Borrowers

The results so far indicate that shocks to the ability of banks to raise external finance can have a substantial impact on the supply of credit by local constrained banks. This section addresses the empirical question of whether these shocks will affect the aggregate supply of credit. The answer will depend on the ability of borrowers from local banks to tap alternate sources of capital when their main lenders are constrained. This is indeed a possibility in a financial system characterized by the presence of large, foreign and plausibly unconstrained banks that can supply capital. However, recent empirical evidence from emerging markets suggests that foreign banks shy away from lending to informationally opaque firms, which tend to borrow from local banks (Mian (2006)).

I address this question by testing the following empirical prediction: if borrowers are unconstrained, an improvement in the financial position of their lenders should not affect the

amount of finance available to them. I look at whether borrowers' total bank credit increases when their lender institutions experience an expansion in external financing with the following specification:

$$\ln(Debt_{kt}) - \ln(Debt_{kt-1}) = \alpha_k + \alpha_t + \varrho^F (\ln F_{kt}^F - \ln F_{kt-1}^F) + v_{kt} \quad (\text{IV-6})$$

Each observation corresponds to a firm k at time t in the sample period and $Debt_{kt}$ is the total bank debt of firm k aggregated across all banks at t . The independent variable of interest is the change in bank sources of capital averaged across all lenders of firm k at time t . It is instrumented with the change in log expected external finance, $\hat{p}_{kt} \hat{C}_{kt}$ also averaged across all lenders. α_k and α_t are firms and month fixed effects. The parameter ϱ^F represents the sensitivity of firm k 's total bank debt to a shock to the external finance of any of firm k 's lenders', controlling for all time invariant firm characteristics. The estimated sensitivity of the amount of bank finance of a firm to an increase in available external finance to a lender is positive and significant (column 1 of Table VII). The estimated coefficient indicates that a 1% increase in bank external finance leads to an average expansion of debt across borrowers of 0.3%. The point estimate is consistent with previous results: it implies that an increase in \$1 of external finance leads to an expansion of \$0.73 in aggregate bank credits to firms.¹⁵

The firm level specification has two potential caveats. First, the standard error estimation does not allow for clustering at the bank level which leads to underestimate their magnitude. And second, if firm investment opportunities are time varying and banks lend to firms with better investment opportunities, the estimated ϱ^F will have an upward bias. To address these issues I look in loan level specification at whether the amount of debt of firm k from bank i that receives an external financing shock, increases relative to the amount borrowed by the *same* firm k from other financial institutions:

$$\begin{aligned} \ln(\text{Debt}_{ikt}) - \ln(\text{Debt}_{ikt-1}) = & \alpha_k + \alpha_i + \alpha_t + \rho^L (\ln F_{ikt} - \ln F_{ikt-1}) + \\ & + \chi (\ln(\text{Debt}_{-ikt}) - \ln(\text{Debt}_{-ikt-1})) + v_{ikt} \end{aligned} \quad (\text{IV-7})$$

Each observation in this specification is a bank-borrower-month cell (sub indexes i , k and t). The dependent variable is the change in log debt of firm k with bank i at month t , and the independent variable of interest is the change in sources of capital of bank i (instrumented with the log change in expected finance of bank i). The added control is the total debt of the same firm k at time t with all banks other than i (denoted by the subindex $-i$). The specification includes firm, bank and month dummies and standard errors are calculated allowing for clustering at the bank level. Also, controlling for the growth of debt with other banks requires reducing the sample of firms to those that borrow from more than one bank. The parameter of interest, labeled ρ^L to denote the loan level specification, represents the sensitivity of the amount of debt of borrower k from lender i , to changes in lender i 's external finance. The estimated sensitivity is positive and not statistically distinguishable from the firm level one (column 4 of Table VII). The point estimate is slightly larger, but this is entirely driven by the fact that the estimation is performed over a different sample of firms, with multiple bank relationships (columns 2 and 3 report the loan level estimates for the full and reduced samples without the other bank debt control). The results corroborate that shocks to a bank's financial position affect the available credit to its borrowers even after controlling for firm investment opportunities.

These results overall suggest that borrowers from constrained banks were also constrained before the lending expansion. Holding firm investment opportunities and interest rates constant, borrowers expanded the amount of bank debt when their lenders' external financing increased. This behavior violates of the MM proposition for firms, and is consistent with

borrowers being credit rationed before the external finance shock to the banks. The overall evidence suggests that financial constraints at the bank level can result in financing constraints at the firm level, and that shocks to the financial position of banks will affect the aggregate availability of credit and the financial position of their borrowers.

E. Testing the Identifying Assumptions

The interpretation of the results so far has led to the conclusion that banks are financially constrained. This interpretation rests upon the assumption that the external financing provided by the program was uncorrelated with changes in the marginal cost of financing or the investment opportunities of the bank. It also implies that the targeting restrictions imposed by the program did not have a direct effect on the lending behavior of the banks. This final subsection provides additional evidence that corroborates these assumptions.

Changes in the Risk Profile of Banks

An identification assumption throughout the paper is that the external financing provided by the program was inframarginal, in the sense that the marginal cost of finance of the banks was unaffected by the program. This is a necessary condition for the validity of the financing frictions test. This assumption can be tested empirically by looking at how proxies for the risk profile of the bank and its marginal cost of capital change when banks receive program financing. Two such proxies are the overnight interbank interest rate and the interest rate on subordinated debt (see Ashcraft and Bleakley (2005) for evidence that federal funds market rates reflect bank creditworthiness).

The estimated coefficients of a regression of changes in interest rates on changes in external financing provided by the program (actual and expected), bank and month fixed effects are shown in Table VIII. The point estimates of the sensitivity of both interest rates to actual

program finance are negative, which is consistent with a decline in the risk profile of the bank when additional external finance became available. However, the estimated sensitivities are not statistically significant and they switch sign when interest rates are regressed on expected financing. These results are consistent with the hypothesis that program financing did not significantly affect the risk profile of banks. Thus, the observed sensitivity of lending to program financing is unlikely to be driven by changes in the marginal cost of capital of the bank.

Liquidity Shocks and Investment Opportunities

Another important identifying assumption underlying the financial constraints test is that expected program financing was uncorrelated with other sources of changes in bank liquidity and with changes in bank investment opportunities. The previous section already showed that there is an expansion in firm borrowing holding constant firm investment opportunities. Additional evidence can be drawn from looking at the correlation between expected external financing and proxies for bank liquidity needs and investment opportunities. I use lagged changes in bank deposits and lagged bank cash flows respectively. A decline in bank deposits or cash flows will reduce bank liquidity and can be correlated expectations of the banks' investment prospects (Alti (2003), Kaplan and Zingales (1997), Moyen (2004)).¹⁶

Table IX shows the estimated coefficients of a regression of program finance, actual and expected, on lagged changes in deposits, lagged cash flows, and bank and month fixed effects. One would expect actual program financing to be negatively (positively) correlated with past deposits and cash flows if bank participation in the program responded, at least in part, to short term liquidity shortages (investment opportunities). Column 1 shows that actual program financing was negatively and significantly correlated with lagged shocks to deposits, which

suggests that program participation was potentially induced by liquidity shortages. A similar correlation does not exist with the expected program financing variable (columns 2 and 3 of Table IX), neither within the sample of banks that participated in the program or in the entire sample of banks. Expected financing is not significantly related to the proxies of either liquidity shocks or changes in investment opportunities. These results corroborate that the expected program financing variable is a suitable candidate as an instrument for bank sources of capital.

