Relationship Banking, Network Dynamics and Sovereign Default *

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Abstract

We study the impact of banks' exposure to defaulted sovereign debt on their supply of credit. As a natural experiment and to identify the credit supply effects of an unanticipated shock to banks funding, we use the default of 2001 in Argentina and the sharp currency devaluation that followed. We start by exploiting the variation in the data at the bank-level and bank-firm linked data in the context of a reduced form empirical model. Then, we build a model characterized by search and matching frictions in which firms (borrowers) develop long-term relationships with their lenders. Using bank-firm linked data for the period 2001-2005 we find evidence consistent with our theory. Exposure to defaulted bonds in 2001 of the lenders that a firm borrows from has a negative effect on the post-default growth rate of the supply of credit available to that firm. This exposure effect is weaker for firms that were able to grow even after the default.

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1 Introduction

We study the impact of banks' exposure to sovereign default on the supply of credit within an environment characterized by search and matching frictions in which firms (borrowers) develop long-term relationships with their lenders.

To identify an unanticipated shock to the banking sector and credit supply, we use the case of the Argentine default of 2001 and the sharp currency devaluation that followed as a natural experiment. In December of 2001 Argentina declared default on $95 billion worth of sovereign debt (37% of GDP), the largest sovereign default in world history. As a result, by December of 2002, the peso had already depreciated by almost 250% and interest rates had risen dramatically (from 36% to 63% for personal loans and from 13% to 22% for mortgages, for example - see Figure 2). Since most of the debt was denominated in foreign currency, the debt-to-GDP ratio jumped to 150%. By December of 2002 GDP had dropped by a cumulative 15% relative to the beginning of 1998, annual inflation reached 40%, unemployment 25% of the labor force, and poverty 50% of the population (see Figure 3). [1] Given the magnitude of this default we interpret it as an unanticipated shock to the banking sector.

Our analysis has three main sections. In the first part we present empirical evidence from reduced-form empirical models using both bank-level and loan-level data. In the second we propose a model with search frictions in the market for bank credit where banks and firms are matched. This friction makes it costly for firms to switch lenders and, as a result, these relationships become long-term. Last, we use the model to provide theoretical foundations to our empirical design which exploits the variation at both the bank-level and loan-level in the data.

We benefit from rich detail in our data on alternative measures of sovereign debt exposure at the bank level. Around this default episode, we can see large month-to-month variations across banks of different type and across bonds denominated in domestic versus foreign currency. Also, given the monthly frequency of our data, we can perfectly identify the contemporaneous impact of the default from its long-run effects.

Here is what we find. At the bank-level exposure to sovereign debt at the time of default seems to have a positive and significant effect on the availability of credit. However, during the default period, the sign on the exposure measure changes sign. This effect is robust to

[1] Prior to this event Argentine had been in a deep recession since 1998 with yearly growth rates of -0.4%, -0.9% and -1.9% in 1998, 1999 and 2000, respectively, with a debt-to-GDP ratio of 55%, deficits in both the fiscal and current accounts and an overvalued currency. To try to restore competitiveness of the export sector, the federal government started with a strategy of real depreciation via internal deflation. This proved unsuccessful due to the downward rigidity in both wages and prices. The government then engaged in a debt mega-swap (known in Argentina as "el mega canje") and a shield ("el blindaje"). These policies were not able to avoid a run on the banks and the government had to institute a restriction on cash withdrawals known in the country as a "fence" on deposits ("el corralito").

several alternative specifications of the reduced-form empirical model. The result holds even when restricting the sample to the subsets of private, big and private and big banks. Since these results might be subject to an identification problem, we run a similar model but at the loan-level so that we can control for demand-side effects of the default on credit markets. We find results that are qualitatively equivalent: While exposure to sovereign debt has a positive impact on the supply of credit outside of default episodes, its impact turns negative (and significant) during the default period of 2001-2004.

The data seems to provide evidence on bank-firm links that is consistent with the predictions of our theoretical model. In particular, the exposure to defaulted bonds in 2001 of the lenders that a firm borrows from has a negative effect on the post-default growth rate of the supply of credit available to that firm. This effect is weaker for firms that grew even after the default and large change in relative prices implied by the real currency devaluation.

Following this introduction the paper proceeds as follows. In section 2 we review previous related work. In section 3 we provide preliminary empirical evidence derived from reduced-form models. In sections 4 and 5, respectively, we present the model and empirical evidence derived from its testable implications. We conclude in section 6.

2 Literature Review

Our work belongs into a rather large body of literature on the impact on the supply of credit of lenders exposure to government bonds during sovereign default episodes. This work can be organized into three strands depending on whether they resort to bank-level, firm-level or loan-level data.

Among those papers using evidence at the bank-level, Paravisini (2008) studies a program of subsidized bank financing for small firms (PyMES) in Argentina and documents a positive effect on bank lending. Arias (2013) studies banks in the United States during the recent financial crisis, and documents that interbank credit spreads are increasing in default risk. Pérez (2015) uses data for banks in Argentina from 1994 to 2012 and shows that after default banks replace government debt with less productive investments. Popov and VanHoren (2015) study syndicated loans for all 119 European banks and they find that lending by non-PIIGS banks exposed to sovereign debt issued by PIIGS countries contracted relative to that nonexposed banks. Last, Gennaioli, Martín and Rossi (2018): use data for 20,000 banks in 191 countries and 20 default episodes during the period 1998-2012, and show that higher exposure to sovereign debt reduces loan growth.

Arellano, Bai and Bocola (2017) study this issue from the borrowers' perspective using data for Italian firms for the period 2004-2012. They show that exposure to sovereign debt

explains 50% of the decline in output for these firms.

