Federal Reserve Bank of Philadelphia

Working Papers
Research Department

WP 19-43
October 2019
https://doi.org/10.21799/frbp.wp.2019.43

Relationship Networks in Banking Around a Sovereign Default and Currency Crisis

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ISSN: 1962-5361

Relationship Networks in Banking Around a Sovereign Default and Currency Crisis*

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October 23, 2019

Abstract

We study how banks' exposure to a sovereign crisis gets transmitted onto the corporate sector. To do so we use data on the universe of banks and firms in Argentina during the crisis of 2001. We build a model characterized by matching frictions in which firms establish (long-term) relationships with banks that are subject to balance sheet disruptions. Credit relationships with banks more exposed to the crisis suffer the most. However, this relationship-level effect overstates the true cost of the crisis since profitable firms (e.g., exporters after a devaluation) might find it optimal to switch lenders, reducing the negative impact on overall credit and activity. Using linked bank-firm and firm-level data we find evidence largely consistent with our theory.

Keywords: Sovereign Default, Devaluation, Bank networks.

JEL Classifications: E32, G21, H63, N26.

*The views expressed in this paper do not necessarily reflect those of the Federal Reserve Bank of Philadelphia, the Federal Reserve System or the Central Bank of Argentina. For very helpful comments we thank the editorial committee of the IMF-CBC-IMFER Conference on Current Policy Challenges Facing Emerging Markets and conference participants at the 2019 Society of Economic Dynamics Meetings, 2018 Spring Midwest Macroeconomics Meetings, the CORE 2018 meetings in Córdoba, Argentina, Swarthmore College, and the 2018 Meetings of the LACEA in Quito, Ecuador. We thank Laura D'Amato for valuable help with this project. This Philadelphia Fed working paper represents preliminary research that is being circulated for discussion purposes. The views expressed in this paper are solely those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. Any errors or omissions are the responsibility of the authors. Philadelphia Fed working papers are free to download at www.philadelphiafed.org/research-and-data/publications/working-papers.

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1 Introduction

We empirically and theoretically study the impact of banks' exposure to sovereign default and a large devaluation on the supply of credit. To identify shocks to credit supply from those to credit demand, we use the case of the Argentine default of 2001, followed by a sharp and lasting currency devaluation. In December 2001 Argentina declared default on $95 billion worth of sovereign debt (37% of GDP). As a result, by December 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). Since most of the debt was denominated in foreign currency, the debt-to-GDP ratio jumped to 150%. By December 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.[1]

The combination of a default and a sharp devaluation is of particular interest to us and provides a good natural experiment since, within a crisis environment, our data allows us to identify contemporaneous credit supply and demand shocks. The 2001 crisis in Argentina involved severe changes in the real exchange rate. Therefore, some firms (the exporters) saw their terms of trade improve dramatically (which we identify as a credit demand shock). The theoretical model proposed in this paper predicts that firms with a positive shock increase their demand for credit but are affected by the quality of their banking network (affected by the sovereign default and the devaluation - i.e., the credit supply shock). Exporters with relationship networks that are relatively unaffected by the sovereign default will be able to borrow and profit from their improved terms of trade. On the other hand, exporters operating within banking networks that saw their credit supply limited by the sovereign default faced incentives to look for new lenders and expand their banking network. Under a search and matching friction in the banking sector, the search for new lenders takes time (and possibly resources). This mechanism implies that exporting firms with better banking networks pre-crisis will be able to react faster to the new terms of trade than their counterparts with banking relationships relatively more exposed to the default.

We start our analysis by exploiting the variation in the data at the bank level. We benefit from rich detail in our data on alternative measures of sovereign debt exposure. Around this default episode, we can see large month-to-month variations across banks of different types and across bonds denominated in domestic versus foreign currency. Also, given the monthly frequency of our data, we can identify the contemporaneous impact of the default from its long-run effects. In section 4, we follow Gennaioli, Martin, and Rossi

[1]See section 2 for a review of the events prior, during and after the default of 2001.

(2018) and estimate the correlation between the pre-shock exposure of banks to sovereign default (via their holdings of sovereign debt and loans to the public sector) and devaluation (via their holdings of non-deposit foreign currency liabilities) on credit post-default when controlling for other bank-level factors and year fixed effects. We find that exposure to sovereign debt and foreign currency at the time of default has a negative correlation with the growth of credit post-default. Admittedly, when trying to identify the supply-side effects of this shock, resorting to bank-level data would suffer from an identification bias if banks most severely exposed to defaulted loans were systematically those lending to firms for which the demand for credit suffered the most during the crisis. Thus, we interpret the robust negative correlation between exposure (sovereign debt and foreign currency) and lending that we obtain from this analysis as indicating that the "supply" channel has the *potential* to be relevant in explaining the decline in credit post-crisis. Clearly though, more is needed to accurately identify this channel.

We then proceed to build a theoretical framework that helps us address this identification bias. The model is based on search frictions with relevant empirical implications. Non-financial firms establish relationships with multiple banks (banking networks) that give them access to credit. In the event of a negative credit supply shock (i.e., a sovereign default or a large devaluation), firms with banking networks that are relatively unaffected by the shock will have their access to credit relatively unchanged (compared with firms that work with a network of banks that are very exposed to the shock).[2]

In order to disentangle the supply and demand effects in credit markets, we use the theoretical model and its relationship-level testable implications as a guiding tool to design the empirical regressions using bank-firm-level (relationship-level) data. The data on these bank-firm links provide evidence that is consistent with the predictions of our model. In particular, links that were more exposed to defaulted bonds in 2001 show a negative and significant relationship with the growth rate of credit post-default.

Our model also shows that firms might be able to undo the effects of the credit supply shock by switching lenders (see Hubbard, Kuttner, and Palia (2002), Khwaja and Mian (2008), and Becker and Ivashina (2014)). If that was the case, our results from the relationship-level data would be overestimating the true negative effects of lenders' exposure on firms' availability of credit. To study this issue, in our last set of experiments we assess the impact of the firm-level lending network prior to the shock on the changes in credit

[2]One observation is that, as in Bocola (2016) and Rojas (2018), the decision of the sovereign to default or leave the currency peg is not actually modeled. Any financial shock that has qualitatively similar implications for banks would operate in the same way, whether it was the result of a government default or not. Default events (e.g., Argentina 2001) or episodes of high default risk have provided valuable natural experiments for teasing out the effects of financial shocks in the cross section of firms.

post-default and devaluation as well as on the probability of creating new relationships, the extensive margin of exports, and the probability of default. The data are fully in line with the predictions of the model. While some firms (mostly exporters) undo the effects of the credit supply shocks deriving from the exposure of their network to sovereign debt, other firms are negatively affected.[3] Interestingly, the devaluation affects considerably more foreign banks and, via this channel, exporter firms more than non-exporters. These results are robust to controlling for the quality of the network (such as the concentration in a set of banks, the size of the banking network, the age of the relationships) and firm characteristics. Moreover, the exposure of the banking network to a sovereign default and currency devaluation raises the probabilities both of creating a new banking relationship and of default (at the firm level), and negatively impacts the likelihood that a firm will be able to export post-default.

Following this introduction the paper proceeds as follows. In Section 1.1 we review previous related work. Section 2 provides the historical background that led to the sovereign default crisis of 2001 and the currency crisis of 2002 in Argentina. In Sections 3 and 4, respectively, we describe the bank-level data and provide empirical evidence derived from these data. In Sections 5 and 6, respectively, we present the model and empirical evidence derived from its testable implications. In Section 7, we present the evidence derived from firm-level data on firms' access to credit as well as on their probability of switching lenders and starting new relationships, exporter status and probability of default. In Section 8, we conclude and provide some thoughts on the policy implications of our model and results. We discuss how policies that would ease credit access for firms linked to a network of banks (relatively) more exposed to a sovereign default or a large devaluation can reduce the cost of a financial crisis.

1.1 Literature Review

Our work belongs to a recent literature that resorts to relationship-level data to identify the effects of sovereign default episodes and other events that imposed unanticipated shocks on the supply of credit. Some of these papers focus on the effects of crises in emerging economies (e.g., Khwaja and Mian (2008), Kalemli-Ozcan, Kamil, and Villegas-Sanchez (2016)), while others study the 2008 financial crisis in the U.S. (e.g., Chodorow-Reich (2013), Chava and Purnanandam (2011), Adrian, Colla, and Shin (2012), Montoriol-Garriga and Wang (2012), Duygan-Bump, Levkov, and Montoriol-Garriga (2014) and Greenstone, Mas, and Nguyen

[3]Other papers have focused on imports rather than exports as a way to document negative effects of sovereign default or devaluations (e.g. Mendoza and Yue (2012) and Gopinath and Neiman (2014)). We focus on exports instead for two reasons. First, we use the exporter nature of some firms in our sample as a way to identify positive credit demand shocks. Second, our dataset of the universe of firms in Argentina does not include the importer identifiers.

(2014)), the European Sovereign Debt crisis (e.g., Jiménez et al. (2014), Bottero, Lenzu, and Mezzanotti (2015) and Alfaro, García-Santana, and Moral-Benito (2019)) or the real estate crisis in Japan (e.g., Gan (2007) and Amiti and Weinstein (2018)).[4] An important contribution of this line of research has been to develop an approach to identify credit supply shocks based on the observation that, as in our model, credit relationships are sticky and firms that borrow from a healthier, less exposed bank (or network of banks) have less difficulty obtaining credit after a crisis. The methodology for estimating the bank-lending channel focuses on firms' borrowing from multiple banks, where the banks differ in their exposure to sovereign debt or foreign currency liabilities.[5] This within-firm variation provides a plausible strategy for identification of the supply shock that we are after.

Khwaja and Mian (2008) develop the methodology to disentangle the bank-lending channel and the firm borrowing channel. They 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 an 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 1990s banks with greater real-estate exposure contracted loan supply significantly more. Montoriol-Garriga and Wang (2012) use loan-level data for the United States during the Great Recession and find evidence that the degree of credit rationing was significantly greater for small businesses. Chodorow-Reich (2013) combines loan-level data for American non-financial firms with employment data for the crisis period of 2008-2009 and concludes that the state of the lenders network has a significant effect on employment at small and medium-sized firms but no effect on the larger and more transparent firms. 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 (2018) 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 between firms with access to capital markets and less capitalized banks. Bottero, Lenzu, and Mezzanotti (2015) use data for all Italian banks and a large sample of firms from 2009-2011 and document the impact of banks' sovereign exposure using the 2010 Greek bailout as a natural experiment. Amiti and Weinstein (2018) use a vast sample of matched bank-lender data for the universe of listed Japanese firms from

[4]Some papers trying to estimate the effect of a sovereign default on bank lending use bank-level data (e.g., Pérez (2015) and Gennaioli, Martin, and Rossi (2018)). One shortcoming shared by papers using bank-level data is the difficulty with identifying supply from demand-side effects.