Targeting Requirements of the Program

The program rules required banks to use the program resources to extend new loans to small enterprises. A potential alternative interpretation of the results of the paper is that banks expanded lending in order to comply with the program rules and secure access to cheap funding from future waves of the program. Figure 1 showed some preliminary evidence that banks could exploit the fungibility of resources to comply with the allocation rule and at the same time allocate the additional funds without restrictions. This was accomplished by crowding-out or re-labeling existing loans of bank clients that met the targeting criteria (firms with less than \$200,000 in annual sales and 20 workers).

This subsection provides additional evidence that the allocation rule was not binding. First, the lending expansion that resulted from the increase in available external finance was mostly allocated to firms that were not eligible to the program. This can be shown by estimating the within firm specification (IV-7) over two subsamples of firms: eligible and non-eligible to the MYPES program.¹⁷ If the targeting rule were binding, one would expect the external financing shock to affect the amount of borrowing of eligible firms, and be zero otherwise. On the contrary, the results in Table VII (columns 5 and 6) show that the observed total expansion in

borrower bank debt comes solely from firms that are not eligible to the program. The impact on eligible firms is not statistically significant.

I finally test whether the time series pattern of lending expansions is consistent with the potential incentives provided by regulatory oversight. One would expect that the incentives to expand lending to secure future finance will decline as the program nears an end. As a result, the magnitude of the lending expansion should decline during the last waves of the program. I test this prediction by estimating specification (IV-7) over two periods, before and after July 1999. The first period includes waves 10 and 11 of the program, and the second one includes the last two waves. The estimated coefficients in each period, not included in the tables for succinctness, are 0.0025 and 0.0028 and statistically indistinguishable at the 1% confidence level. This implies that the magnitude of effect of the expansion in available external finance on firm debt did not vary significantly as the program drew to an end. This result does not support the hypothesis that the lending expansion was driven by regulatory oversight.

V. Conclusions

This paper shows empirically that local banks in emerging markets are subject to financial constraints that prevent them from undertaking profitable lending opportunities. These lending opportunities are not arbitrated by other competing lenders, even in an environment where close to 50% of the assets of the banking system is held by large multinational banks. The results imply that financing frictions of financial intermediaries will affect the aggregate supply of credit and investment.

A natural question that arises from the results in this paper is what prevents borrowers of constrained banks from seeking funding from unconstrained institutions. Theory suggests that

switching sources of finance is costly due to the private information that lenders hold about their borrowers' creditworthiness. Such private information creates a hold-up problem that makes competing banks reluctant to lend to borrowers that are switching lenders, and when they do, these borrowers tend to be *lemons*. Consistent with these predictions, additional results not shown in the paper indicate that less than 6% of the loans issued to new borrowers during 1999 went to borrowers that were switching from another financial institution. And the loans issued to these switching borrowers were more likely to default than other new loans, even after controlling for borrower characteristics.

Another important question that arises from the paper is whether the results can be generalizable to other empirical contexts. The early adoption of Basel II recommendations by the regulatory authorities, the openness to foreign investment in the banking sector, and the privatization of most of the government owned financial institutions make the Argentine economic and institutional environment a peculiar one. But it also provides a natural experimentation ground to learn about empirical banking issues in emerging markets, given the worldwide trends towards adoption of Basle II, the internationalization and privatization of the banking sectors in these markets. Moreover, the empirical strategy employed in the paper exploits a source of variation in the supply of bank credit that is widely available in other settings. Thus, replicating the methodology to learn about the extent of bank financing constraints and their effects on investment in other contexts should be a feasible and fruitful area for future research.

Appendix: A Model of Program Participation

The stylized facts on participation and wave size can be formalized in a simple model of bank participation with fixed costs and private information. Suppose N banks are deciding at time $t=0$ whether or not to participate in program wave w of size A_w . For now assume all banks are equal except for their cost of participation, η_i , which is private information and that if n banks participate, each will receive an equal share of the resources in the wave at time $t=1$. The only cost of the program is the participation cost, such that if bank i participates in a wave with $n-1$ other banks, it will make profits of $A_w/n - \eta_{iw}$. Profits at time 1 are a function of the number of banks that participate, which is unknown at time 0 when the participation decision is made. All banks know at time zero is the common knowledge p.d.f. from where the participation costs are drawn, $f(\eta)$. All banks are risk neutral, such that a bank will participate in a program wave when expected profits are positive.

This setup is equivalent to a private value auction and the solution can be described by a cutoff rule: bank i participates if $\eta_{iw} < \eta_w^*$. That is, banks will participate in the program if their participation cost at time zero is below a threshold value η_w^* , and will not participate otherwise. The probability any bank i participates in the program is given by:

$$p_w = \int_0^{\eta_w^*} f(\eta) d\eta \quad (\text{A1})$$

and expected profits of bank i in wave w are:

$$E(\pi_{iw}) = A_w \sum_{j=0}^{N-1} \left[\frac{1}{1+j} p_w^{j+1} (1-p_w)^{N-(j+1)} \binom{N-1}{j} \right] - \eta_{iw} \quad (\text{A2})$$

The sum term represents the expected fraction of the resources in a wave that each bank receives. The interpretation of the first two terms in the sum term is straightforward: bank i receives a share $1/(1+j)$ of the resources in a wave when j other banks participate, which

happens with probability $p_w^{(j+1)}(1-p_w)^{N-(j+1)}$. The last term of the sum represents the number of potential combinations of j banks that may participate out of $N-1$ potential candidates.

Finally, the cutoff η_w^* is determined by the value of η that makes the expected profit of participation in (A2) equal to zero. This participation threshold is the same for all banks given the symmetry assumptions made so far. Substituting η_w^* into (A1) gives an implicit expression for the probability of participation:

$$p_w = \Pr \left[\eta < A_w \left[\sum_{j=0}^{N-1} \frac{1}{1+j} p_w^{j+1} (1-p_w)^{N-(j+1)} \binom{N-1}{j} \right] \right] \quad (\text{A3})$$

The probability of participation p_w is an increasing function of wave size A_w , which is consistent with the positive correlation between wave size and number of participating banks observed in the data.

The model can be modified to allow the probability of participation to vary across banks. I assume that the resources in a wave are distributed according to the actual formula used to allocate program resources (II-3). Each bank receives a fraction of the resources available in the wave that is proportional to the ratio of their score points ($Z_{region_{-i}}, Z_{size_{-i}}$) relative to the sum of the scores of all participating banks. Each bank will now have a different participation threshold, η_{iw}^* , and a different probability of participation, p_{iw} . The expression for the expected profits of bank i of participating in wave w can be summarized as:

$$E(\pi_{iw}) = A_w G(Z_{region_{iw}}, Z_{size_{iw}}, Z_{region_{-iw}}, Z_{size_{-iw}}) - \eta_{iw} \quad (\text{A3})$$

The function $G(\cdot)$ is the expression for the expected fraction of resources in a wave assigned to bank i . It is the equivalent of the sum term in (A2) but it is now a function of bank i 's region and size scores, and the rest of the potential participant bank's region and size scores. The key feature of this function is that it is increasing in the point scores of bank i . Thus, banks with a

higher region and size point scores will be more likely to participate in the program for a given wave size.