One shortcoming shared by all these papers is the difficulty with identifying supply from demand-side effects. In response an emerging set of papers is resorting to loan-level data to better identify the effects of sovereign default episodes and other events that imposed unanticipated shocks on the supply of credit. Khwaja and Mian (2008) study liquidity shocks due to unanticipated nuclear tests in 1998 for 18,000 firms in Pakistan. They find evidence that while large firms compensate reduced bank loan supply through capital markets, small firms suffer from overall drop in borrowing. Gan (2007) uses loan-level data for Japan during the period 1994-1998 and shows that after the collapse in land prices in the early 1990's banks with greater real-estate exposure contracted loan supply significantly more. Jiménez et al (2014) use data for Spain for the period 1999-2009 and document a strong impact on credit supply to non real-estate firms of banks securitization of real estate assets. Schwert (2015) uses data for the United States from Dealscan-Compustat link for 1987-2012 and documents a matching between bank dependent firms and well capitalized banks and firms with access to capital markets and less capitalized banks. Last, Bottero et al (2016) use data for all Italian banks and a large sample of firms 2009-2011 and document the impact of banks' sovereign exposure using the 2010 Greek bailout as a natural experiment.

Our paper contributes to this line of work by exploiting the loan-level variation in our data. We believe we also contribute by focusing on the Argentine default of 2001, the largest of world history, and 300% currency devaluation of 2002. Also, our bank-level data has a rich level of detail in terms of types of securities held by banks and currency composition of both the assets and liabilities sides of their portfolio.

3 Motivation and Preliminary Evidence

3.1 The Data

We have balance sheet and income statement data for all banks in Argentina at a monthly frequency. The time frequency is important since it allows us to identify the period of default. We also have a detailed composition of bank portfolios by currency and by sectors of depositors and borrowers. Second, we have access to detailed data on banks exposure to sovereign and private debt. Last, we know bank characteristics that are important to the industrial organization features of the sector, i.e. type of bank, regional presence, and number of branches and ATMs by province. Tables 1 and 2 summarize this information.

As shown in Table 3 the default did not seem to impose a drastic change in the capitalization of banks in Argentina. After 2001, equity as a percentage of total assets remained

at 13% for private banks and just below 9% for state-owned banks. Loans as a percentage of total assets fell just slightly from 52% to 48% for private banks, and more drastically from 55% to 35% for state-owned banks. Worthy of note is that while loans to the private non-financial sector by private banks fell by 10%, those to the public sector increased by 20%.

In terms of exposure to sovereign debt, banks (both private and state-owned) increased their exposure to public bonds but lowered their exposure to bonds denominated in foreign currency. Overall private banks saw their exposure rise from 12% to only 13%, and public banks a bit more significantly from 24% to 27% (see Table 4). Figure **??** shows the dynamics of exposure at the monthly frequency for alternative measures of exposure and for banks at the median level of exposure, and for those with high (above the median) and low (below the median) exposure. It shows a drop in exposure right after the default in December of 2001 and a quite drastic increase right after that.

We have data on the debt contracted by the 100 largest borrowers in Argentina from July of 2001 to December of 2005. For each borrower we know the total number of relationships, the quality of each relationship as given by index that classifies the loan from a regular loan all the way down to a loan that has been written-off by the bank, and the value of the loan for top-4 banks with which firms have a banking relationship. The sectoral composition of borrowers is presented in Table 5.

3.2 Bank Exposure to Sovereign Debt and Credit Supply: Evidence from Bank-Level Data

In this section we follow Gennaioli, Martin and Rossi (2018) and use the bank-level data to estimate the following reduced-form specification where the dependent variable of interest is the change in the loans-to-assets ratio (ℓ_i) between period t and period $t-1$ (measured as a 12-month change). This loans-to-assets ratio is regressed on a measure of exposure to government debt (E_i) and a set of bank-level controls (X_i).

$$\Delta\ell_{it} = \alpha_i + \beta_1 E_{it-1} + \beta_2 def_{t-1} + \beta_3 E_{it-1} \times def_{t-1} + \beta_4 X_{it-1} + u_{it} \tag{1}$$

where α_i are bank fixed effects and $def_{t-1} = 1$ if $t \in \{2002, 2003, 2004, 2005\}$.

The controls at the bank-level are intended to account for other variables that can impact the banks' availability of loanable funds. As such the vector X_i includes liquidity, leverage, loans to the private-non-financial sector, profitability and the growth rate of deposits.

Our results are presented in Table 6. They indicate that exposure to sovereign debt at the time of default has a positive and significant effect on the availability of credit. However,

during the default period, the sign on the exposure measure changes sign. This effect is robust to several alternative specifications of the reduced-form empirical model. As shown in Table 7, this result holds even when restricting the sample to the subsets of private, big and private and big banks.

3.3 Bank Exposure to Sovereign Debt and Credit Supply: Evidence from Bank-Firm Linked Data

Our results from section 3.2 might be subject to the identification problem common to the literature that uses firm-level data. The estimates of β_1 and β_3 in equation (1) can be biased by the effects of exposure on the demand for credit and might not be capturing the true impact of exposure on the supply of credit. To address this shortcoming, we run a similar model but at the loan-level so that we can control for demand-side effects of the default on credit markets. The dependent variable of interest is now the 3-month change, annualized, in loans from bank i to firm j (ℓ_{ij}).

$$\Delta\ell_{ijt} = \rho_j + \beta_1 E_{it-1} + \beta_2 def_{t-1} + \beta_3 E_{it-1} \times def_{t-1} + \beta_4 X_{it-1} + e_{ijt} \tag{2}$$

where ρ_j are firm fixed effects.

Our results, presented in Table 8, are qualitatively equivalent with those obtained at the bank-level: While exposure to sovereign debt has a positive impact on the supply of credit outside of default episodes, its impact turns negative (and significant) during the default period of 2001-2004.

4 Model

Banks and firms are assumed to be distributed in islands. There are a total of $(I+1)$ islands. A total of I peripheral island and a central one. Islands are labeled from 0 to I, where the island labeled 0 is the central island. There are a total of B banks per island (including the central island) and F firms in islands 1 through I (Note that there are no firms in the central island). The relationships between firms and banks in the peripheral islands are interpreted as existing relationships that do not require costly setup costs. The central island is meant to represent a market where new firm-bank relationships are established after incurring in a cost.

Each period a fraction α_i of all firms in the i^{th} island receive an investment opportunity. Investment opportunities, or projects, need to be financed by banks in order to produce. Each financed project, produces y units of output, that is split between the firm and the

bank financing the project. Per project, the firm receives $(y - r_i)$, and the bank receives r_i, where r_i can be interpreted as the interest rate in the i_{th} island. Firms remain in the market for only one period.