[5]Then, using firm-month fixed effects (among other controls), it is possible to compare the growth of a given firm's credit from one bank with minimal exposure to default and devaluation risk to that from another more affected bank.

1990 to 2010 to identify bank supply shocks. They find significant effects of these shocks on firms' capital expenditure. Last, Alfaro, García-Santana, and Moral-Benito (2019) combine registry data for all firms in Spain with bank-firm level data and firm-specific measures of upstream vs downstream exposure and find that credit shocks have significant effects on investment but not on employment during the recovery. Using the Spanish input-output matrix they also document that the downstream effects are quantitatively even larger than the direct effects. Popov and Van Horen (2014) study syndicated loans for all 119 European banks and find that lending by non-PIIGS banks exposed to sovereign debt issued by PIIGS countries contracted relative to non-exposed banks.

Other papers use different approaches to identify credit supply shocks. These include the paper by Adrian, Colla, and Shin (2012) who study the financial crisis of 2007-2009 in the United States by using a micro-level dataset on new loans and bonds issued by US non-financial corporations between 1998 and 2010 on both quantities and price of new credit, which allows them to identify supply from demand shocks in this market. They conclude that this crisis was characterized mostly by a credit supply shock more than a demand shock. To separate demand from supply effects of a negative shock to the capitalization of US banks, Chava and Purnanandam (2011) resort to a foreign shock, the Russian crisis of 1998, arguing that it affected banks but not borrowers. They exploit the variation in the effects of this shock between firms with and without access to public debt markets, and they document a negative effect of this shock on firms' valuation and a decline in their capital investment and profitability. Duygan-Bump, Levkov, and Montoriol-Garriga (2014) identify credit supply shocks by using industry-level measures of dependence on external financing. They study the effects of small business financing constraints on employment during the Great Recession in the United States. They show that the likelihood of becoming unemployed was larger for small firms with high external financing needs.

Closely related to our paper is the work by Paravisini et al. (2014) and Kalemli-Ozcan, Kamil, and Villegas-Sanchez (2016).[6] Paravisini et al. (2014) study the link between credit access and firm performance using matched firm-level credit data as well as customs data for firms in Peru during the financial crisis of 2008. They focus on the exporters sector and find that, by raising variable costs of production (and not so much sunk entry costs), credit shortages reduce exports but have no significant effect on firms' entry to new product and

[6] Also related are Paravisini (2008), Becker and Ivashina (2014) and Greenstone, Mas, and Nguyen (2014). Using bank-level data, Paravisini (2008) studies a program of subsidized bank financing for small firms (PyMES) in Argentina and documents a positive effect on bank lending. Using firm-level data, Becker and Ivashina (2014) study the substitution between bank loans and non-bank debt. Greenstone, Mas, and Nguyen (2014) find that the 2007-2009 crisis had significant negative effects on employment for both small firms and overall.

destination markets (the extensive margin). We complement their work by analyzing a more direct shock to banks' balance sheet and firms' investment opportunities. Kalemli-Ozcan, Kamil, and Villegas-Sanchez (2016) study the effects of shocks to lending on firms' corporate investment in Latin America during large devaluations. They find that domestic exporters holding unhedged debt in foreign currency decrease investment while foreign-owned exporters with better access to credit from their parent company increase investment despite their unhedged foreign currency debt. While we do not have access to the currency composition of firm's debt, our paper builds upon Kalemli-Ozcan, Kamil, and Villegas-Sanchez (2016) by analyzing the universe of firm-bank data during the devaluation and financial crisis in Argentina in 2001. In addition, as we describe in Section 2, after the default and the devaluation of the peso (275%), the Argentine government announced the conversion of all dollar denominated deposits (74% of total deposits) to pesos at the exchange rate of \$1.4=US\$1 and all loans to the private sector denominated in dollars (under domestic law) at the rate of \$1=US\$1, making the "balance sheet" channel less important for the great majority of firms in our sample (since for most firms in our sample the only source of external financing were bank loans).

Last, our paper belongs in the literature started by Manova (2012), Mendoza and Yue (2012), and Gopinath and Neiman (2014) who study the amplification effects of financial crises and sovereign defaults via a restriction on trade flows.[7]

In a recent paper, Hébert and Schreger (2017) estimate empirically the costs of a sovereign default. They use United States court rulings against the Argentine government to identify exogenous default shocks and document the negative effect of default on the value of the small set of Argentine publicly traded firms. They also find that foreign-owned firms, exporters, banks and large firms tend to be disproportionately affected, which is consistent with what the theory on sovereign default predicts. Our paper contributes to this line of work by exploiting the loan-level variation in our data and by looking at all firms rather than just the publicly-traded ones. We believe we also contribute by focusing on the Argentine default of 2001, the largest in world history, and 300% currency devaluation of 2002. Also, our bank-level data have a rich level of detail in terms of types of securities held by banks and currency composition of both the assets side and the liabilities side of their portfolio.

[7]Mendoza and Yue (2012) and Gopinath and Neiman (2014) focus on the real effects of devaluations through importers. We use the devaluation as a way to identify positive credit demand shocks. In addition, we do not have access to importer identifiers. Also related, Arellano, Bai, and Bocola (2017) study the endogenous cost of default 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 and develop a structural model to understand the empirical findings. Rojas (2018) also presents a model with an endogenous firm size distribution to study the link between firm dynamics and sovereign defaults.

2 The 2001 Crisis in Argentina

Pre-Default and Devaluation Period

Since the early 1990s Argentina used a currency board to peg the peso to the US dollar at \$1 peso= US\$1, adopted a set of market-oriented reforms and restructured its sovereign debt (Brady deal in 1992). The new monetary regime provided fresh access to capital markets and led to a sharp decline in inflation and a few of years of economic growth. The Tequila crisis in 1995 impacted Argentina and resulted in the implementation of further reforms and consolidation in the Argentine banking sector (see Calomiris and Powell (2001) and Guidotti and Nicolini (2016)). Several macro-prudential policies (e.g., a reform of the reserve requirement, enhanced liquidity requirements, implementation of capital requirements following Basel guidelines) were put in place, and in May 1995 deposit insurance funded through risk-based bank specific premiums was reestablished for small deposits.[8,9]

During the Asian crisis of 1997 and the Russian crisis of 1998 bank deposit and credit growth slowed in Argentina, but in contrast to other emerging economies, both the real and the financial sectors weathered these storms relatively well. From 1996 to 1998, the financial system grew strongly with deposits rising at an average year over year rate of 25% and credit to the private non-financial sector growing at 19% (see Panel (*i*) in Figure 1).[10]

Between 1997 and 1998 there were several significant transactions that resulted in the purchase of domestic banks by foreign institutions with the associated entry of foreign capital to the system. The decline in loan and deposit market share experienced by public banks (see Panel (*ii*) in Figure 1) contributed to the perception of low systemic risk. In addition, many banks were allowed to fail after the Tequila crisis and, during these years, the financial sector observed a significant number of mergers (some assisted by the government) and privatizations. The currency board regime severely restricted the Central Bank's function of lender of last resort, and the international banks were perceived as safer and potentially the sources of hard currency in the event of a bank run. As a result, the number of financial institutions went from 212 in 1992 to 114 at the end of 2000. The fraction of foreign-owned banks increased from 15% to 45% and the number of public banks declined from 33 at the end of 1994 to 14 at the end of 2000.[11] During the same period GDP grew 5.8%, mostly

[8] Argentina had abolished deposit insurance in the early 1990s. When reestablished, deposit insurance covered only deposits below \$20,000 and then was expanded to deposits below \$30,000.

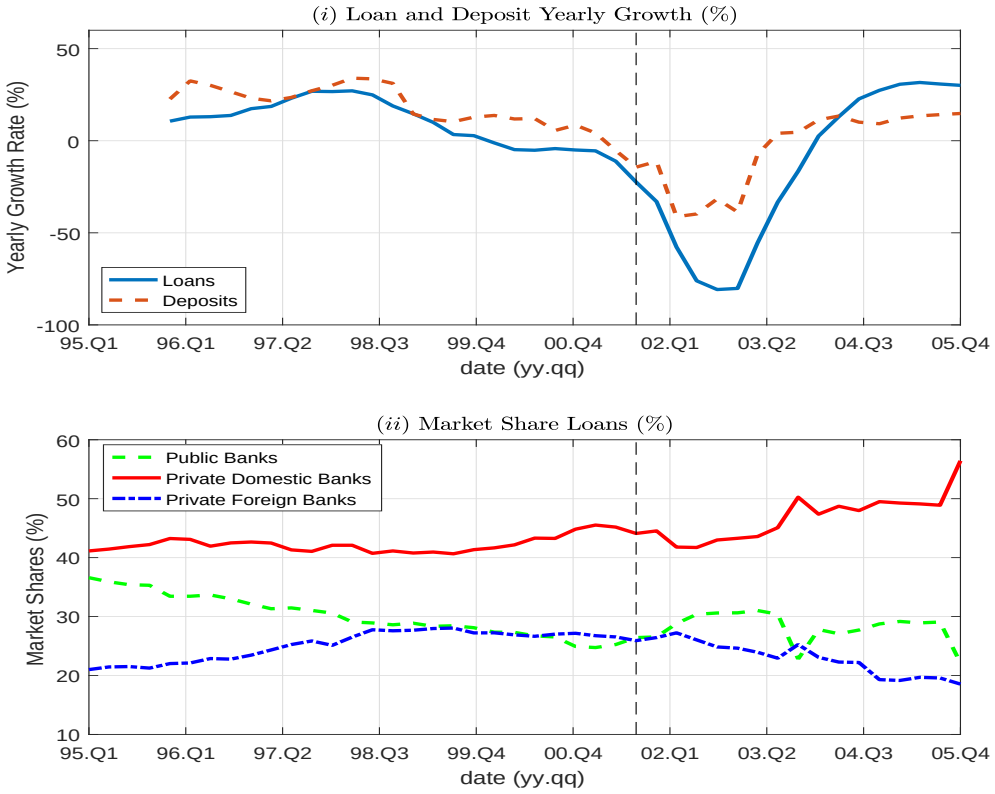
[9] Government bonds remained with a zero weight in the requirement for credit risk but became subject to a surcharge for market and interest-rate risk.