References

- Allen, Franklin, and Douglas Gale, 2004, Financial Intermediaries and Markets, *Econometrica* 72, 1023-1061.
- Alti, Aydogan, 2003, How Sensitive Is Investment to Cash Flow When Financing Is Frictionless?, *The Journal of Finance* 58.
- Ashcraft, Adam, 2006, New Evidence on the Lending Channel, *Journal of Money, Credit and Banking* 38.
- Ashcraft, Adam, and Hoyt Bleakley, 2005, On the Market Discipline of Informationally Opaque Firms: Evidence from Bank Borrowers in the Federal Funds Market, mimeo.
- Barger, Teresa, 1998, Financial Institutions, World Bank Lessons of Experience (International Finance Corporation - World Bank, Washington).
- Berger, Allen, Leora Klapper, Margaret Miller, and Gregory Udell, 2003, Relationship Lending in Argentine Small Business Credit Market, in Margaret Miller, ed.: *Credit Reporting Systems and the International Economy* (The MIT Press, Cambridge, Massachusetts).
- Bernanke, Ben, 1983, Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression, *American Economic Review* 73, 257-76.
- Bernanke, Ben, and Alan Blinder, 1988, Credit, Money, and Aggregate Demand, *American Economic Review* 78, 435-9.
- Bernanke, Ben, and Mark Gertler, 1989, Agency Costs, Net Worth, and Business Fluctuations, *American Economic Review* 79, 14-31.
- Bernanke, Ben, and Mark Gertler, 1995, Inside the Black Box: The Credit Channel of Monetary Policy Transmission, *The Journal of Economic Perspectives* 9, 27-48.

Bharath, Sreedhar, Sandeep Dahiya, Anthony Saunders, and Anand Srinivasan, 2006, So what do I get? The bank's view of lending relationships, *Journal of Financial Economics* forthcoming.

Blanchard, Olivier, F. Lopez-de-Silanes, and Andrei Shleifer, 1994, What do Firms do with Cash Windfalls?" *Journal of Financial Economics* 36, 337-360.

Bratanovic, Brajovic, 2002, Financial Intermediary Operations Overview, from http://info.worldbank.org/etools/docs/library/154927/financeforum2002/pdf/brajovic_fioperation.ppt (World Bank).

Calomiris, Charles, and Joseph Mason, 2003, Consequences of Bank Distress During the Great Depression, *American Economic Review* 93, 937-47.

Calomiris, Charles, and Andrew Powell, 2000, Can Emerging Market Bank Regulators Establish Credible Discipline? The Case of Argentina, 1992-1999, NBER Working Papers.

Chava, Sudheer, and Amiyatosh Purnanandam, 2006, The Effect of Banking Crisis on Bank-Dependent Borrowers, mimeo.

Diamond, Douglas, and Raghuram Rajan, 2000, A Theory of Bank Capital, *The Journal of Finance* 55, 2431-65.

Diamond, Douglas, and Raghuram Rajan, 2001, Liquidity Risk, Liquidity Creation and Financial Fragility: A Theory of Banking, *The Journal of Political Economy* 109, 287.

Erickson, Timothy, and Toni Whited, 2000, Measurement Error and the Relationship between Investment and "q", *The Journal of Political Economy* 108, 1027-57.

Escude, Guillermo, Tamara Burdisso, Marcelo Catena, Laura D'Amato, George McCandless, and Tomas Murphy, 2001, Las MIPyMES y el mercado de crédito en la Argentina, Documento de trabajo 15 (Banco Central de la República Argentina, Buenos Aires).

- Fazzari, S. M., Glenn Hubbard, and B.C. Petersen, 1988, Financing Constraints and Corporate Investment, *Brookings Papers on Economic Activity* 141-195.
- Gan, Jie, 2006, The Real Effects of Asset Market Bubbles: Loan and Firm Level Evidence of a Lending Channel, mimeo.
- Gatev, Evan, and Philip Strahan, 2006, Banks' Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market, *The Journal of Finance* 61, 867-92.
- Gomes, Joao, 2001, Financing Investment, *American Economic Review* 91, 1263-85.
- Gormley, Todd, 2006, Banking Competition in Developing Countries: Does Foreign Bank Entry Improve Credit Access?, mimeo, Washington University.
- Hart, Oliver, and John Moore, 1995, Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management, *American Economic Review* 85, 567-85.
- Holmstrom, Bengt, and Jean Tirole, 1997, Financial Intermediation, Loanable Funds and the Real Sector, *The Quarterly Journal of Economics* 112, 663-91.
- Hubbard, Glenn, 1995, Is there a Credit Channel of Monetary Policy?, *Federal Reserve Bank of St. Louis Review* 77, 63-77.
- Hubbard, Glenn, Kenneth Kuttner, and Darius Palia, 2002, Are there Bank Effects in Borrowers' Cost of Funds? Evidence from a Matched Sample of Borrowers and Banks, *Journal of Business* 74.
- IMF, 2005, Staff Report for the 2005 Article IV Consultation, from <http://www.imf.org/external/pubs/ft/scr/2005/cr05236.pdf> (IMF).
- Jayarathne, Jith, and Donald Morgan, 2000, Financial Market Frictions and Deposit Constraints at Banks, *Journal of Money, Credit and Banking* 32, 74-92.

- Jensen, Michael, 1986, Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers, *American Economic Review* 76, 323-29.
- Kaplan, Steven, and Luigi Zingales, 1997, Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?, *The Quarterly Journal of Economics* 112, 169-216.
- Kaplan, Steven, and Luigi Zingales, 2000, Investment-cash Flow Sensitivity are not Valid Measures of Financial Constraints, *The Quarterly Journal of Economics* 115, 707-712.
- Kashyap, Anil, Owen Lamont, and Jeremy Stein, 1994, Credit Conditions and the Cyclical Behavior of Inventories, *The Quarterly Journal of Economics* 109, 565-592.
- Kashyap, Anil, Raghuram Rajan, and Jeremy Stein, 2002, Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking, *The Journal of Finance* 57.
- Kashyap, Anil, and Jeremy Stein, 2000, What do One Million Observations on Banks Have to Say About the Transmission of Monetary Policy, *American Economic Review* 90, 407-428.
- Kashyap, Anil, Jeremy Stein, and David Wilcox, 1993, Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance, *American Economic Review* 83, 78-98.
- Khwaja, Asim, and Atif Mian, 2005, Tracing the Impact of Bank Liquidity Shocks, mimeo.
- Kishan, Ruby, and Timothy Opiela, 2000, Bank Size, Bank Capital, and the Bank Lending Channel, *Journal of Money, Credit and Banking* 32, 121.
- Krueger, Anne, 2002, Crisis Prevention and Resolution: Lessons from Argentina, from *Conference on the Argentina Crisis*

<http://www.imf.org/external/np/speeches/2002/071702.htm> (IMF and NBER, Cambridge).

La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer, 2002, Government Ownership of Banks, *The Journal of Finance* 57, 265-301.

Lamont, Owen, 1997, Cash Flows and Investment: Evidence from Internal Capital Markets, *Journal of Finance* 51, 83-109.

Mian, Atif, 2006, Distance Constraints: The Limits of Foreign Lending in Poor Economies, *The Journal of Finance* 61, 1465-1505.

Mishkin, Frederic, 2000, Prudential Supervision: Why is it Important and What are the Issues?, NBER Working Paper.

Mishkin, Frederic, 2001, Financial Policies and the Prevention of Financial Crises in Emerging Market Countries, NBER Working Paper.

Mishkin, Frederic, 2006. *The Next Great Globalization: How Disadvantaged Nations Can Harness their Financial Systems to Get Rich* (Princeton University Press).

Modigliani, Franco, and Merton Miller, 1958, The Cost of Capital, Corporation Finance, and the Theory of Investment, *American Economic Review* 48, 261-297.

Moyen, Natalie, 2004, Investment-Cash Flow Sensitivities: Constrained versus Unconstrained Firms, *The Journal of Finance* 59, 2061-92.