Each bank in the i^{th} island receives v_i units of available credit to be offered in the i^{th} market. Once banks and firms meet, they split the surplus of the match after bargaining with the bank's bargaining power given by ϕ.

Banks and firms find each other using a constant-returns-to scale matching function

$$M = m\left(F\alpha_i\right)^{\gamma}\left(B\nu_i\right)^{1-\gamma} \tag{3}$$

Given this matching technology, market tightness is indicated by $\theta_i = \frac{Bv_i}{F\alpha_i}$. The probability of an investment opportunity to be financed is then given by $q(\theta_i) = \frac{M}{F\alpha_i} = m\left(\frac{Bv_i}{F\alpha_i}\right)^{1-\gamma}$, and the probability of a unit of available bank credit being matched to a firm is $p(\theta_i) = \frac{M}{B\nu_i}$. While firms can transfer investment projects from their i^{th} island to the central island paying a switching cost z, unmatched credit vacancies cannot be moved.

Total output is then measured by the total number of projects successfully financed $q(\theta_i)F\alpha_i$.

The timing is as follows: First, the vectors α and v containing the information on α_i and v_i for all islands are observed and peripheral island markets open for all islands 1 through I. Then, the central market opens and firms can decide to take their unmatched projects to the central island by paying the cost z.

4.1 Equilibrium

In the central island, matched firms and banks bargain over the match surplus without any outside option.

$$\max_{r_0}(y - r_0)^{1-\phi} r_0^{\phi}$$
$$r_0 = \phi y$$

This determines the interest rate in the central island, which is given by The equilibrium in the central island affects the outside option for firms in the peripheral islands and the matching surplus to be split between banks and firms in the peripheral islands.

The outside option of a firm in the peripheral island is given by

$$U_i = max(0, q(\theta_0)(1 - \phi)y - z) \tag{4}$$

Notice that U_i is independent of island i conditions, so it can be labeled as U. The matching surplus in the i^{th} island is then:

$$S_i = y - U \tag{5}$$

This is so, because banks in the peripheral islands cannot transfer their credit vacancies to the central island. This fact determines that their outside option is effectively zero. Again, the surplus of a match in the peripheral island is not affected by the island conditions, therefore we label it as S.

The banks in the peripheral islands receive ϕS, which is constant across all peripheral islands. This is because, independently of the island's conditions, they all share the same outside option for firms given by the transition to the central island U.

In particular, banks in all peripheral islands receive

$$r_i = \phi(y - max(0, q(\theta_0)(1-\phi)y - z)) \tag{6}$$

After the first sub-period finishes, there are a fraction $(1-q(\theta_i))$ of projects that could not find a bank to finance it in the i^{th} island. Then, the firm must decide to pay the transition cost to the central island or scrap the project. At this point, the firm will transition to the central island market as long as $z < q(\theta_0)(y(1-\phi))$, where θ_0 is the market tightness in the central island and determines the probability of successfully finding financing for the project.

This condition determines a threshold $\hat{\theta_0} = q^{-1}(z/(y(1-\phi)))$, above which all firms with unmatched projects at the peripheral island will transition to the central island. If $\theta_0 = \hat{\theta_0}$, then firms with unmatched projects are indifferent between transitioning to the central island and scrapping the project.

If $\theta_0 \geq \hat{\theta_0}$, all the unmatched projects transition to the central island, which determines the central island market tightness as

$$\theta_0 = \frac{Bv_0}{F\sum_{i=1}^{I}\alpha_i(1-q(\theta_i))} \tag{7}$$

Notice that, given v_0, $\hat{\theta_0}$ determines a maximum number of projects, $\hat{P}$, that can transition to the central island in order for $\theta_0 = \hat{\theta_0}$. This number is given by

$$\hat{P} = \frac{Bv_0}{q^{-1}(z/(y(1-\phi)))} \tag{8}$$

We assume that if $\theta_0 = \hat{\theta_0}$ firms use a mixed strategy and transition to the central island

with probability γ given by

$$\gamma = \frac{\hat{P}}{F \sum_{i=1}^{I} \alpha_i (1 - q(\theta_i))} \tag{9}$$

So, firms will transition their projects to the central island with probability $\hat{\gamma} = min(\gamma, 1)$.

4.2 Shocks to banks exposed to government debt

It is assumed that in good times the vector v and α are constant for all islands, generating a constant probability of financing for all projects across islands given by

$$q(\theta_i) + (1 - q(\theta_i))\hat{\gamma} q(\theta_0) = q(Bv/F\alpha) + (1 - q(Bv/F\alpha))\hat{\gamma} q(\theta_0) \tag{10}$$

In bad times, banks are shocked heterogeneously. A subset of islands receive loan vacancies that are lower than in good times. This lowers the probability of financing for all projects in all islands but in a heterogeneous way. This captures the idea that some banks are hit harder than others in some circumstances. In our case, it is banks that were exposed to the government debt that cannot offer credit after the government defaults. The credit-availability shock represented by v_i is meant to represent the supply of credit from banks after their asset position is affected by movements in the price of some of its components. In particular, if a bank holds government bonds that depreciate due to a default, it will have less available credit to offer to firms as a result.

For the islands where the stock of loan vacancies fell, there is a direct effect in their own island probability of financing $q(\theta_i)$. The lower probability of financing in the peripheral island is not counteracted by the financing probability at the central island (which depends also on the probability of not finding financing in the peripheral island), because the term $(1 - q(\theta_i))$ is multiplied by a number that is less than one given by $\hat{\gamma} q(\theta_0)$.