[10] Growth rates reported in real terms. See Section 3 for a full description of the data.

[11] Some public banks with a large market presence remained active, including Banco Nación, owned by the federal government, and Banco de la Provincia de Buenos Aires, owned by the government of Buenos Aires, the largest province in terms of GDP.

driven by export growth and investment (see Hausmann and Velasco (2002)).

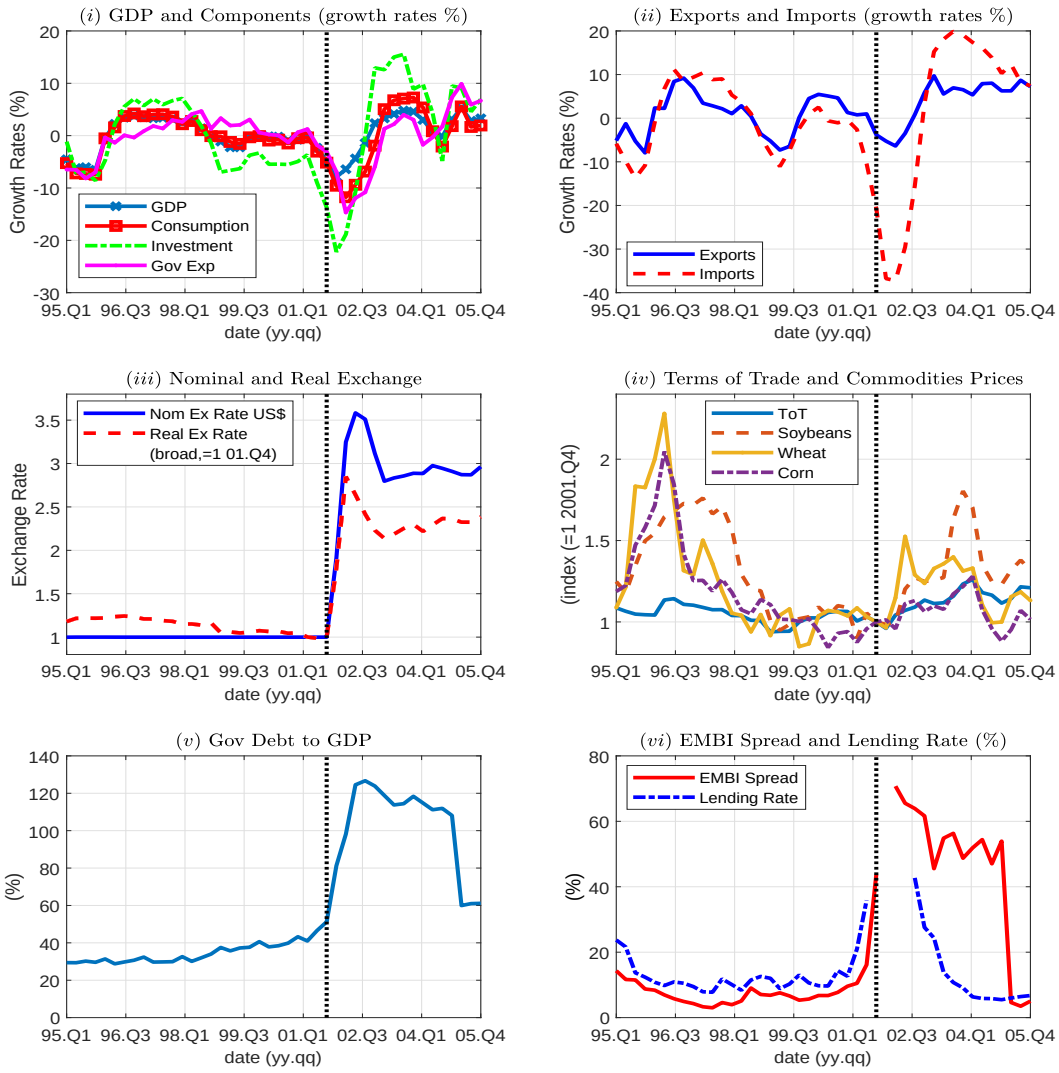
Figure 1: Credit and Deposit Growth and Banking Industry Structure



Note: Dashed vertical line corresponds to sovereign default period. In Panel (i), loans corresponds to loans to the private non-financial sector. Deposits corresponds to deposits to the non-financial sector. Growth rates are (real) year over year growth rates (deflated using the consumer price index). In Panel (ii), public banks refer to government-owned banks. Private domestic banks refer to private banks owned by domestic residents. Private foreign banks refer to banks owned by foreign institutions. *Source: Central Bank of Argentina.*

Figures 1 and 2 show that the economy as well as the growth of deposits and credit slowed down late in 1998, leading to a recession. The appreciation of the real exchange rate against most trading partners (particularly Brazil after a depreciation of the Real early in 1999) made evident how susceptible Argentina was to external factors. On the other hand, it kept the value of Argentina's external debt (mostly denominated in US dollars) artificially low (see De La Torre, Levy Yeyati, and Schmukler (2003)).

Figure 2: Evolution of Macro Aggregates

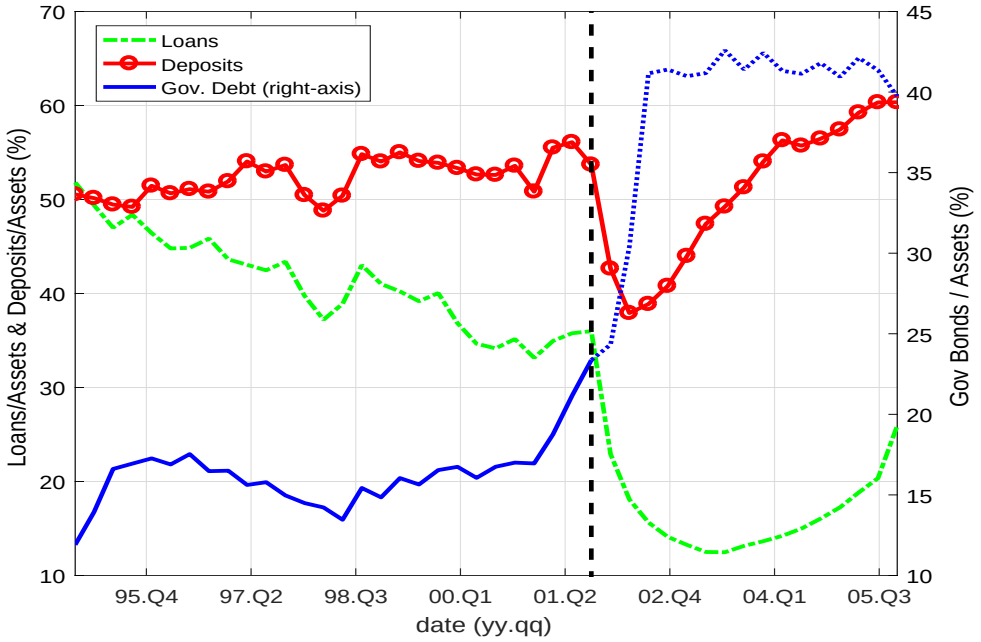


Note: Dashed line corresponds to the period of the sovereign default. Growth rates correspond to year over year growth rates. In Panel (i), GDP, Consumption, Investment and Government Expenditures are measured in real terms (pesos of 2004, deflated using the GDP deflator). In Panel (ii), exports and imports are measured in dollars. In Panel (iii), nominal exchange rates are measured as pesos per US$. Real Exchange Rate Index corresponds to the Broad Effective Exchange Rate Index-CPI based (normalized to 1 in 2001.Q4). Higher values correspond to a depreciation. In Panel (iv), terms of trade, the (dollar) price of a ton of soybeans, wheat and corn are normalized to 1 in 2001.Q4. In Panel (v), Government Debt to GDP corresponds to Federal Government Gross Debt to GDP. In Panel (vi), EMBI Spread corresponds to the J.P. Morgan Emerging Markets Bond Index Plus for Argentina. Lending Rate corresponds to the prime 30-day Lending Rate (in annual terms, denominated in pesos). *Source: International Financial Statistics of the IMF, Bloomberg, Argentina Secretary of the Treasury, and Haver Analytics from Instituto Nacional de Estadísticas y Censos (INDEC).*

While economic activity showed some signs of recovery in the second half of 1999 (industrial production increased 10% during this period), deposit and credit growth slowed further in 1999 and 2000. Deposits grew at an average annualized rate of 11% and credit to the private sector increased only, on average, 2% year over year. Argentina started 2000 with a sovereign debt to GDP ratio of 43% (see Panel (*v*) in Figure 2), and a change in government at the end of 1999 contributed to a decline in sovereign debt spreads to 538 basis points in March 2000 as measured by the Argentine component of the EMBI+ index (see Panel (*vi*) in Figure 2 and Guidotti and Nicolini (2016)).

Banks' exposure to the public sector increased considerably (Figure 3). The asset-weighted exposure to the public sector (measured as sovereign bonds plus public loans over assets) increased from 11.7% in 1995 to 16.9% at the end of 2000. During the same period the asset-weighted average of the ratio of loans to the non-financial private sector to assets went from 51.9% to 34.9%, suggesting that government borrowing was crowding out private credit.