Myers, S., and N. Majluf, 1984, Corporate Financing and Investment Decisions when Firms have Information that Investors do not Have, *Journal of Financial Economics* 13, 187-222.

Ostergaard, Charlotte, 2001, External Financing Costs and Bank's Loan Supply: Does the Structure of the Bank Sector Matter?, (Norwegian School of Management, mimeo).

- Peek, Joe, and Eric Rosengren, 1997, The International Transmission of Financial Shock, *American Economic Review* 87, 495-505.
- Peek, Joe, and Eric Rosengren, 2000, Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States, *American Economic Review* 90, 30-45.
- Petersen, Mitchell, and Raghuram Rajan, 1995, The Effect of Credit Market Competition on Lending Relationships, *Quarterly Journal of Economics* 110, 407-443.
- Poterba, James, 1988, Comment: Financing Constraints and Corporate Investment, *Brookings Papers on Economic Activity* 1, 200-6.
- Rauh, Josh, 2006, Investment and Financing Constraints: Evidence from the Funding of Corporate Pension Plans, *The Journal of Finance*.
- Sharpe, Steven, 1995, Bank Capitalization, Regulation, and the Credit Crunch: A Critical Review of the Research Findings, Board of Governors of the Federal Reserve System Finance and Economics Discussion Series.
- Stein, Jeremy, 1997, Internal Capital Markets and the Competition for Corporate Resources, *The Journal of Finance* 52, 111-133.
- Stein, Jeremy, 1998, An Adverse Selection Model of Bank Asset and Liability Management with Implications for the Transmission of Monetary Policy, *RAND Journal of Economics* 29, 466-86.
- Stein, Jeremy, 2003, Agency, Information and Corporate Investment, in George Constantinides, Milton Harris, and Rene Stulz, eds.: *Handbook of the Economics of Finance* (North Holland, Amsterdam).
- Stulz, Rene, 1990, Managerial discretion and optimal financing policies, *Journal of Financial Economics* 26, 3-27.

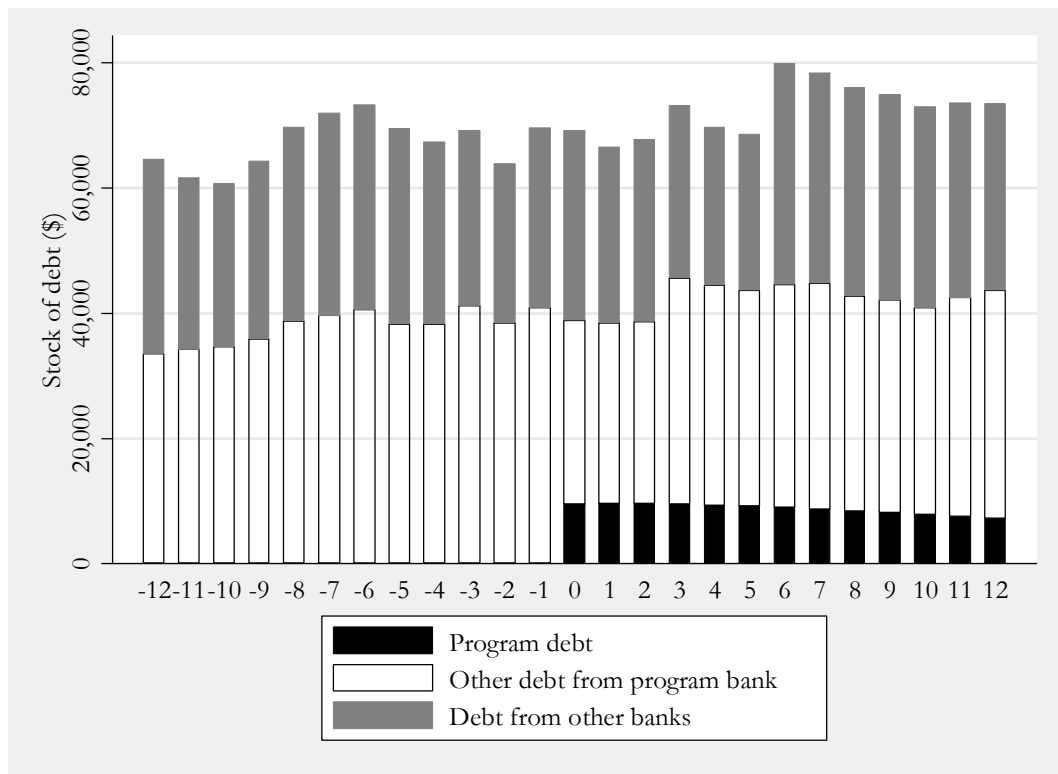
Wooldridge, Jeffrey, 2002. *Econometric Analysis of Cross Section and Panel Data* (MIT Press, Cambridge).

World_Bank, 1998, Argentina: Financial Sector Review, 17864-AR (World Bank, Washington).

Zia, Bilal, 2006, Financial Constraints and the (Mis)Allocation of Subsidized Credit: Evidence from Export Loans, mimeo MIT.

Figure 1

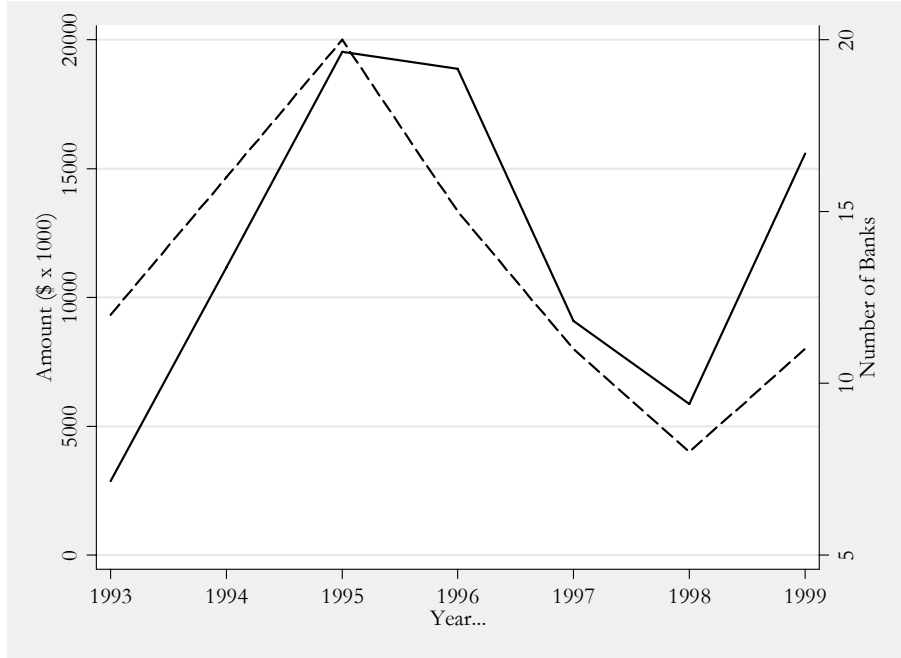
Evidence on Loan Re-Labeling: Monthly Debt Evolution of the Firms that Received Program Loans, by Source