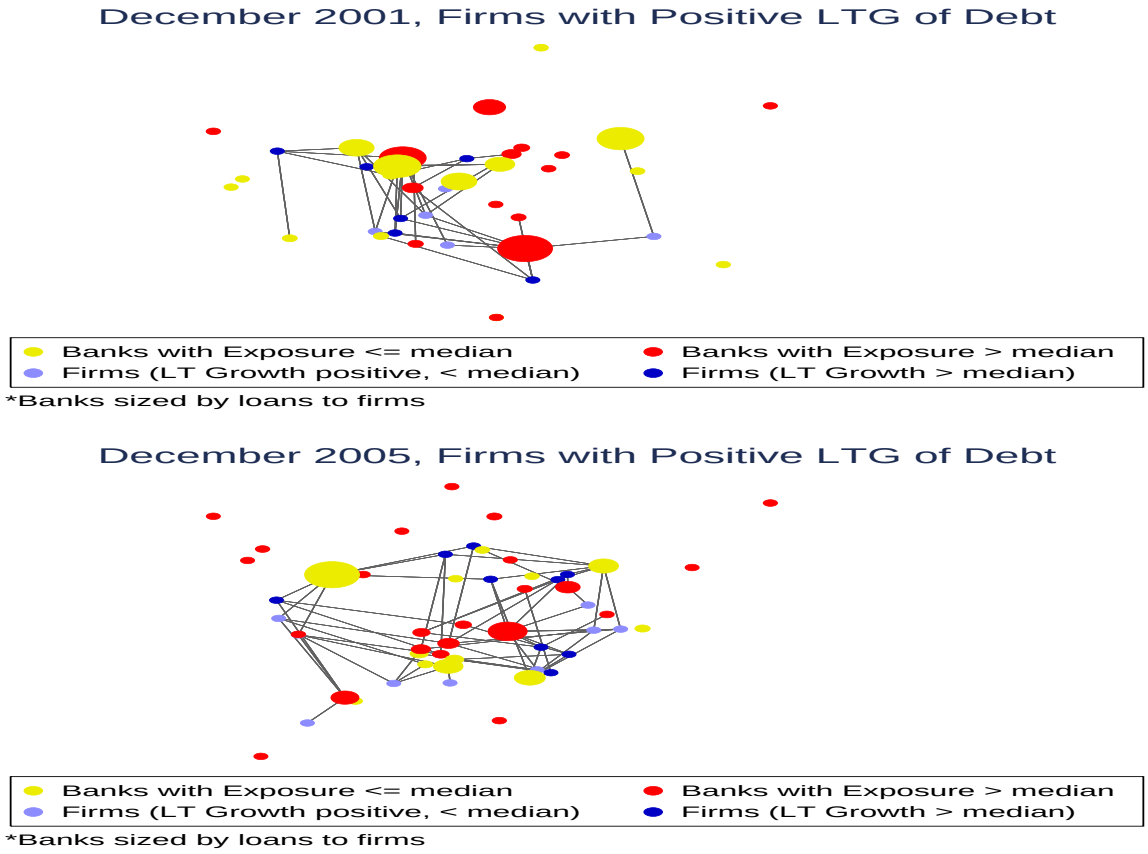
The phenomenon in the affected peripheral islands triggers a secondary effect in the central island that affects all projects in all islands. This additional flow of unmatched projects from the islands shocked with lower availability of credit, causes θ_0 or γ, or both to fall. Lowering financing probability for all projects at the central island, and lowering output.

5 Empirical Evidence on Network Dynamics

5.1 The Nature of the Network

Figure 1 shows our data graphically. The red (yellow) dots represent each of the B banks with a pre-default exposure above (below) the median, while the blue (gray) dots represent each of the F firms that exhibited long-term growth post-default above (below) the median growth. The green (maroon) lines represent COMPLETE!!.

Figure 1: Network Dynamics



Comparing the network before default in 2001 to that in 2005, we can highlight the following changes. Before default ensues, fast and slow-growing (blue and gray, respectively) seemed to be randomly matched with high and low exposure banks. After default however, banks with high exposure (red dots) seem to be "relocating" towards outside of the circle, whereas the fast-growing firms seem to have gotten more tightly linked to banks with low exposure (yellow dots). We interpret this as providing support to our model where an unexpected shock to the availability of credit ν_i of banks in each peripheral island (red dots in Figure 1) lowers the probability $q(\theta_i)$ of an investment opportunity being matched to a

lender, and makes unmatched projects move to the central island (towards the boundaries in the network figure).

5.2 Evidence on Bank-Firm Links

To test the predictions of our model, we now take the implications from equation (10) to the data. We regress the growth on a 3-month basis (annualized) in the lending available to a firm j on the following three determinants, all pre-default. First, the exposure of the subset of banks that it borrows from ($E_{j,2001}$); second, the number of banks in this subset ($B_{j,2001}$) and third, the 3-firm concentration ratio for the banking industry ($C3_{2001}$). We also control for the firms in our sample having been firms with actual investment opportunities, i.e. firms whose draw of α_j was equal to 1. We do so by building an indicator of long-term growth (LTG Ind.) equal to 1 if the firm grew at a rate faster than the sample median.

$$\Delta L_{jt} = \rho_j + \beta_1 E_{j,2001} + \beta_2 B_{j,2001} + \beta_3 C3_{2001} + \\ + \beta_4 E_{j,2001} \times LTGInd + \beta_5 B_{j,2001} \times LTGInd + \beta_6 C3_{2001} \times LTGInd + e_{jt} \quad (11)$$

The data seems to provide evidence on bank-firm links that is consistent with the predictions of our theoretical model (see Table 9). In particular, the exposure to defaulted bonds in 2001 of the lenders that a firm borrows from has a negative effect on the post-default growth rate of the supply of credit available to that firm. Noticeably, due to the large change in relative prices implied by the real currency devaluation that followed the default, some firms in Argentina were able to grow even after the default. We show that the exposure effect is weaker for these firms.

6 Conclusions

In this paper we study the bank credit channel around an episode of sovereign default. To do so we use the Argentine default of 2001 as a natural experiment.

We propose a matching model where banks and firms set up lending relationships that are costly to replace and that become long-term contracts, as a result. We then use this theory to guide our design of the empirical model.

Having access to both bank-level and loan-level data for the banking sector in Argentina, we use the exposure to government bonds to identify shocks to the supply of credit. Having access to sector-level data for agriculture, manufacturing and services in Argentina, we then

use production data to identify demand-side effects.

We are able to show robust evidence that lenders exposure to defaulted sovereign bonds causes credit to shrink at the bank-level, firm-level, and loan-level.