Figure 3: Evolution of Balance Sheet Ratios



Note: The dashed vertical line corresponds to the period of the sovereign default. Variables reported are (asset-weighted) averages of ratios to total assets. Loans refers to loans to the private non-financial sector. Deposits refers to deposits from the private non-financial sector. Government Debt corresponds to banks' holdings of government bonds and loans to the public sector. Government Debt is plotted with a dotted line post-default since a large fraction of these holdings was in default. *Source: Central Bank of Argentina.*

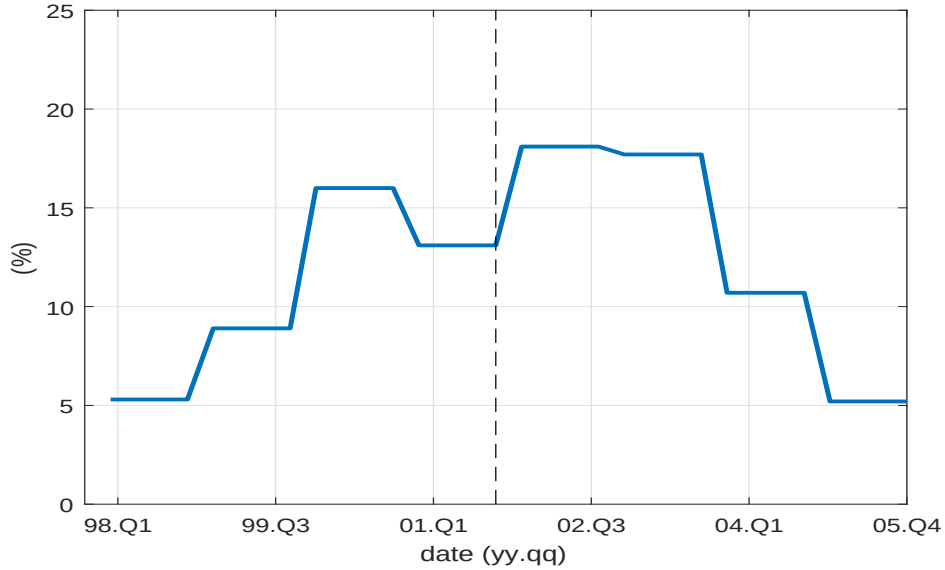
2001 Sovereign Default

Credit to the private sector started to decline in 2000 but started coming to an abrupt stop in 2001 (see Figure 3). The average year over year decline of credit to the non-financial private sector was 11%. In March 2001 a crisis within the president's cabinet induced the first run on deposits. In April 2001 the government used moral suasion to place US$2 billion of bonds with banks in Argentina, allowing banks to use those bonds to meet up to 18% of the liquidity requirement (see della Paolera and Taylor (2003) and De La Torre, Levy Yeyati, and Schmukler (2003)). The banking system thus became less liquid and more exposed to a government default. Total banking system claims on the government continued to increase to reach over 20% of assets (asset-weighted average) by the end of 2001. Spreads on government debt increased almost 200 basis points between April and June. Precisely, in mid-June, the government announced a $29.5 billion voluntary debt restructuring in which short-term debt was exchanged for new debt with longer maturities and higher interest rates. Shortly after, the spread on Argentine bonds increased to 1,300 basis points over U.S. Treasuries, consistent with an imminent default. In July and August, deposits fell by more than 11%. As Guidotti and Nicolini (2016) describe, while by mid-2001 48% of deposits were placed at branches and subsidiaries of foreign banks, these banks also faced significant deposit losses. In October and November, the last two months prior to the imposition of a restriction on deposit withdrawals (the so-called "corralito"), the deposit run accelerated and the fraction of the loan portfolio in default reached 13% (Figure 4).

Private consumption and GDP contracted significantly during 2001 (5.8% and 4.5%, respectively, see Panel (i) in Figure 2). In November 2001, the government exchanged government bonds held by banks for illiquid bonds called guaranteed loans ("prestamos garantizados").[12] At the end of November, sovereign spreads of government bonds over US treasuries were above 3000 basis points. On December 26, 2001 the government announced the suspension of sovereign debt payments. The default brought the financial system to the brink of collapse. However, the effects were heterogeneous depending on the exposure to government debt and foreign currency liabilities. More than half of government bonds and loans were in hands of private banks. It is also interesting (and relevant for identification) to understand the relative importance of these holdings for banks of different sizes and ownership structure.

[12]Each bond exchanged at par value for a guaranteed loan extended its maturity three years and bondholders could choose between a fixed or variable rate (Fernandez et al. (2007)). These loans were later part of the pesification.

Figure 4: Fraction of Loan Portfolio in Default

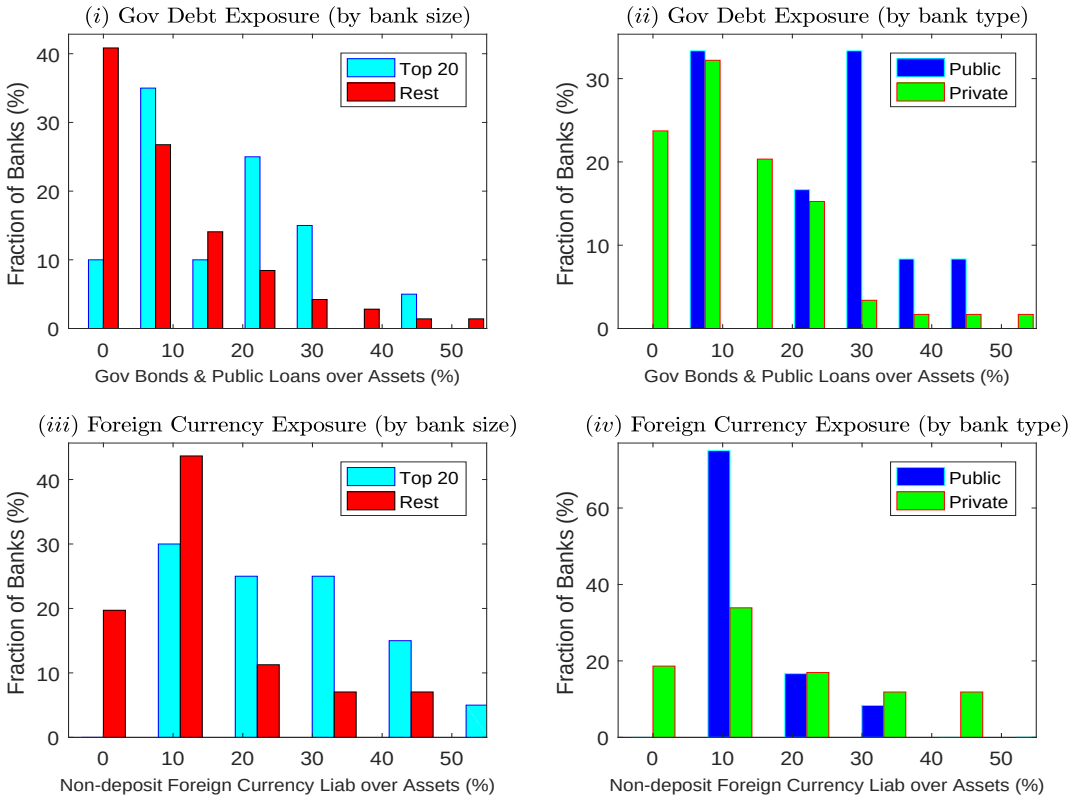


Note: Series corresponds to the ratio of bank non-performing loans (payments of interest and principal past due 90 days or more) to gross loans.
Source: World Bank, retrieved from FRED, Federal Reserve Bank of St. Louis.

We find that in 2001 there is substantial heterogeneity across banks in terms of their sovereign debt and foreign currency liabilities (as shares of their total assets). Figure 5 shows that, as a fraction of assets, the exposure to the government default was relatively more significant for large banks (top 20 when sorted by assets) than for small banks (the rest) and for public banks than for private banks. When it comes to exposure to foreign currency liabilities, Figure 5 also shows that it was relatively larger for the top 20 banks and for private than for public banks.[13]

[13]As we describe below, we use non-deposit foreign currency liabilities as our measure of foreign currency exposure because deposits in foreign currency were "pesified".

Figure 5: Distribution of Government Debt and Foreign Currency Exposure in 2001(by bank size and bank type)



Note: Government Debt Exposure refers to the ratio of government bonds and loans to the public sector to assets. Foreign Currency Exposure corresponds to the ratio of non-deposit liabilities denominated in foreign currency to assets.
Source: Central Bank of Argentina.

Post-Default Period: Devaluation and Pesification

Formally, the government abandoned the currency board on January 7, 2002. An initial devaluation of 40% proved to be insufficient and was followed in February by the implementation of a dirty-float exchange rate regime that led to a further depreciation of the currency (see Figure 2 and De La Torre, Levy Yeyati, and Schmukler (2003)). The exchange rate jumped to $2.15 pesos per dollar at the end of February (a 215% devaluation in two months). Together with the new exchange rate regime, the government announced the conversion of all dollar denominated deposits (74% of total deposits) to pesos at the exchange rate of $1.4=US$1 and their indexation to the CPI. While deposits increased in January and February due to the forced conversion to pesos, they continued to decline during 2002.

All loans to the private sector denominated in dollars (under domestic law) were also converted to pesos at the rate of \$1=US\$1 (75% of domestic loans were denominated in foreign currency).[14] Like foreign currency deposits, sovereign bonds and public credit denominated in dollars under domestic law were converted to pesos at \$1.4=US\$1 (see Fernandez et al. (2007)). The government gave the holders of guaranteed loans the explicit option of accepting the pesification or returning to the original bond holdings. As a consequence, approximately 13 billion US\$ reverted back to bonds in foreign currency (in default). To compensate the banks for the asymmetric pesification, the government (who was in default) issued a so-called compensation bond (BODEN). The amount of the compensating bond is estimated at 14.6 billion pesos (see De La Torre, Levy Yeyati, and Schmukler (2003)). Bonds issued by provincial governments and held by banks were transformed to guaranteed loans. During 2002, the government issued BOCON ("Bono de Consolidación") to consolidate debts with pensioner and state suppliers and BOGAR ("Bono Garantizado") to alleviate the financial difficulties faced by provinces (approximately 6% of GDP). The main recipients were the financial system, pension funds and some private investors. Foreign legislation bonds, almost all in default, tripled their value in terms of GDP as a consequence of the devaluation.