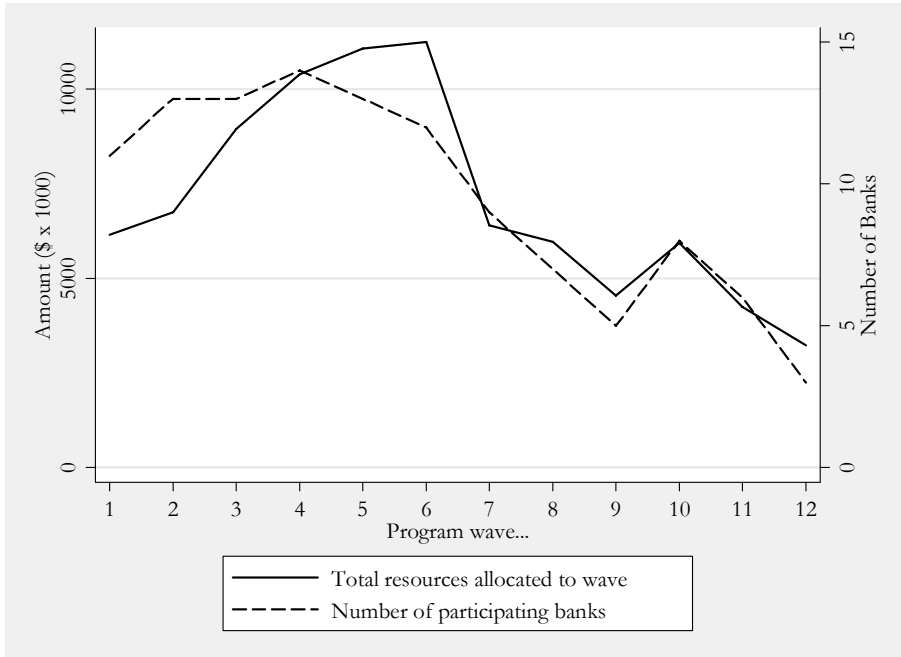
Source: own calculations using MYPES program database and CDSF credit bureau data. Based on a sample of 2,596 firms that received program loans after January 1996. The horizontal axis measures time in months relative to the moment of reception of the program loan (0 is the month the program loan was received by the firm).

Figure 2

Panel 1: Flow of Program Financing and Number of Participating Banks, by Year

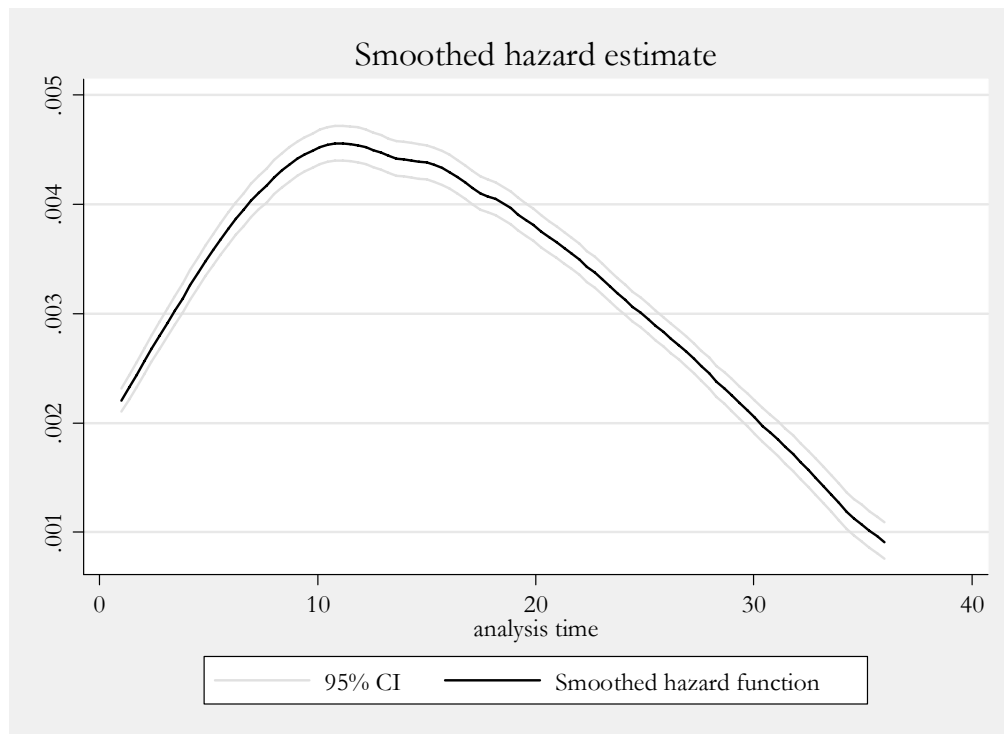


Panel 2: Flow of Program Financing and Number of Participating Banks, by Wave



Source: own calculations using MYPES program data. The flow of financing during a year is the sum of the amount of resources allocated to all the waves that began during that year. The number of banks counts a bank only once even if it participated in two waves during a year.

Figure 3
Kernel Estimation of the Monthly Hazard Rate of Default



Source: Own calculations using Public Credit Bureau database from the sample of loans issued between January and August 1998. The vertical axis plots the weighted kernel density estimate utilizing the estimated monthly default hazard. The horizontal axis measures months elapsed after the loan was issued. Loan performance is observed until August 2001 where the sample is truncated to avoid the period of high default rates that preceded the December 2001 crisis in Argentina.

Table I

Bank Descriptive Statistics (Non-Government Banks), by Ownership and Program Participation (Thousands of \$)

Means and standard deviations (in brackets) are reported. The statistics are calculated for a sample of 111 banks (83 locally owned, 26 of which received external financing from the program at some time between 1993 and 1999), first averaging each variable across all monthly observations between January 1998 and December 2000 (the preferred sample period) and then across banks. The reported standard errors are calculated from the cross-sectional variation, calculated after averaging each variable across monthly observations between January 1998 and December 2000. Sources of capital: the sum of equity, deposits and other liabilities minus the reserve requirements for each type of liability (for example 20% for checking accounts and 5% for 90 day deposits, 0% for one year deposits and so on). Expected External Financing is the amount of financing a bank expects to receive from the MYPES program, and is calculated using the estimation of a participation model and the cross sectional formula (see description in subsection II.C). Program banks hold on average 10.2%, and local banks 51% of the total assets of the banking system.

	All Banks (1)	Locally Owned Banks (2)	Program Banks (3)
Assets	1,095,287 [2,396,431]	693,538 [1,880,620]	543,985 [599,719]
Loans	536,344 [1,241,008]	362,000 [1,043,741]	283,790 [332,044]
Loans and Commitments	636,382 [1,541,574]	584,056 [1,751,396]	345,905 [394,131]
Liabilities	979,350 [2,168,293]	605,314 [1,674,728]	488,200 [539,852]
Deposits	569,590 [1,331,549]	384,378 [1,122,679]	361,719 [407,961]
Sources of capital	616,099 [1,348,276]	399,500 [1,151,055]	382,853 [418,375]
Loans/Assets	0.500 [0.146]	0.517 [0.140]	0.500 [0.109]
Deposits/Assets	0.515 [0.194]	0.538 [0.189]	0.626 [0.124]
Equity/Assets	0.133 [0.135]	0.144 [0.141]	0.133 [0.130]
ROA	0.31% [1.22]	0.26% [1.23]	0.14% [1.12]
Financial Rev./Loans (%)	13.6% [7.2]	14% [7.6]	12.8% [2.4]
Exp. External Financing	1,547.5 [494.9]	1,630.4 [482.4]	1,598.7 [429.2]
Exp. Ext. Financing/Loans	0.068 [0.166]	0.068 [0.154]	0.076 [0.196]

Table II
Loan and Loan Recipient Summary Statistics, by Borrower Type

Means and standard deviations (in brackets) are reported. Statistics are estimated using the January 1998 to December 2000 preferred subsample. Each observation corresponds to a new loan, loan commitment or increase in credit limit extended during the sample period. Loan amount represents the amount of the loan or credit availability expansion. Default after 12 (24) months is a dummy equal to one if the loan is non performing 12 (24) months after the loan is issued. Total bank debt is the sum of the bank debt held by the loan recipient across all financial institutions. Past non-performing loan is a dummy equal to one if the loan recipient has any non-performing debt at the time of receiving the new loan. A loan recipient is classified as *new* if it has no previous credit with the issuing bank, and *existing* otherwise.