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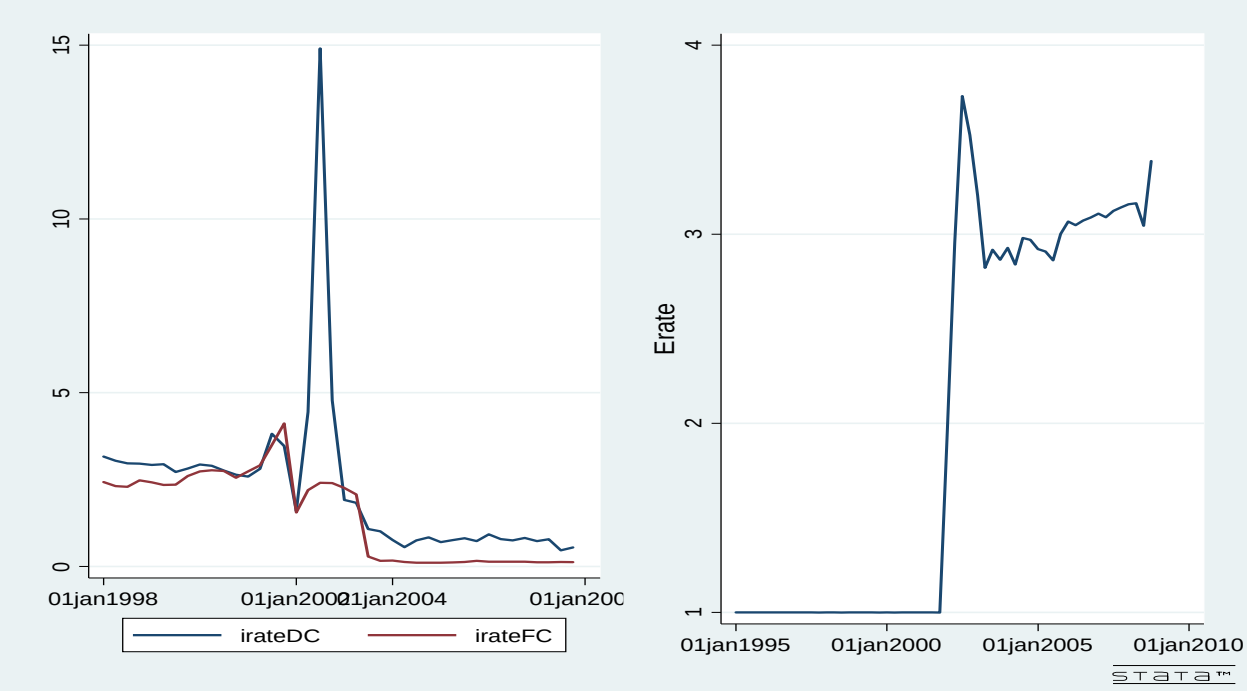
Figure 2: Peso depreciation