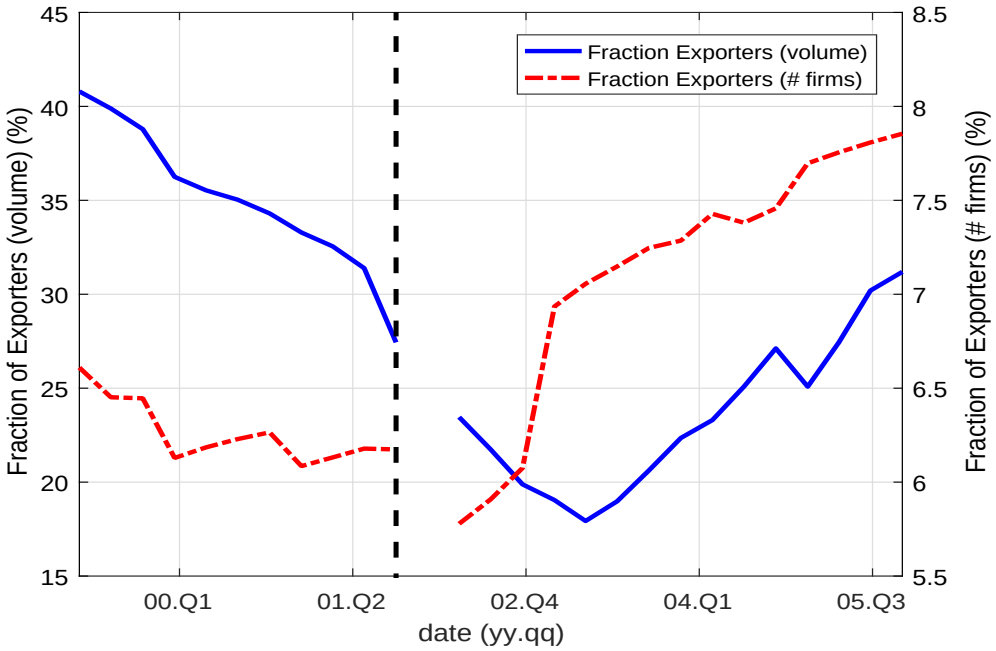
As Panel (ii) in Figure 2 shows, after an initial decline, exports grew consistently at 10% on average from 2003 to 2005.[15] Consistent with the evolution of total exports, Figure 6 makes evident that, while the fraction of exporters (as measured by the number of firms and the volume of credit directed to them) declined consistently in the period prior to the crisis, the negative trend reverses starting in 2003 to the end of 2005 with a fraction of exporters that is well above the pre-crisis level, both when measured by the number of firms (a 27% increase versus 2001, from 6.17% to 7.85%) and when measured by the volume of loans allocated to exporters (a 14% increase versus 2001, from 27.44% to 31.19%). This is not surprising given the jump in the real exchange rate observed post-default and the evolution of the terms of trade or the price of Argentina's main exported commodities (soybeans, wheat, and corn). In addition, the pesification reduced the effect of the balance sheet channel for exporters (i.e., the impact of the devaluation was smaller than in other devaluation episodes given that all loans denominated in dollars (under domestic law) were converted to pesos at \$1=US\$1 exchange rate) and allowed exporters to benefit from the depreciation of the exchange rate and the increase in the terms of trade. Using our model and the data at hand, we will explore whether eventually, the likelihood of becoming an exporter is affected by the state of the banking network (i.e., its exposure to the sovereign default and devaluation)

[14] Initially, converted loans were indexed to the CPI but a large portion was subsequently de-indexed.

[15] In fact, the value of exports measured in US dollars doubled from 2002 to 2008 (see Heymann and Ramos (2012)).

that firms have in place prior to the crisis.

Figure 6: Fraction of Exporters (%)



Note: Reported series correspond to the fraction of all loans made to exporters divided by total loans (value measure) and the fraction of exporters divided by the total number of firms (# of firms measure). Missing values correspond to months for which data is unavailable.
Source: Central Bank of Argentina.

3 The Data

Our dataset combines information from different sources. We have balance sheet and income statement data for all banks in Argentina at a monthly frequency since 1995 provided by the Superintendencia de Entidades Financieras of the Central Bank of Argentina. The time frequency is important since it allows us to identify the period of default. These data provide a detailed composition of bank portfolios by currency and by sectors of depositors and borrowers, including data on banks' exposure to sovereign and private debt (by issuer and currency). We also have information on bank characteristics that are important to the industrial organization features of the sector (i.e., whether the bank is a public or private bank and whether it is foreign-owned or domestic).

We also use a rich dataset assembled in part from the Central Bank of Argentina's credit registry (Central de Deudores), which contains monthly information on individual businesses, their industry classification (as provided by the Central Bank of Argentina), all their loans,

and the identities of the banks they operate with. This information is combined with the (also monthly) data on the balance sheet and income statements of the individual banks, taken also from the Central Bank of Argentina, and information collected in Castagnino, D'Amato, and Sangiácomo (2013) on the yearly export status of each firm (an indicator of whether the firm exports in a given year).[16] The credit data are similar to those used in Berger, Klapper, and Udell (2001). For each borrower we know the total number of banking relationships, the quality of each relationship as given by an 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 each loan for all banks that the firm operates with.[17] While the bank-level data are available since 1995, the credit registry data are only available since June 1999 to the present. We use data on firm and bank conditions prior to the default and devaluation (2001) and focus on the effects on credit for the period that goes from June 2002 to December 2005 (the year when Argentina officially exited its state of default according to the international rating agencies, also evident in the level of the spread in Figure 2). In all, we employ monthly data on 202,438 firms with 344,105 total loans/relationships. To guarantee the consistency and the quality of the data we apply several filters that we describe in detail in Appendix A-1. The filters are aimed to reduce the impact of outliers on our estimates. We also delete borrowers in the financial sector as well as those that are government-owned. Last, we use macroeconomic data publicly available, such as the CPI index, the GDP deflator and the exchange rate between the Argentine peso and the US dollar as aggregate country-level controls.[18]

The dataset allows a relatively complete look at the financial sector in Argentina, where banks are the main source of credit for firms. Less than a hundred firms are quoted in the stock exchange, whereas the banking sector grants credit to over 200,000 legally incorporated firms. While several reforms were implemented during the 1990s in order to facilitate the issuance of corporate bonds ("obligaciones negociables"), this market was only accessible to very large firms (including distributors of gas and electricity, and telephone companies) and the market collapsed with the sovereign default.[19] In addition, consistent with what is described in the literature as "the missing middle," the corporate sector in Argentina is

[16]Following the Tequila crisis, the Central Bank of Argentina required all supervised institutions to report on a monthly basis the status of all loans outstanding in excess of 50 pesos (equivalent to US$50 at the time).

[17]Our definition of debt between bank i and firm j includes all credit available from bank i to firm j.

[18]Since our period of analysis expands to 2005, measurement problems in official statistics that started in 2007 do not affect the series we employ to deflate nominal variables.

[19]In 2001 corporate bonds represented 8.19% of GDP and corporate loans 24.3% of GDP. It is important to note that risk-rating agencies placed most corporate bonds in selective default status (see Fernandez et al. (2007)), making it almost impossible for firms to access new credit via the corporate debt market.

characterized by a few large firms and many small to medium-sized firms. The small firms rely heavily (if not exclusively) on bank credit.

We use information at the bank level (and index banks in our sample by i), at the firm level (and index firms by j), and at the relationship level between bank i and firm j. In many cases, we describe the state of the banking network that operates with firm j by constructing loan-weighted averages of the bank level variables for all the banks that operate with firm j. In particular, let any variable $v_{i,t}$ denote a bank level measure for bank i in period t (for example, the sovereign debt to asset ratio or the ratio of foreign currency liabilities to assets). Then, we let $\overline{v}_{j,t}$ denote the loan-weighted average of $v_{i,t}$ for banks that operate with firm j. That is,

$$\overline{v}_{j,t} = \sum_{i \in I_{j,t}} w_{i,t}^{j} v_{i,t} \tag{1}$$

where $I_{j,t}$ corresponds to the set of $I_{j,t}$ banks that operate with firm j in period t, and $w_{i,t}^{j}$ is the loan share of bank i in total loans to firm j in period t computed as $w_{i,t}^{j} = \frac{\ell_{i,j,t}}{L_{j,t}}$ with $L_{j,t} = \sum_{i \in I_{j,t}} \ell_{i,j,t}$.

Of particular importance are measures of exposure to sovereign debt that we compute as the ratio of domestic sovereign bonds to assets and denote by $E_{i,t}$, and a measure of exposure to foreign currency that we calculate as the ratio of non-deposit liabilities denominated in foreign currency to total assets and denote by $FC_{i,t}$.[20] Then, the exposure of the network that operates with firm j to sovereign debt and foreign currency liabilities in period t is $\overline{E}_{j,t}$ and $\overline{FC}_{j,t}$, respectively. Other relevant network variables include the fraction of loans coming from public or private domestic banks (leaving private foreign banks as the omitted category), the number of banks (i.e., the number of banking relationships for firm j in period t), the average age of its banking relationships (measured in months), the share of new relationships (i.e., the fraction of relationships created after the sovereign crisis), the export status of the firm, and the size of the firm as measured by total loans.[21,22] Table 1

[20] Non-deposit liabilities correspond to total liabilities denominated in foreign currency minus deposits denominated in foreign currency. We then calculate the ratio to total assets. This is the relevant measure of exposure of the banking sector to the devaluation since, as we describe in Section 2, the government converted dollar denominated deposits into pesos in 2002 at the 1.4 to 1 exchange rate (pesos per dollar) and all domestic credit denominated in foreign currency at the 1 to 1 exchange rate (pesos per dollar).

[21] Unfortunately, we do not have access to additional data sources for the size of the firms, such as employees, sales or assets.

[22] The number of banks or banking relationships is measured as the number of banks for which we observe a positive loan amount for firm j in any period t. A new relationship is defined as a banking relationship that was not active prior to the default event and becomes active (i.e., has positive loans) after the default. The age of the relationship counts the number of months from the start of the relationship until the last appearance in our sample. All active firm-bank relationships receive an age equal to 1 at the beginning of our sample in June 1999 (i.e., the sample is left censored for existing relationships in 1999). For example, a relationship that is continuously active from the start of the sample until December 2001 has an age equal

presents summary statistics at the firm level conditional on the export status of the firm post-crisis ($x_j = 1$ if the firm exports in the period post-default).[23]

Table 1: Summary Statistics (Firm Level)

	Firm Export Status					
	$x_j = 0$			$x_j = 1$		
	Avg.	Median	Std. Dev.	Avg.	Median	Std. Dev.
Pre-Crisis Variables						
Sov. Debt Exposure $\overline{E}_{j2001}$	0.083	0.075	0.048	0.085	0.077	0.048
Foreign Currency Exposure $\overline{FC}_{j2001}$	0.216	0.238	0.085	0.232	0.250	0.074
Public Banks Network$_{j2001}$	0.339	0.000	0.448	0.173	0.000	0.328
Dom. Private Banks Network$_{j2001}$	0.323	0.000	0.439	0.435	0.263	0.442
Number of Banks$_{j2001}$	1.47	1.00	0.94	1.88	1.25	1.30
Avg Age Relationships$_{j2001}$ (months)	20.75	25.25	7.47	20.39	24.13	7.15
Export Indicator$_{j2001}$	0.000	0.000	0.000	0.605	1.000	0.489
Firm Debt$_{j2001}$ (real, 000s)	45.41	10.78	115.02	115.29	31.41	321.06
Contemporaneous Variables						
Sov. Debt Exposure $\overline{E}_{jt}$	0.199	0.186	0.124	0.184	0.182	0.104
Foreign Currency Exposure $\overline{FC}_{jt}$	0.142	0.128	0.105	0.159	0.153	0.098
Public Banks Network$_{jt}$	0.313	0.000	0.447	0.174	0.000	0.349
Dom. Private Banks Network$_{jt}$	0.323	0.000	0.439	0.435	0.263	0.442
Number of Banks$_{jt}$	1.37	1.00	0.82	1.68	1.00	1.14
Avg Age Relationships$_{jt}$ (months)	43.04	45.00	20.05	43.26	45.00	20.05
New Relationship Indicator$_{jt}$	0.321	0.000	0.455	0.333	0.000	0.449
Firm Debt$_{jt}$ (real, 000s)	45.74	7.41	105.47	87.94	14.87	160.98
Change in Loans ΔlnL_{jt}	-0.023	-0.020	0.522	0.011	-0.024	0.746

Note: Export Status x_j takes a value of 1 if the firm exports between 2003-2005. All variables except for Firm Debt are loan-weighted averages. Firm Debt is reported in thousands in real terms (pesos of 2001, which at the time represented 1 US$).
Source: Central Bank of Argentina.