	All (1)	Existing Borrowers (2)	New Borrowers (3)
Number of Loans	750,526	620,325	130,201
1. Loan Characteristics			
Loan amount (\$)	16,691 [226,660]	17,722 [218,790]	11,776 [260,858]
Collateral/Loan	0.123 [0.301]	0.124 [0.299]	0.118 [0.312]
2. Loan Performance			
Default after 12 months (yes=1)	0.122 [0.328]	0.104 [0.306]	0.191 [0.393]
Default after 24 months (yes=1)	0.168 [0.374]	0.153 [0.359]	0.228 [0.420]
3. Borrower History			
Total bank debt		58,551 [601,468]	
Past non-performing loan (yes=1)		0.141 [0.348]	

Table III

First Stage: Regression of Sources of Capital on Expected External Financing

Panel 1 presents the estimated coefficients of the following specification:

$$\ln F_{it} - \ln F_{it-1} = \alpha_i + \alpha_t + \varphi (\ln \hat{p}_{it} \hat{C}_{it} - \ln \hat{p}_{it-1} \hat{C}_{it-1}) + \mathbf{x}_{it}' \gamma + \eta_{it}$$

where F_{it} represents sources of capital (sum of equity, deposits and other liabilities minus the reserve requirements for each type of liability) of bank i at time t . \hat{p}_{it} is the predicted probability of participation, \hat{C}_{it} the expected external financing conditional on participation, α_i and α_t are bank and month fixed effects, and \mathbf{x}_{it} is a set of bank level controls (lagged log of assets, deposits, cash flows, and net income). All estimates are based on the sample months between January 1998 and December 2000, which includes the final four waves of the program. The sub-sample partition in columns 2 and 3 is selected according to the predicted probability of participation. Banks are defined as having a high average probability of participation if they are in the top quartile of the distribution estimated participation probabilities, \hat{p} . Panel 2 presents the estimated coefficients of a similar specification, where the left hand side variable is a dummy equal to one if bank i receives a external financing from the program at month t . Heteroskedasticity-robust standard errors in brackets, clustered at the bank level.

Bank Sub-Sample:	All		High-Probability of Participation	Low-Probability of Participation
	(1)	(2)	(3)	(4)
Expected External Financing Growth	0.068*** [0.021]	0.076*** [0.025]	0.067** [0.030]	0.016 [0.024]
Additional Controls	No	Yes	No	No
Bank/Month FE	Yes	Yes	Yes	Yes
Observations	4,654	4,654	1,405	3,493
R-squared	0.07	0.08	0.06	0.04

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table IV

OLS/2SLS Estimates of the Effect of an Expansion in Bank External Financing on Loans, by Bank Size and Capitalization

Each column presents estimated coefficients from a specification of the form:

$$\ln L_{it} - \ln L_{i,t-1} = \alpha_i + \alpha_t + \beta_0(\ln F_{it} - \ln F_{i,t-1}) + \beta_1(\ln F_{it} - \ln F_{i,t-1})\text{ConstrainedBank}_i + \varepsilon_{it}$$

where L_{it} are loans (or loans plus loan commitments in panel 2) of bank i at month t . F_{it} are sources of capital (total capital minus regulatory reserve requirements), and ConstrainedBank_i is a dummy equal to one if bank i is likely to be financially constrained according to an ex-ante observable characteristic, and α_i and α_t are bank and month fixed effects. As constrained banks indicators, specification 3 uses *Small*, a dummy equal to one if the bank is in the lowest quartile of the asset distribution, and specification 4 uses *LowCap*, a dummy equal to one if the bank is in the lowest quartile of the equity to assets ratio distribution. Both variables are pre-determined, calculated at the time the banks first appear in the sample. Of the program banks in the 1998-2000 sample, 40.7% are classified as small and 25.9% as low capitalized. Of the non-program banks, 51.0% are classified as small and 14.9% as low capitalized. The Two-Stage-Least-Squares (2SLS) estimates are obtained using the change in expected external financing as an instrument for the change in bank sources of capital, and expected external financing interacted with *Small* and *LowCap* as an instrument for the interaction term between sources of capital and the dummy variables. The first stage for all estimates is shown in Table III. The reduced sample of specifications 3 through 6 covers years 1998 and 1999, which include the last 4 waves of the program. Heteroskedasticity-robust standard errors in brackets, clustered at the bank level.

Estimation:	All waves		Final four waves			
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	2SLS (5)	2SLS (6)
1. Dependent Variable: log(Loans) in Diffs.						
log (Sources of capital) (in Difs.)	0.309*** [0.074]	0.474* [0.260]	0.314*** [0.090]	0.745*** [0.139]	0.618*** [0.171]	0.708*** [0.174]
log (Sources of capital) x Small					0.065 [0.211]	
log (Sources of capital) x LowCap						0.105 [0.204]
Bank/Month FE	Yes	Yes	Yes	Yes	Yes	Yes
# Banks	119	119	113	113	113	113
Observations	6,330	6,330	4,654	4,654	4,654	4,654
R-squared	0.14		0.17			
2. Dependent Variable: log(Loans and Commitments) in Diffs.						
log (Sources of capital) (in Difs.)			0.433*** [0.065]	0.650** [0.273]	0.455 [0.449]	0.428 [0.849]
log (Sources of capital) x Small					0.982* [0.581]	
log (Sources of capital) x LowCap						0.849** [0.408]
Bank/Month FE			Yes	Yes	Yes	Yes
# Banks			113	113	113	113
Observations			4,654	4,654	4,654	4,654
R-squared			0.13			

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table V

2SLS Point Estimates and Standard Errors of the Lagged Cumulative Effect of an Expansion in Bank External Financing on Loans

The marginal lagged effects are the 2SLS estimation results of the coefficients of the following specification:

$$\ln L_{it} - \ln L_{it-1} = \alpha_i + \alpha_t + \beta_0(\ln F_{it} - \ln F_{it-1}) + \beta_1(\ln F_{it-1} - \ln F_{it-2}) + \beta_2(\ln F_{it-2} - \ln F_{it-3}) + \dots + \beta_T(\ln F_{it-T} - \ln F_{it-24}) + \varepsilon_{it}$$

where L_{it} are loans of bank i at month t , F_{it} are sources of capital (total capital minus regulatory reserve requirements), and α_i and α_t are bank and month fixed effects. The specification is estimated including all lags, but only the coefficients for every quarter are reported for conciseness. The 2SLS estimates are obtained using the change in expected external financing and its lags as an instrument for the change in bank sources of capital. The cumulative lagged effects up to time s are the sum of the marginal coefficients β_0 through β_s . The estimations are obtained from the reduced sample that includes the last four waves of the program. Heteroskedasticity-robust standard errors, clustered at the bank level are reported. Both specifications include a full set of bank and month dummies.