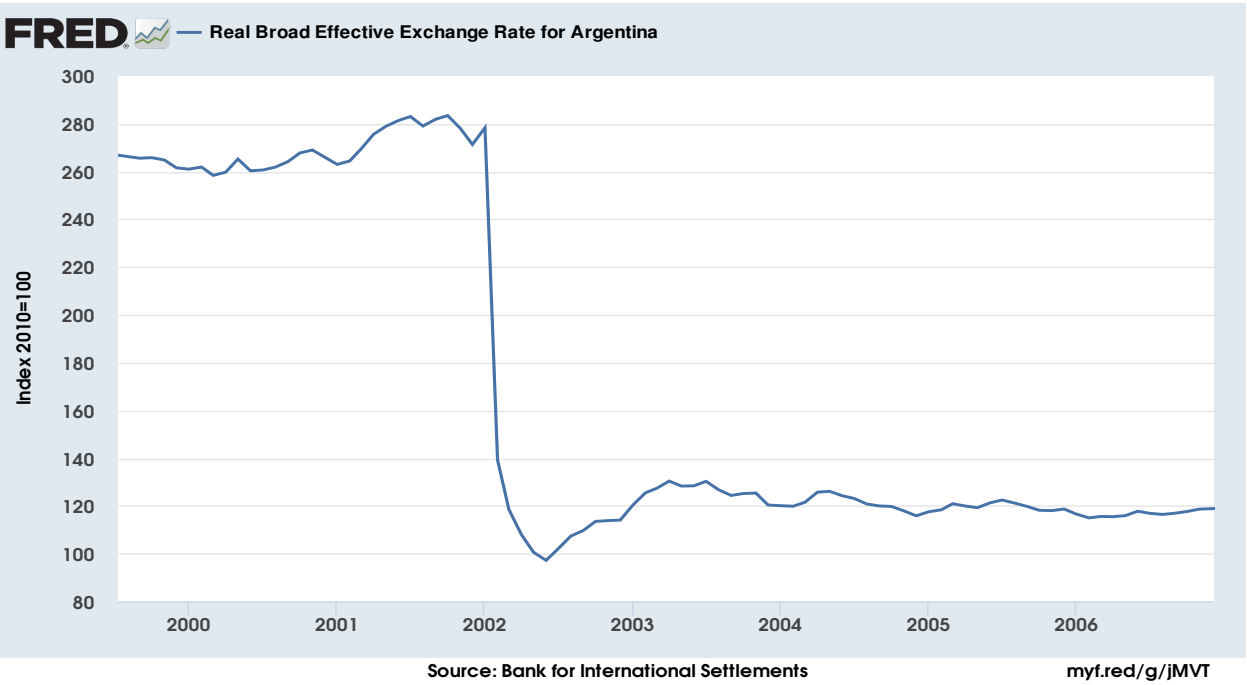


Figure 3: Growth and Inflation

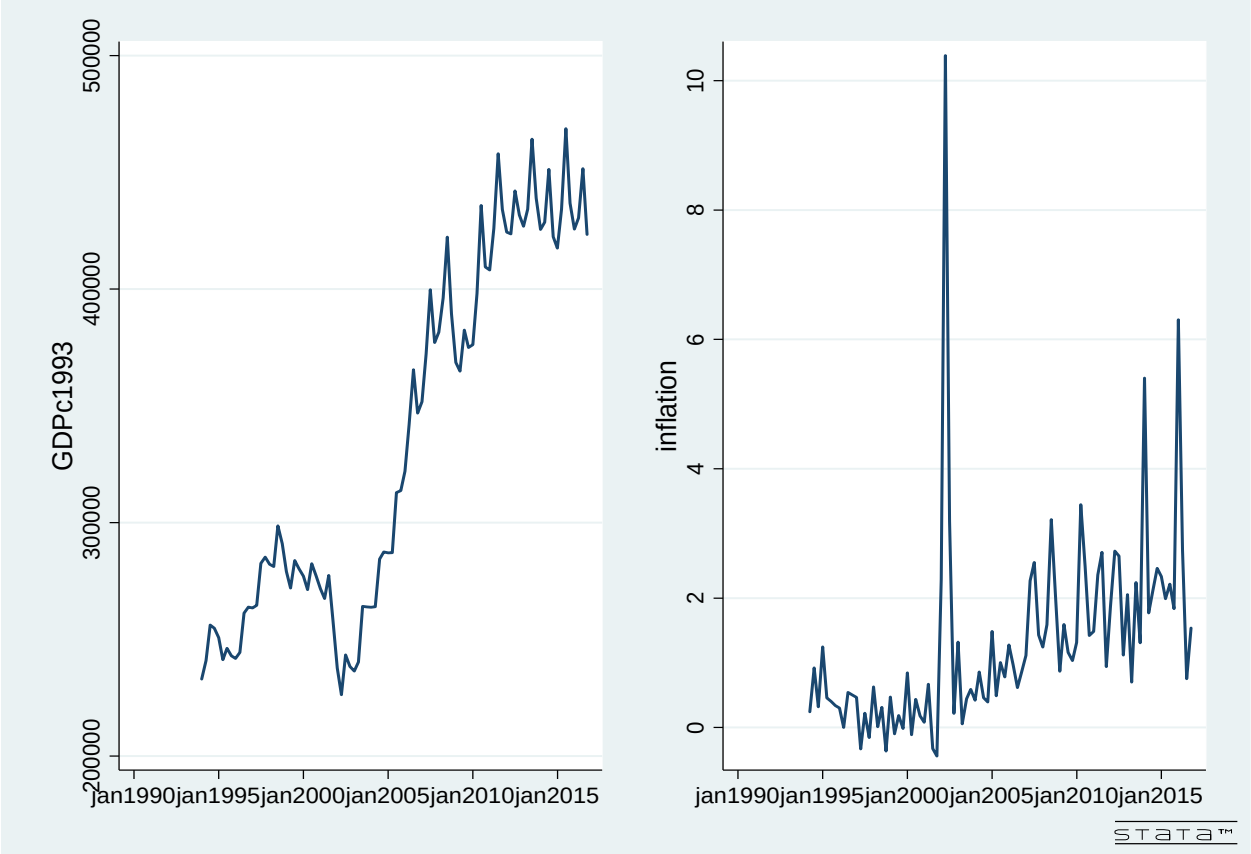


Table 1: Banking Sector Structure

	N	%
Private domestic banks	34	38.2
Private coop banks	1	1.12
Foreign banks	12	13.48
State-owned federal banks	3	3.37
State-owned provincial banks	10	11.24
Affiliates of foreign banks	11	12.36
Cajas de crédito	2	2.25
Domestic financial companies	4	4.49
Foreign financial companies	12	13.48

Table 2: Bank Structure

	N	%
Retail - large	10	11.24
Retail - mid-size	11	12.36
Retail - small	18	20.22
Wholesale - large	7	7.87
Wholesale - other	12	13.48
State-owned federal	3	3.37
State-owned provincial	10	11.24
Non-bank institutions	18	20.22

Table 3: Bank-Level Data: Loans and Equity

(% of total assets)	Private		State-owned	
	Pre-2001	**Post-2001**	**Pre-2001**	**Post-2001**
Loans				
- Public sector	5.62	6.40	14.49	9.85
- Financial sector	3.23	1.52	2.82	0.70
- Private non-financial sector	42.25	38.90	37.18	24.25
- Foreign residents	0.88	0.45	0.17	0.13
Equity	13.33	13.06	9.36	8.53