There are no significant differences between non-exporters and exporters when it comes to the exposure of their banking network to sovereign debt and foreign currency prior to

to 31 months. The same relationship (if it remained active) would have an age of 45 months in December 2003 and so on.

[23]Table A.1 in the Appendix presents summary statistics for all variables used in the empirical analysis. In particular, we also present additional bank balance sheet ratios, different measures of the size of the banking network, and additional statistics at the firm level such as its credit status (a default indicator). Tables A.2 and A.3, also in the Appendix, present the distribution of the number of banking relationships and the distribution of the age of the banking relationships conditional on export status, respectively.

default. The banking network for exporters appears to rely much more on private banks (both domestic and foreign). There is a high persistence when it comes to the export status with approximately 60% of firms that exported post-default being those that also exported prior to the crisis. Consistent with evidence for other countries, exporters appear to be larger than non-exporters, with the median exporter having almost three times the amount of debt of a non-exporter firm. Exporters appear to have a slightly larger banking network than non-exporters (as measured by the average and median number of banking relationships). This table makes clear that, while we cover the universe of firms in Argentina, the distribution is heavily skewed toward small firms (see also Table A.2 in the Appendix).

The five largest sectors obtaining credit from the banking sector in Argentina are wholesale & retail, agriculture, construction, transportation and warehousing, and food in that order. As expected, while the agricultural sector tends to borrow more from public banks and less from foreign banks, wholesale & retail and transportation and warehousing appear to be more intensive in borrowing from foreign private banks (See Table A.4 in the Appendix).

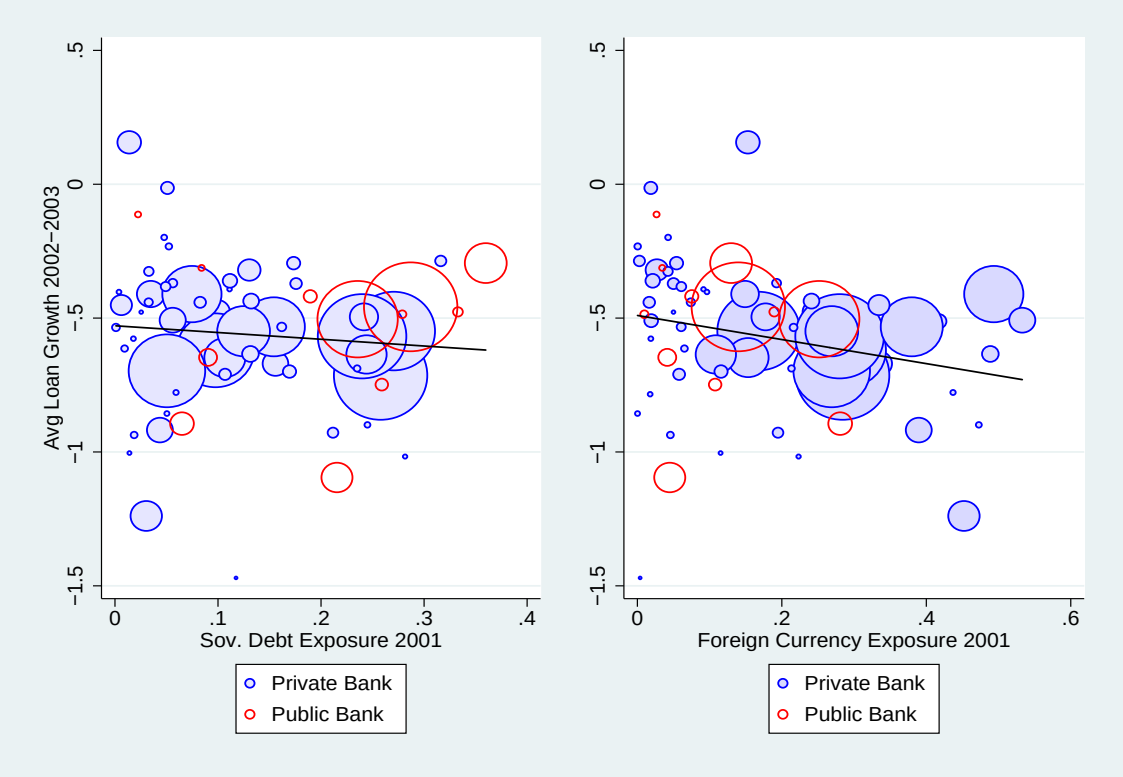
4 Credit Supply Effects of Banks' Exposure to Sovereign Default and Devaluation: Bank-Level Analysis

In this section, we follow Gennaioli, Martin, and Rossi (2018) and use the bank-level data to estimate the correlation between the pre-shock exposure of banks to a sovereign default (via their holdings of sovereign debt and loans to the public sector) and devaluation (via its holdings of non-deposit foreign currency liabilities) on credit post-default when controlling for other bank level factors and year fixed effects.[24] While the relationship we uncover in this section cannot separate supply from demand effects (i.e., it cannot identify the bank-lending channel), we interpret a negative coefficient on exposure to sovereign debt and foreign currency as indicating that the "supply" channel might have some bite when looking at more disaggregated data.

Figure 7 presents evidence on the relationship between sovereign debt exposure and foreign currency exposure across bank types (public and private) and loan growth between 2002 and 2003.

[24] As we described in Section 2, after the sovereign default the Argentine government "pesified" dollar denominated deposits at the 1.4 to 1 exchange rate (pesos per dollar), effectively reducing the liability exposure to the devaluation. To capture this idea, in our measure of exposure we include only non-deposit liabilities in foreign currency.

Figure 7: Relationship Between Loan Growth and Exposure to Sovereign Debt and Foreign Currency



Note: The black line corresponds to a fitted line between each exposure measures and loan growth (the coefficient is negative and significant). Each observation is plotted proportional to the bank size in 2001 (i.e., the size of the circles represents bank size). The measure of loan growth is $\Delta\ell_{it} = \frac{\ell_{it}-\ell_{it-3}}{0.5(\ell_{it}+\ell_{it-3})}$.
Source: Central Bank of Argentina.

We study this correlation more seriously using the following specification where the change in loans by bank i to the private non-financial sector (ℓ_{it}) between period t and period $t-3$, $\Delta\ell_{it} = \frac{\ell_{it}-\ell_{it-3}}{0.5(\ell_{it}+\ell_{it-3})}$ (i.e., a quarterly change with monthly data), is regressed on a measure of exposure to government debt in 2001 prior to default (E_{i2001}), exposure to the devaluation via non-deposit foreign currency liabilities (FC_{i2001}), a set of bank-level controls (X_{it-3}) and month fixed effects (α_t):[25]

$$\Delta\ell_{it} = \alpha_t + \beta_1 E_{i2001} + \beta_2 FC_{i2001} + \beta_3 X_{it-3} + u_{it}. \quad (2)$$

[25]This growth measure is standard in the establishment and firm dynamics literature (e.g., Haltiwanger, Jarmin, and Miranda (2013)). It shares some properties of log differences but also allows us to capture entry and exit into credit relationships. We use it in this section to be consistent with the measure we utilize when analyzing lending relationships at the firm-bank level and firm level. Variables for 2001 correspond to the average of year 2001.

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_{it-3} includes banks' liquidity and leverage, the level of loans to the private non-financial sector, and profitability as measured by banks' net income.[26]

We measure liquidity using the ratio of liquid assets to total assets and bank leverage using the inverse of the equity to asset ratio. Our measure of bank size is standard and given by the value of total assets. Table 2 presents the results.

Table 2: Bank-Level Effects of Sovereign Debt and Foreign Currency Exposure

Dep. Variable	$\Delta\ell_{it}$					
Government Exposure						
Sov. Debt Exposure (E_{i2001})	-0.845**	-0.923**	-0.985**	-0.721*	-0.747*	-0.847**
	(0.047)	(0.030)	(0.018)	(0.095)	(0.084)	(0.045)
FC Exposure (FC_{i2001})				-0.298	-0.495**	-0.386*
				(0.118)	(0.014)	(0.051)
Bank Characteristics						
Liquidity$_{t-3}$	1.353***	1.553***	1.393***	1.239***	1.440***	1.306***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage$_{t-3}$	-0.622***	-0.755***	-0.431***	-0.633***	-0.824***	-0.487***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
(log) Real Assets$_{t-3}$		0.0501**	0.0219		0.0692***	0.0370
		(0.024)	(0.314)		(0.003)	(0.109)
Net Income$_{t-3}$			2.387***			2.371***
			(0.000)			(0.000)
Bank Type×Time FE	yes	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
No Observations	3,220	3,220	3,220	3,220	3,220	3,220
R-squared	0.029	0.030	0.077	0.029	0.032	0.078

Note: "Sov. Debt Exposure" refers to the ratio of domestic government bonds to total assets in 2001. "FC Exposure" refers to the ratio of non-deposit foreign currency liabilities to total assets in 2001. p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01.

The estimated coefficients indicate that exposure to sovereign debt prior to the time of default and devaluation has a negative and significant effect on the availability of credit post-default. This prima facie evidence suggests that the supply channel of default is statistically significant and economically important. Foreign currency exposure also appears to negatively affect credit growth. Even though after the devaluation the Argentine government decided to turn dollar-denominated deposits into pesos, banks' holdings of other liabilities denominated

[26]Appendix A-2 presents several robustness checks that involve including additional controls.

in foreign currency (mostly bonds or loans from foreign institutions) still affected the growth of credit post-crisis. Both results are robust to many alternative specifications.

With respect to the role of liquidity, we find that banks with more liquid assets are less likely to reduce lending after a negative shock. We also find that higher leverage negatively affects loan growth, which implies that the bank is in a worse position to sustain losses in the case of an adverse shock. Regarding the role of bank size, in some specifications we find that larger banks grow faster. Finally, we conclude that banks with a higher return on assets exhibit faster loan growth.