Lags in months	Marginal Lagged Effect		Cumulative Lagged Effect	
	Point Estimate	SE	Point Estimate	SE
	(1)	(2)	(3)	(4)
0	0.887*	0.476	0.887*	0.476
3	0.475	0.309	1.303*	0.690
6	-0.270	0.306	0.747	0.634
9	-0.265	0.470	1.434*	0.845
12	0.178	0.282	0.935	0.610
15	0.226	0.489	0.954*	0.557
18	0.319	0.509	1.996*	1.156
21	0.198	0.515	2.376*	1.429
24	-0.200	0.263	1.300	1.865

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table VI

Constraints or Free Cash Flows – 2SLS Estimates of the effect of an Expansion in Bank External Financing on Loan Default Rates and Interest Revenues

Columns 1 and 2 present the estimated coefficients from a specification of the form:

$$DefaultT_{ijt} = \alpha_i + \alpha_t + \alpha_s + \psi_T(\ln F_{it} - \ln F_{i,t-T}) + \omega_{ijt}$$

where each observation corresponds to a loan j issued by bank i at month t . $DefaultT_{ijt}$ is a dummy equal to one if loan j is non-performing (at least six months late, defaulted or the loan recipient has filed for bankruptcy) at some time between time t and time $t+T$, where T can be 12 or 24 months (specifications 1 and 2 respectively). F_{it} are sources of capital (total capital minus regulatory reserve requirements). Finally, α_i , α_t and α_s are bank, month and loan recipient sector (3 digit industry sector) fixed effects.

Columns 3 and 4 present the estimated coefficients from a bank level specification of the form:

$$Interest\ Revenue_{it}/Loans_{it} = \alpha_i + \alpha_t + \gamma(\ln F_{it} - \ln F_{i,t-T}) + \omega_{it}$$

The 2SLS estimates are obtained using the change in expected external financing as an instrument for the change in bank sources of capital. Heteroskedasticity-robust standard errors in brackets, clustered at the bank level.

	Loan Non-Performing After:		Interest Revenue /Loans (3)	Net Interest Revenue /Loans (4)
	12 months (1)	24 months (2)		
1. All Loans				
log (Sources of capital) (in Difs.)	0.0007 [0.0015]	-0.0005 [0.0011]	0.004 [0.032]	0.033* [0.018]
Bank/Month Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	No	No
Observations	750,563	750,563	4,654	4,654
2. Existing Borrowers				
log (Sources of capital) (in Difs.)	-0.0001 [0.0012]	-0.0013 [0.0009]		
Bank/Month Fixed Effects	Yes	Yes		
Industry Fixed Effects	Yes	Yes		
Observations	620,325	620,325		

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table VII

Effect of Bank External Financing Expansion on Borrower Debt: Firm level and Within-Firm estimations of the Reduced Form of Change in Firm Debt on Changes in Expected External Finance

Columns 2 through 7 presents estimated coefficients from a specification of the form:

$$\ln(Debt_{ikt}) - \ln(Debt_{ikt-1}) = \alpha_k + \alpha_i + \alpha_t + \varrho(\ln F_{ikt} - \ln F_{ikt-1}) + \chi(\ln(Debt_{ikt}) - \ln(Debt_{ikt-1})) + v_{ikt}$$

where the left-hand-side variable is the debt growth of firm k with bank i at month t . On the right hand side, F_{ikt} are sources of capital net of reserve requirements (instrumented with expected external finance, $\hat{p}_{ikt} \hat{C}_{ikt}$); α_k , α_i and α_t are firm, bank and month fixed effects respectively; and $Debt_{ikt-1}$ represents the sum of all the bank debt held by firm k , excluding bank i . Column 1 presents the coefficients of the same specification but with the information aggregated at the firm-month level. Thus, the estimations of column 1 do not allow for error clustering at the bank level, bank fixed effects or the inclusion of $Debt_{ikt-1}$ as a control.

Columns (1) and (2) perform the estimation over the entire sample of firms. Columns (3) and (4) over the subsample of firms that borrow from more than one bank in the sample, which is required for the inclusion of $Debt_{ikt-1}$ as a control. Specifications (5) and (6) are estimated of the sub-samples of firms that are not eligible and eligible to the MYPES program, where only firms with less than \$200,000 in annual sales and 20 workers are eligible.

Unit of observation	Firm			Loan		
	All	All	With two or more lenders	Non-eligible to the MYPES	Eligible to the MYPES	
Borrower Sample	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Change in log Debt						
log (Sources of capital) (in Difs.)	0.0025*** [0.0001]	0.0026** [.0012]	0.0034** [.0015]	0.0034** [.0015]	0.0037*** [.0003]	0.0012 [.0014]
log (Debt with Other Banks) (in Difs.)				-0.0009 [0.0175]		
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	No	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.11	0.12	0.06	0.06	0.12	0.08
Observations	3,098,481	3,275,779	371,512	358,741	3,226,602	49,171
Error clustering	Firm	Bank	Bank	Bank	Bank	Bank

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table VIII

Testing for Changes in Bank Risk Profile: Regression of Changes in Inter-Bank Rate and Subordinated Debt Rate on Changes in Actual and Expected External Financing

Each column presents estimated coefficients from a specification of the following form:

$$R_{it} - R_{it-1} = \alpha_i + \alpha_t + \beta \ln(C_{it} / C_{it-1}) + \varepsilon_{it}$$

Where R_{it} is either the inter-bank rate (columns 1 and 2) or the subordinated debt rate (columns 3 and 4) faced by bank i at time t . The rate for each type of debt is calculated dividing the interest rate accrued (from the earnings report at month t) by the stock of debt (from the balance sheet at time $t-1$). C_{it} is either actual (columns 1 and 3) or expected (columns 2 and 4) program financing of bank i at time t , and α_i and α_t are bank and month fixed effects. All estimations are performed on the reduced sample of banks that received program financing at some time between 1993 and 1999. Heteroskedasticity-robust standard errors in brackets, clustered at the bank level.

Dependent Variable	Inter-Bank Debt Rate		Subordinated Debt Rate	
	(1)	(2)	(3)	(4)
log (Actual Program Financing) (in Difs.)	-0.074 [0.358]		-0.001 [0.003]	
log (Expected Program Financing) (in Difs.)		1.748 [17.42]		0.173 [0.321]
Bank/Month FE	Yes	Yes	Yes	Yes
Observations	991	984	993	922
R-squared	0.15	0.07	0.43	0.42

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table IX

Testing for Changes in Liquidity and Investment Opportunities: Regression of Actual and Expected Financing Expansion on Lagged Deposit Growth and Cash Flows

Each column presents estimated coefficients from a specification of the following form:

$$\ln(C_{it} / C_{it-1}) = \alpha_i + \alpha_t + \beta_0 \ln(D_{it} / D_{it-1}) + \beta_1 \ln(D_{it-1} / D_{it-2}) + \beta_2 \ln(D_{it-2} / D_{it-3}) + \beta_3 \ln(D_{it-3} / D_{it-4}) + \beta_4 \ln(D_{it-4} / D_{it-5}) + \gamma_0 \ln(CF_{it} / CF_{it-1}) + \gamma_1 \ln(CF_{it-1} / CF_{it-2}) + \gamma_2 \ln(CF_{it-2} / CF_{it-3}) + \gamma_3 \ln(CF_{it-3} / CF_{it-4}) + \gamma_4 \ln(CF_{it-4} / CF_{it-5}) + \varepsilon_{it}$$

where C_{it} is either actual (column 1) or expected (columns 2 and 3) external financing from the program of bank i at time t , D_{it} represents deposits, CF_{it} cash flows, and α_i and α_t are bank and month fixed effects. Column 2 presents the estimates using the reduced sample of banks that received program financing at some time between 1993 and 1999. Heteroskedasticity-robust standard errors in brackets, clustered at the bank level.