Balance Sheet Composition by Exposure Level

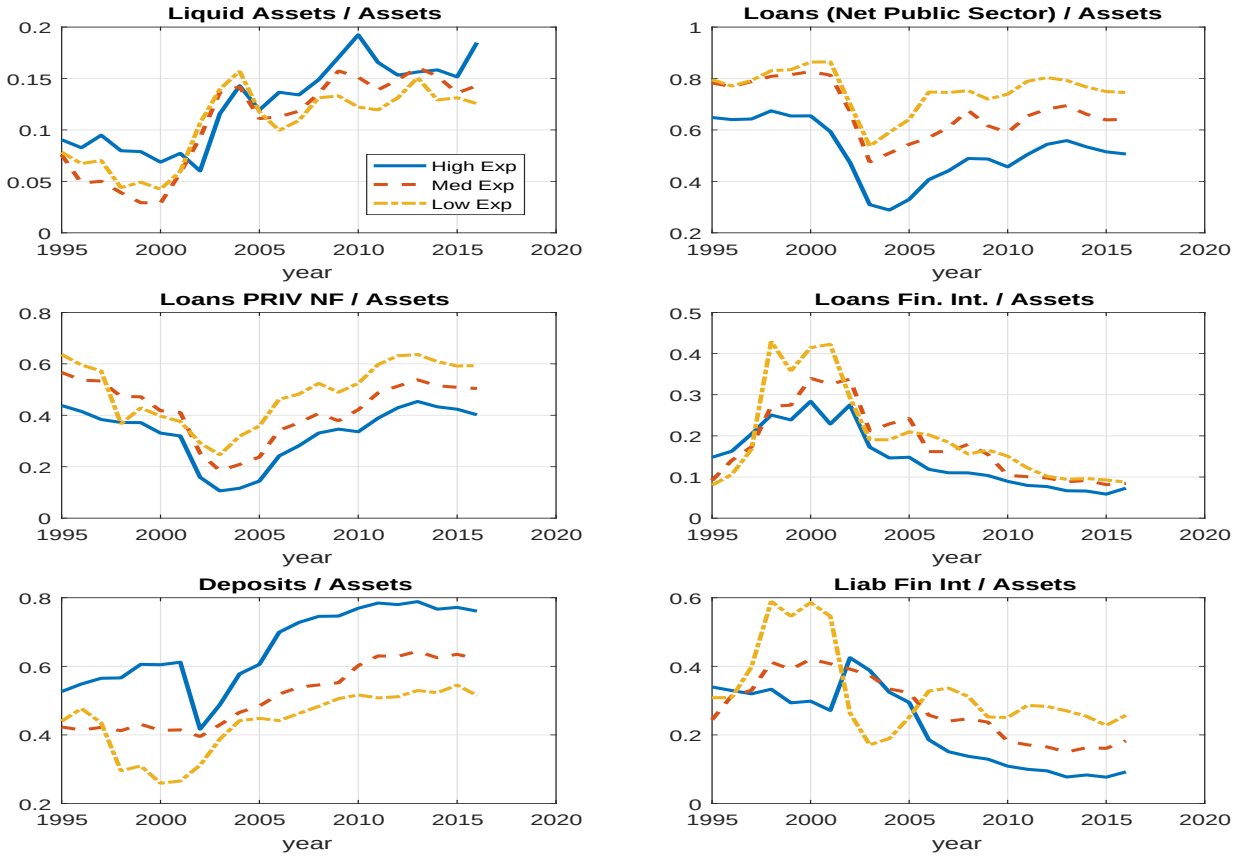


Table 4: Bank-Level Data

(% of total assets)	Private		State-owned	
	Pre-2001	**Post-2001**	**Pre-2001**	**Post-2001**
Total exposure	12.40	13.14	24.41	27.07
Public Bonds	7.89	15.28	9.51	29.77
- Government	7.89	6.71	9.51	14.85
- Central Bank	0.00	10.21	0.00	17.38
Public Bonds (foreign currency)	6.85	3.17	8.40	3.26
- Government	6.85	2.97	8.40	3.11
- Central Bank	0.00	1.04	0.00	0.91

Sovereign Debt Exposure of Banks

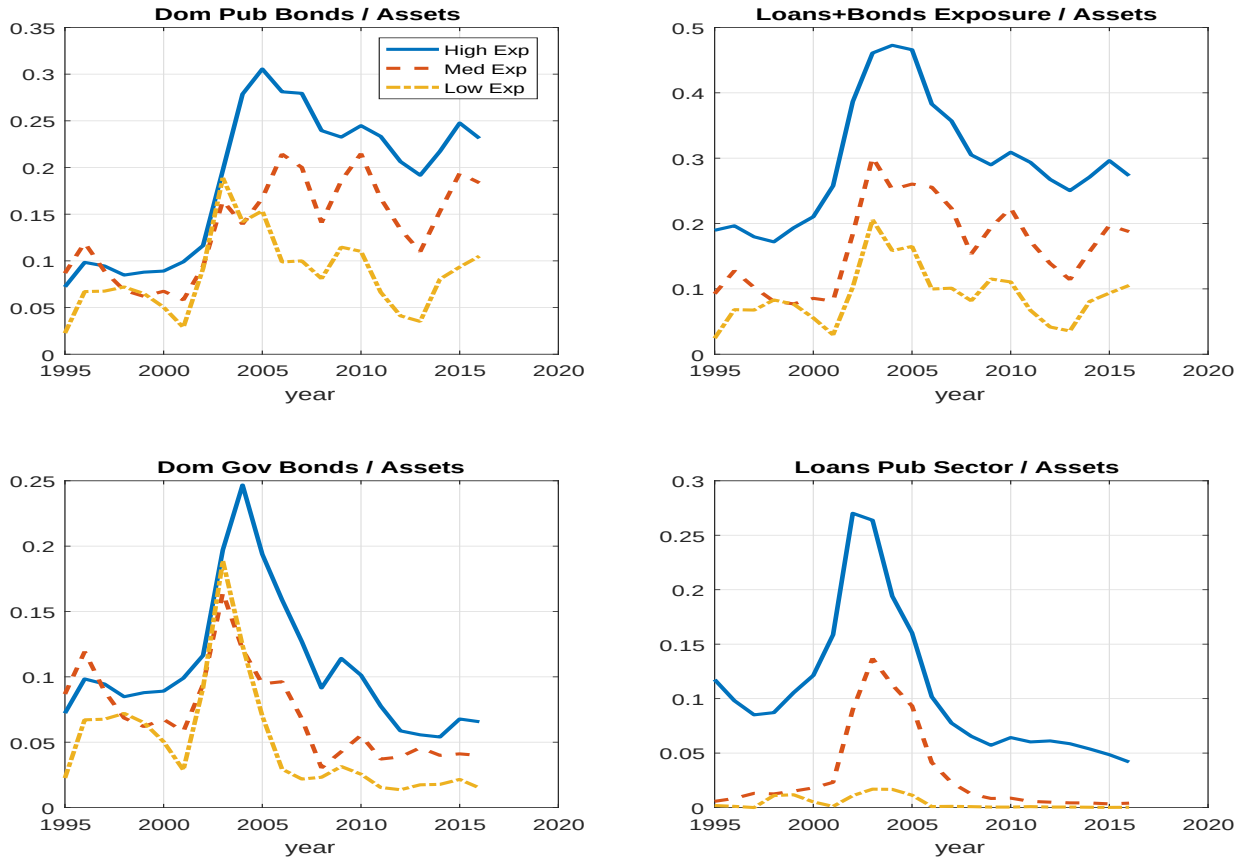


Table 5: Firm-Level Data

Sector	N	%
Agro	42	10.74
Textiles & garments	11	2.81
Cars	14	3.58
Chemicals	6	1.53
Construction	24	6.14
Equipment & high-tech	29	7.42
Metals	6	1.53
Oil and mining	30	7.67
Paper and forestry	4	1.02
Pharmaceuticals	13	3.32
Proc. foods & beverages	46	11.77
Energy	37	9.46
Retail	24	6.14
Editorial & publishing	3	0.77
Finance & insurance	50	12.79
Government	3	0.77
Other services	42	10.74
Total	391	