5 The Model

As thoroughly discussed by Bleger and Rozenwurcel (2000), Berger, Klapper, and Udell (2001), and Escudé et al. (2001), informational asymmetries in credit markets make long-lasting banking relationships difficult to replace.[27] In this section we present a model characterized by search and matching frictions in which firms (borrowers) have established long-term relationships with their lenders. Using our model, we derive testable implications that shed light on how the state of the banking network affects credit supply and real activity and we use these implications as a guide to design the empirical specification of the next sections.

5.1 Environment

Banks and firms are assumed to be distributed on 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 on islands 1 through I (note that there are no firms on 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 on the i^{th} island receive an investment opportunity.

[27] This is particularly important for small and medium-sized firms that characterized the corporate sector in Argentina during the 2001/2002 crisis (and still do). These firms tend to be relatively more opaque, operate less diversified product lines, have less access to the management systems, and allocate a smaller fraction of their assets to fixed assets that can be used as collateral. Notice that the increased concentration and internationalization of Argentine banking during the 1990s further hindered credit access for these firms since private and foreign banks are known for concentrating their business on clients with lower opacity more than public and domestic banks.

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 on the i_{th} island. Firms remain in the market for only one period.

Each bank on 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 $p(\theta_i) = \frac{M}{Bv_i}$. While firms can transfer investment projects from their i^{th} island to the central island by 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.

5.2 Equilibrium

On 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 on the central island, which is given by $r_0 = \phi y$. The equilibrium on 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 on 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:

$$S = y - U. \tag{5}$$

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 on 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, independent 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 on 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 on the central island and determines the probability of successfully finding financing for the project.

This condition determines a threshold $\hat{\theta_0} = q^{-1}(z/(y(1-\phi))) = \frac{z}{[my(1-\phi)]}^{\frac{1}{1-\gamma}}$, above which all firms with unmatched projects at the peripheral island will transition to the central island. Intuitively, since the probability of finding a math is increasing in θ, firms will pay the fixed cost only if, given the supply of credit in the central island, the demand for credit is such that the expected return (net of cost) is non-negative. If $\theta_0 = \hat{\theta}_0$, then firms with unmatched projects are indifferent between transitioning to the central island and scrapping the project.

Let $\underline{\theta}_0 = \frac{Bv_0}{F\sum_{i=1}^{I}\alpha_i(1-q(\theta_i))}$ denote the market tightness that would result if all unmatched firms transition to the central island (for a given v_0, $\{\alpha_i, v_i\}_{i=1}^{I}$). If $\underline{\theta}_0 \geq \hat{\theta}_0$, all unmatched projects will in fact transition to the central island, and the central island market tightness equals

$$\theta_0 = \underline{\theta}_0. \tag{7}$$

If $\underline{\theta}_0 < \hat{\theta}_0$, in equilibrium, not all unmatched firms will transition to the central island. Firms will transition until the equilibrium market tightness $\theta_0 = \hat{\theta}_0$. Since $\underline{\theta}_0 < \hat{\theta}_0$, it is possible to find the fraction of unmatched firms that will transition to the central island consistent with $\theta_0 = \hat{\theta}_0$ by defining $\tau \in [0, 1]$ such that

$$\frac{1}{\tau}\underline{\theta}_0 = \hat{\theta}_0 \Leftrightarrow \tau = \frac{\underline{\theta}_0}{\hat{\theta}_0}.$$

When $\theta_0 = \hat{\theta}_0$ firms are indifferent between transitioning or not, so we assume that unmatched firms use a mixed strategy and transition to the central island with probability τ.

5.3 Shocks to Banks Exposed to Government Debt/Devaluation

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

$$q(\theta_i) + (1 - q(\theta_i))\tau q(\theta_0) = q(Bv/F\alpha) + (1 - q(Bv/F\alpha))\tau q(\theta_0). \tag{8}$$

In bad times, heterogeneous banks are subject to idiosyncratic shocks. A subset of islands receives 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 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 on the probability of financing $q(\theta_i)$ on their own island. The lower probability of financing on the peripheral island is not counteracted by the financing probability at the central island (which depends also on the probability of not finding financing on the peripheral island), because the term $(1 - q(\theta_i))$ is multiplied by a number that is less than one given by $\tau q(\theta_0)$.

The phenomenon in the affected peripheral islands triggers a secondary effect on 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 τ or both to fall, lowering the financing probability for all projects on the central island and lowering output.

5.4 Testable Implications

Given the workings of the model and the availability of data, we can look at the following testable implications:

$$\frac{\partial q(\theta_i)}{\partial v_i} \geq 0 \tag{9}$$

$$\frac{\partial \tau q(\theta_0)}{\partial v_i} \leq 0. \tag{10}$$

Equation (9) implies that the probability of finding financing from the perspective of the firm is increasing in the availability of funds ν_i for banks on the peripheral island (or initial island). In terms of empirical implementation, it would mean that after the devaluation, exporters whose long-term relationships with the banking system did not suffer as much after the sovereign default, should see their credit increase faster than their counterparts with relationships with banks where the availability of credit suffered as a result of the default.

Moreover, equation (10) states that new relationships on the central island and the availability of credit in the peripheral one should be negatively related to each other. That is, conditional on the availability of credit in the initial relationships, new relationships should start more often for those firms whose initial long-term bank relationships suffer the most with the default.

6 Credit Supply Effects of Banks' Exposure to Sovereign Default and Devaluation: Relationship-Level Analysis

Guided by the model presented in Section 5, we start the analysis of the effects of a government default and devaluation by looking at linked bank-firm (relationship)-level data. The results from Section 4 might be subject to identification bias since it is not possible to fully disentangle supply and demand effects. The estimates of β_1 and β_2 in equation (2) 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 use data at the loan level (matched firm-bank information) to control for demand effects following the strategy in Gan (2007) and Khwaja and Mian (2008) among others. We estimate a model similar to that of the previous section, where the dependent variable of interest is the growth rate of real loans (computed as the 3-month change, annualized) from bank i

to firm j ($\Delta\ell_{ij} = (\ell_{it} - \ell_{it-3})/(0.5(\ell_{it} + \ell_{it-3}))$), and incorporate firm-time fixed effects ρ_{jt} that absorb all firm-specific credit demand shocks. The identification strategy relies on the comparison of a given firm's availability of credit across different banks (after controlling for bank and relationship characteristics).[28] In short, this approach allows us to study whether credit growth for the same firm is lower when paired with a bank more heavily exposed to sovereign default and devaluation. This strategy requires the use of firms with more than one relationship.[29] The identification restriction prevents us from using the set of small firms with one relationship to estimate the effects at the relationship level but, in Section 7, we estimate firm level effects that do not require us to use firms that have more than one relationship and show that the negative effects of sovereign debt and foreign currency exposure are still significant.[30]

The model that we estimate is

$$\Delta\ell_{ijt} = \rho_{jt} + \delta_1 E_{i2001} + \delta_2 FC_{i2001} + \delta_3 R_{ijt-3} + \delta_4 X_{it-3} + e_{ijt}. \tag{11}$$

where ρ_{jt} are firm-time fixed effects. E_{i2001} is defined as before and corresponds to our measure of exposure of bank i operating with firm j to government debt in 2001 prior to default (computed as the ratio of domestic sovereign bonds to total assets in 2001). FC_{i2001} corresponds to our measure of exposure to the devaluation via non-deposit foreign currency liabilities (computed as the ratio of non-deposit liabilities denominated in foreign currency to total assets in 2001). R_{ijt-3} are controls that capture the strength of the relationship between bank i and firm j. Following Gan (2007) and Rajan (1994), we include the length (age) of the relationship. They argue that firms with long-term relationships receive more credit from their banks and pay lower interest rates. We also include the ranking of bank i within all banks that deal with firm j (i.e., the largest lender to firm j will receive a value

[28] If firms' demand for credit is bank specific (after controlling for observable characteristics of the bank and the relationship), the identification strategy is not valid. One concern is the case where banks that specialize in firms that export had a larger exposure to sovereign debt or foreign currency non-deposit liabilities and suffer a larger balance sheet shock than other banks.

[29] Table 1 presents summary statistics at the firm level. This table shows that the average firm has 1.47 banking relationships, implying that many firms in our sample have only one banking relationship (pre and post-default). In particular, Table A.2 in the appendix shows that 34.7% (pre-default) and 41.6% (post-default) of the volume of loans in our sample correspond to firms in the sample have only one banking relationship (this amounts to 69.9% and 76.2% of the firms in the sample, pre- and post-default, respectively). In addition, only 24% of the volume of loans within firms with positive export status have one relationship.

[30] When estimating the effects at the firm level and using the full sample, we show that the estimated effects are robust to controlling for the number of banking relationships. In addition, we follow Khwaja and Mian (2008) who use the correlation between the supply and demand effects derived from the difference between the fixed effects estimates at the relationship-level (see equation (11)) and the OLS estimates of the same equation at the firm-level (estimated including firms with more than one banking relationship as well) to show that the estimates at the firm level, if biased, underestimate the true effects.

equal to 1, the second a value equal to 2, and so on). Sharpe (1990) describes that lender concentration increases the lender's information monopoly and creates a "hold-up" problem that firms can only avoid by creating relationships with other banks. Last, we include the degree of concentration of the relationship measured by the share of borrowing held by the two largest banks. X_{it-3} are standard bank level characteristics, and include bank size (measured by total assets), liquidity, leverage, real assets and net income.

We present our results in Table 3.

Table 3: Relationship-Level Effects of Sovereign Debt and Foreign Currency Exposure

Dep. Variable	$\Delta\ell_{ijt}$					
Government Exposure						
Sov. Debt Exposure 01	-0.105***	-0.0873***	-0.0348**	-0.0473***	-0.0370**	-0.0487***
	(0.000)	(0.000)	(0.050)	(0.008)	(0.037)	(0.006)
FC Exposure 01		-0.230***		-0.192***		-0.181***
		(0.000)		(0.000)		(0.000)
Relationship Characteristics						
Age Pair$_{ijt-3}$			-0.00115***	-0.000698***	-0.00130***	-0.000880***
			(0.000)	(0.000)	(0.000)	(0.000)
Rank Bank$_{ijt-3}$					-0.0453***	-0.0450***
					(0.000)	(0.000)
Bank Controls	yes	yes	yes	yes	yes	yes
Firm×Time FE	yes	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
No Observations	1,221,373	1,221,373	1,221,373	1,221,373	1,221,373	1,221,373
R-squared	0.183	0.183	0.183	0.184	0.186	0.186

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds and loans to the public sector to assets in 2001. "FC Exposure 01" refers to the ratio of non-deposit foreign currency liabilities over assets in 2001. "Age Pair" corresponds to the length of the relationship between bank i and firm j in our sample. "Rank Bank" corresponds to the ranking of bank i among banks that lend to firm j. Other bank controls include the lagged liquid assets to asset ratio, the leverage ratio (measured as the inverse of the equity to asset ratio), real assets, and net income to asset ratio.