	Actual Program Financing	Expected Program Financing (growth)	
	(growth)	Program banks	All banks
	(1)	(2)	(3)
DepositGrowth _{t-1}	-0.028 [0.049]	0.02 [0.018]	0.002 [0.002]
DepositGrowth _{t-2}	-0.162*** [0.058]	-0.015 [0.011]	-0.001 [0.003]
DepositGrowth _{t-3}	-0.094 [0.086]	-0.021 [0.016]	0 [0.004]
DepositGrowth _{t-4}	-0.111* [0.055]	-0.027 [0.019]	-0.002 [0.003]
CashFlow _{t-1}	0.00078 [0.0035]	0.00074 [0.00071]	0.00076 [0.00073]
CashFlow _{t-2}	0.0033 [0.0035]	0.00070 [0.00074]	0.00055 [0.00040]
CashFlow _{t-3}	0.0058 [0.0056]	0.00096 [0.00098]	0.00027 [0.00044]
CashFlow _{t-4}	0.0049 [0.0071]	0.00071 [0.00074]	0.00019 [0.00044]
Bank/Month FE	Yes	Yes	Yes
Observations	1001	1003	5818
R-squared	0.31	0.85	0.88

* significant at 10%; ** significant at 5%; *** significant at 1%.

¹ For examples of the first line of research see Calomiris and Mason (2003), Kashyap and Stein (2000), Khwaja and Mian (2005) and Peek and Rosengren (1997). Some examples of papers that look into the real effect of shocks to the financial system are Chava and Purnanandam (2006), Hubbard, Kuttner and Palia (2002), Gan (2006), Kashyap, Lamont and Stein (1994), Kashyap, Stein and Wilcox (1993) and Peek and Rosengren (2000).

² Local banks hold around 65% of the private banking assets in developing countries (Mian (2006)). Recent evidence suggests that local banks have an advantage in lending to informationally opaque borrowers and that foreign bank entry reduces the aggregate supply of banking credit to local firms in emerging markets (Gormley (2006), Mian (2006)).

³ The optimal response of an unconstrained bank to an expansion in external financing that doesn't affect the marginal cost of capital is to reduce market priced liabilities or to distribute it among investors as dividends. A lending expansion would yield a return below the opportunity cost of capital. The same underlying logic is behind the investment-cash flow literature in corporate finance and previous empirical work on the lending channel. See Stein (2003) for a recent survey on both.

⁴ The evidence suggests that the Argentine financial crisis at the end of 2001 occurred despite the high regulatory standards during the sample period (Krueger (2002)). Recent analysis of the events that led to the crisis suggests that it ensued as a result of government expropriation of bank assets (IMF (2005)). Mishkin (2006) points out that the balance sheet of Argentine banks remained relatively healthy in 2000: "The amount of bank capital relative to assets, even after loan write-offs, remained in excess of 10% (high by international standards), and bank capital relative to risk-weighted assets was well in excess of requirements under the Basel Accord".

⁵ Three years was the maximum duration, which matched that of the program loans to firms. In practice, the median loan to firms had the maximum duration of three years.

⁶ Banks submitted in the application to the Central Bank the amount of financing required from the program. If the sum of the requested financing of all applicants exceeded the amount of resources in the wave (which it did in every wave), financing was distributed among applicants according to the formula based on loans size and regional loan allocation. The point score according to average loan size assigns a score of 100 for an average loan size between \$0 and \$3000, a score of 97 for average loan size of \$3000 to \$6000, and so on. Average loan sizes of

\$50,000 and above receive scores of 30 and below. The point score according to regional distribution allocated a weight of 30 to loans issued in the rich provinces (Capital Federal, La Pampa y Santa Cruz) and 100 to loans issued in the poorest (Formosa, Catamarca, Santiago del Estero, Chaco, Jujuy, Misiones, Corrientes, Salta, Chubut y Tucumán). Loans to other provinces received a weight of 70.

⁷ Reserve requirements in Argentina vary according to the residual maturity of liabilities. For example, banks are required to hold reserves of 20% of the balance of checking accounts, 5% of 90 day deposits, and 0% of one year deposits.

⁸ The scores corresponding to the first time the banks are observed in the sample are used to avoid the potential bias introduced by banks gaming the allocation formula. Since expected bank profits in the region and loan size scores, banks could manipulate loan size and regional distributions to increase their share of program resources.

⁹ The first assumption follows from the fact that banks had three months to draw the resources from the credit line in the Central Bank without penalty. The repayment period corresponds to the repayment schedule of the median program loan issued by the bank.

¹⁰ Situation 1 (normal): all payments on time. Situation 2 (with potential risk): small and occasional delays in repayment. Situation 3 (with problems): delays in repayment between 90 and 180 days. Repays accrued interest but requires principal refinancing. Situation 4 (high insolvency risk): repayment delays between 180 and 360 days, bankruptcy filings for more than 5% of the firm's equity, has principal and interest refinancing requiring principal forgiveness, some collateral has been seized. Situation 5 (unrecoverable): bankruptcy declared. Situation 6 (unrecoverable by technical disposition): late repayments of more than 180 days with intervened financial institutions.

¹¹ In contrast, the OLS estimate of β_0 cannot be interpreted causally as the effect of changes in sources of capital on lending. The correlation may result, for example, from the fact that the variation in bank sources of capital is driven by changes in deposits, which are potentially correlated with the demand for credit (Bernanke and Gertler (1989), Kashyap, Rajan and Stein (2002), Gatev and Strahan (2006)). I repeated the estimations of Table IV using deposits as an instrument for sources of capital, and obtained estimates for β_0 that are statistically indistinguishable from the OLS ones (0.314).

¹² The 2SLS estimates of the sensitivity of lending to external finance are robust to bank selection. In an unreported estimation restricting the sample to banks that participated at least once in the program and excluding all banks that participated in every wave, I find an estimated elasticity of 0.66 with a standard error of 0.29. This estimate is statistically indistinguishable from the estimate using the entire bank sample. This robustness speaks of the validity of the identification assumptions of the 2SLS strategy and the exogeneity of the expected external finance instrument.

¹³ The magnitude of the lending response is likely to be related to the maturity of the additional financing provided by the program, in this case 3 years. The lending response to an increase in callable deposits is likely to be lower if banks optimally hold buffer stocks to insure against liquidity shocks.

In theory, the lending response to an increase in callable deposits will

¹⁴ The profitability of marginal investments can be below the inframarginal one in the absence of agency problems when banks have market power and face a sharply declining schedule of marginal revenues from lending as in Stein (1998). The two theories will be empirically distinct only when the banking sector is relatively competitive or this schedule is relatively flat in equilibrium. The results below suggest this is the case in the empirical context of this paper.

¹⁵ This number is obtained by multiplying the elasticity of 0.0028 times the average expected external finance (1.2 million), times the average number of borrowers per bank (10,900), and dividing by the average bank debt per borrower (\$29,200).

¹⁶ Other usual measures of investment opportunities, like Tobin's q , are not available because small locally owned banks in Argentina are not publicly traded.

¹⁷ Sales and worker data is not available in the CDSF. I use the database of manufacturing firms collected by Unión Industrial Argentina (UIA) that contains sales and number of workers data for 1048 of firms in 1998 that can be matched to the CDSF database. The UIA database is used to impute sales and number of workers to the CDSF database. The UIA database is collected by a non-for profit organization through questionnaires and site visits, and chosen to be statistically representative by size and region of manufacturing firms. Using the 1998 data from the UIA and the CDSF databases, I estimated an OLS regression of firm workers and sales over past debt performance, past debt growth, collateral, number of bank relationships. The estimated model is used to predict

the sales and workers of the rest of the firms in the CDSF at 1998, which is use in turn to impute program eligibility.