Table 6: Bank-Level Data: Bank Exposure and Credit

$\Delta\ell_{it} = \ell_{it} - \ell_{it-1}$	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	1.730***	1.870***	1.077***	1.074***	1.068***	1.142***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Default	0.011	-0.010	-0.352***	-0.358***	-0.414***	-0.431***
	(0.68)	(0.69)	(0.00)	(0.00)	(0.00)	(0.00)
Exp × Def	-0.793***	-0.882***	-0.396***	-0.430***	-0.374**	-0.095
	(0.00)	(0.00)	(0.01)	(0.00)	(0.02)	(0.57)
Liq. Assets		0.571***	0.529***	0.522***	0.513***	0.537***
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage		0.125*	0.337***	0.366***	0.424***	0.336***
		(0.08)	(0.00)	(0.00)	(0.00)	(0.00)
Loans PNF			-1.617***	-1.657***	-1.657***	-1.672***
			(0.00)	(0.00)	(0.00)	(0.00)
Profitability (ROA)				0.442***	0.533***	0.512***
				(0.00)	(0.00)	(0.00)
Change Dep					0.193***	0.194***
					(0.00)	(0.00)
Change Dep× Def					-0.033	-0.077***
					(0.16)	(0.00)
Exp × Def× Dep Run						-0.983***
						(0.00)
Bank fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	no	no	no	no	no	no
N	6,519	6,519	6,519	6,519	5,871	5,871
Avg Num Banks	89	89	89	89	77	77
R-squared	0.032	0.034	0.102	0.105	0.145	0.151

Note: Bank fixed effects are included in all regressions. p-values in parentheses.

Table 7: Bank Exposure and Credit by Bank Type

$\Delta\ell_{it} = \ell_{it} - \ell_{it-1}$	Private Banks	Big Banks	Private Big Banks
Exposure	1.089*	1.082*	0.574*
	(0.00)	(0.00)	(0.00)
Default	-0.403*	-0.136*	-0.217*
	(0.00)	(0.00)	(0.00)
Exp × Def	-0.324*	-1.140*	-0.446*
	(0.08)	(0.00)	(0.06)
Liquidity	0.716*	-0.082	0.133
	(0.00)	(0.66)	(0.45)
Leverage	0.594*	-0.289*	-0.642*
	(0.00)	(0.05)	(0.00)
Loans PNF	-1.772*	-0.689*	-1.052*
	(0.00)	(0.00)	(0.00)
Profitability (ROA)	0.477*	-0.357	-0.316
	(0.00)	(0.20)	(0.19)
$\Delta d_{it} = d_{it} - d_{it-1}$	0.189*	0.330*	0.317*
	(0.00)	(0.00)	(0.00)
Δd_{it}× Def	-0.022	-0.464*	-0.212*
	(0.36)	(0.00)	(0.00)
Bank Fixed Effects	yes	yes	yes
Time Fixed Effects	no	no	no
N	4,909	840	639
R-squared	0.153	0.274	0.274

Note: Bank fixed effects are included in all regressions. Average number of banks is 64, 10 and 8. p-values in parentheses.

Table 8: Relationship-Level Regressions

$\Delta\ell_{ijt} = \ell_{ijt} - \ell_{ijt-1}$	(1)	(2)	(3)	(4)	(5)	(6)
Exposure	4.230***	4.219***	3.801***	3.321***	3.269***	2.705***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Default	-0.013	-0.018	0.156	-0.408**	-0.414**	-0.320**
	(0.90)	(0.86)	(0.17)	(0.01)	(0.01)	(0.03)
Exp × Def	-4.418***	-4.406***	-3.902***	-3.655***	-3.598***	-3.015***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Liquidity				0.299	0.543	0.586*
				(0.27)	(0.11)	(0.09)
Leverage				0.642	0.716	0.749*
				(0.15)	(0.12)	(0.10)
Loans PNF				-0.930**	-0.886**	-0.817**
				(0.01)	(0.02)	(0.03)
Profitability (ROA)				-0.689	-0.897	-0.816
				(0.42)	(0.30)	(0.35)
$\Delta d_{it} = d_{it} - d_{it-1}$					0.178**	-0.282***
					(0.04)	(0.00)
$\Delta d_{it}\times$ Def					-0.158*	-0.264***
					(0.07)	(0.00)
Firm Fixed Effects	no	no	yes	yes	yes	yes
Sector Fixed Effects	no	yes	no	no	no	no
Time Fixed Effects	no	no	no	no	no	yes
N	4,309	4,309	4,309	4,309	4,270	5,871
R-squared	0.024	0.025	0.109	0.112	0.113	0.151

Table 9: Linked Bank-Firm Data: Credit and Default Exposure

$\Delta L_{jt} = \log(L_{jt+1}) - \log(L_{jt-1})$	(1)	(2)	(3)
Exposure 2001	-3.218**	-3.271**	-2.674*
	(0.038)	(0.046)	(0.100)
Exp 01 × LTG Ind.	2.770*	3.190	3.590
	(0.080)	(0.286)	(0.228)
# Banks 2001	-0.0101	-0.0125	-0.00284
	(0.156)	(0.102)	(0.724)
# Banks 01 × LTG Ind.	0.0250**	0.0216*	0.0256**
	(0.033)	(0.095)	(0.048)
Debt in 2001	0.000538	0.000658	0.000356
	(0.270)	(0.204)	(0.494)
Exposure	-0.687*	-0.723*	-0.675*
	(0.064)	(0.055)	(0.072)
Con. Index (C3) in 2001		-0.00164	-0.00299
		(0.389)	(0.120)
C3 in 01 × LT Growth Ind.		-0.000195	0.000398
		(0.946)	(0.891)
Con. Index (C3)			0.0106***
			(0.000)
Year FE	yes	yes	yes
Sector FE	yes	yes	yes
N	1,284	1,284	1,284
R-squared	0.071	0.072	0.083

Note: L_{jt} refers to total loans to firm j in period t. Δ is the annualized growth rate. The exposure measure ("Exp") corresponds to the cross-sectional average across all banks that operate with firm j. Sample period is 2003-2005. Number of banks refers to the number of banks that extend loans to firm j. The long-term growth indicator is set equal to 1 if the annualized value of 4-year growth is greater than 1%. We use a monthly sample of linked bank-firm observations.