Table 3 shows that the results are qualitatively equivalent with those obtained at the bank level and in line with the predictions of our model. Exposure to the sovereign default and foreign currency consistently reduces the supply of credit. The coefficients are statistically significant and economically relevant. This provides support to our model where an unexpected shock to the availability of credit ν_i of banks on each peripheral island lowers the probability $q(\theta_i)$ of an investment opportunity being matched by a lender (see equation (9)).

Of particular importance are the coefficients we estimate for the age of the relationship

and the rank of the financial institutions. We find that credit is reduced as banks are less important to the firm (their rank increases). Also, the older relationships appear to suffer more than newer ones. This is in line with Ongena and Smith (2001) who find that firms are more likely to leave a bank as the relationship matures. While firms gain as they build a good payment record with their creditors, the bank acquires information that is not public to other lenders, creating a "hold-up" problem that can raise the cost of credit for the firm. The negative coefficient that we find shows that the latter effect dominates in the case of Argentina.

7 Credit Supply Effects of Banks' Exposure to Sovereign Default and Devaluation: Firm-Level Analysis

As our model shows, firms with investment opportunities, i.e., firms with a good draw of α_i (think about exporters in Argentina after the devaluation), might be able to undo a negative bank supply shock by switching to a bank that has not suffered from such a shock. Of course, there are costs of switching (given by the parameter z in the model) so firms might find it difficult to create new lending relationships (Klein, Peek, and Rosengren (2002) present evidence on the constraints faced by bank-dependent firms when their lenders reduce credit availability). Thus, while the effects of the shock might be reduced, they could still be potentially significant for credit and economic activity. In this section, we test this prediction of the model.

7.1 Evidence on Firm-Level Credit and Banking Network

After identifying the credit supply shock as derived from banks' exposure to sovereign bonds as well as liabilities denominated in foreign currency, we quantify the effects of the credit supply shock for credit at the firm level by looking at credit growth for firm j (measured as a 3-month change annualized) as a function of the exposure of its entire banking network (i.e., the exposure of all banks that operate with firm j). More specifically, let $\overline{E}_{j,2001}$ denote the exposure to domestic sovereign debt in 2001 of the network of banks that firm j borrows from (N_j), and $\overline{FC}_{j,2001}$ the exposure to (non-deposit) liabilities denominated in foreign currency. We measure both $\overline{E}_{j,2001}$ and $\overline{FC}_{j,2001}$ as loan-weighted averages (see equation (1)).

We also include controls that capture other relevant determinants of the state of the banking network operating with firm j $\overline{N}_{jt}$ (also loan-weighted), firm characteristics X_{jt} and sector-period fixed effects ρ_{st}. The model we are trying to estimate provides a test for the extent to which firms are able to substitute credit from banks that are not affected

(relatively) by the shock. In particular, we estimate

$$\Delta L_{jt} = \rho_{st} + \alpha_1 \overline{E}_{j,2001} + \alpha_2 \overline{FC}_{j,2001} + \alpha_3 X_{j2001} + \alpha_4 \overline{N}_{j,2001} + \alpha_5 X_{jt-3} + \alpha_5 \overline{N}_{j,t-3} + \epsilon_{jt}. \quad (12)$$

Among the network characteristics we include the fraction of loans coming from public or private domestic banks (leaving private foreign banks as the omitted category) and a measure of the size of the network given by the average deposit market share of banks operating with firm j. Everything else equal, a larger network should provide better access to credit. As described in Section 2, the structure of the banking sector in Argentina suffered considerable changes during this period. There is a large literature on the role of public banks and their role for stabilizing credit (see La Porta, Lopez-deSilanes, and Shleifer (2002) and Micco and Panizza (2006)). In the case of Argentina, prior to the crisis, many depositors and firms viewed private foreign banks as safer since they could be expected to be bailed out by their parent companies if needed.

We also incorporate relationship level characteristics such as the average age of the lending relationships of firm j in 2001, the share of loans in the top 2 lenders, the number of banks the firm operates, and an indicator of deposit growth. In the previous section, we discussed why the length of the lending relationship is an important factor describing the state of the banking network, and the argument also applies to firm-level regressions. In addition to the average age of lending relationships in 2001, we incorporate the average of an indicator that takes a value of 1 if firm j and bank i establish a new lending relationship. We control for the strength of the relationships of firm j by incorporating the fraction of loans allocated to the top 2 banks operating with firm j.

A key identification restriction for relationship-level regressions was the need to use a sample consisting only of multiple banking relationships (see Section 6). When working with firm level data, we are able to incorporate all firms to the analysis (i.e., firms that operate only with one bank are part of this sample). We control for the number of lending relationships since it provides key information about the network structure that firms work with.[31] Among firm characteristics, we incorporate an indicator that takes a value of 1 if the firm is an exporter during the year 2001. As we described before, exporters were among the few firms that benefited from the crisis.[32] Other firms controls, such as industry-time fixed

[31] In addition, we follow Khwaja and Mian (2008) to address a potential bias when working with firm level data.

[32] We do not have access to detailed balance sheet information (such as foreign currency composition of liabilities) outside the banking sector. Working with a sample that contains balance sheet information would require us to focus on a very small sample of firms (those publicly listed in Argentina) as opposed to the universe of firms as we do here. Using the set of publicly listed firms for Argentina and Mexico, Kalemli-Ozcan, Kamil, and Villegas-Sanchez (2016) find that domestic exporters holding unhedged foreign currency

effects, are included in all specifications.

Table 4 presents our results. This table provides further evidence in favor of our model. It is clear that, while firms might be able to undo the lending channel shock that we explored in the previous section when looking at the relationship-level data, the exposure of the bank network to a sovereign default and a devaluation still negatively affects firm-level credit. This is in line with the evidence presented in Khwaja and Mian (2008) for another emerging economy. Since this period is one where the sovereign remained in a state of default, for the most part this also imposed a constraint on the access of firms to other types of borrowing (e.g., corporate borrowing in international markets), so the negative coefficients in Table 4 imply that the supply shock affects credit and, potentially real activity, at the firm level as well.

Interestingly, we find that the characteristics of the banking network (and not only the exposure to sovereign debt and default) also matter for the evolution of credit post-default. In particular, firms that operated within larger banking networks saw their credit grow faster than similar firms working with smaller banks (measured by the average deposit market share).

Of key importance is the fact that firms that are able to generate new relationships observe an increase in credit. The same is true for firms that were exporters prior to the crisis. As Table 1 shows, all firms that were exporters prior to the crisis are exporter post-crisis (representing about 60 percent of the total number of exporters post-crisis). We condition on export status post-crisis but also control for export status prior to the crisis, which allows us to disentangle the differential effect of being an exporter and that of becoming an exporter post-crisis. The results for a selected group of regressions and number of regressors are presented in Table 5. The full set of results is in Table A.10 in the Appendix.

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debt decrease investment.

Table 4: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure

Dep. Variable	ΔL_{jt}			
Government Exposure 2001				
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.194***	-0.211***	-0.274***	-0.290***
	(0.000)	(0.000)	(0.000)	(0.000)
FC Exposure 01 $\overline{FC}_{j2001}$		-0.131***		-0.118***
		(0.002)		(0.005)
Bank Network Characteristics				
Network Size (Dep Mkt Share)$_{j2001}$	0.182***	0.211***	0.168***	0.194***
	(0.001)	(0.000)	(0.002)	(0.000)
Public Banks Network$_{j2001}$	0.0142**	-0.00638	0.00196	-0.0165*
	(0.022)	(0.469)	(0.750)	(0.060)
Dom. Private Banks Network$_{j2001}$	0.00851	0.00228	0.0210***	0.0154**
	(0.170)	(0.723)	(0.001)	(0.016)
Relationship Network Characteristics				
Avg Age Relationships$_{j2001}$	0.00195*	0.00261**	0.00153	0.00213*
	(0.063)	(0.017)	(0.143)	(0.051)
Share Top 2 Banks$_{j2001}$	0.119***	0.120***	-0.256***	-0.253***
	(0.000)	(0.000)	(0.000)	(0.000)
Number of Banks$_{j2001}$			-0.0308***	-0.0306***
			(0.000)	(0.000)
New Relationship Indicator$_{jt-3}$			0.0725***	0.0727***
			(0.000)	(0.000)
Firm Characteristics				
Export Indicator$_{j2001}$	0.122***	0.122***	0.133***	0.133***
	(0.000)	(0.000)	(0.000)	(0.000)
Sector×Time FE	Yes	Yes	Yes	Yes
Period	2003-2005	2003-2005	2003-2005	2003-2005
Bank Controls	Yes	Yes	Yes	Yes
Other Firm Controls	Yes	Yes	Yes	Yes
No Observations	1,979,087	1,979,087	1,968,321	1,968,321
R-Squared	0.005	0.005	0.006	0.006

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure 01" refers to the ratio of non-deposit foreign currency liabilities. "Network Size (Dep Mkt Share)" refers to the (loan-weighted) average deposit market share of the banks operating with firm j, "Public Banks Network" refers to the (loan-weighted) average of an indicator that takes a value equal to 1 if a bank operating with firm j is a state-owned bank, "Dom. Private Banks Network" the (loan-weighted) average of an indicator that takes a value equal to 1 if a bank operating with firm j is a domestically-owned private bank, "Avg Age Relationships" is the (loan-weighted) average of the age of the existing relationships between firm j and all the banks that operate with it, "Share Top 2 Banks" corresponds to the share of loans of firm j allocated to its two largest lenders, "Export Indicator" takes a value equal to 1 if the firm exported during 2001. Other bank network controls include the (loan-weighted) average of liquidity, leverage and net income for banks that operate with firm j in 2001. Other firm controls include a default indicator in 2001 and contemporaneous and total debt of the firm in 2001 (in real terms).

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. Firms that have access to export markets are, if any, the group with the best chance of being able to undo the effects of the credit supply shock. To study this in detail, we study a model similar to the one in equation (12) conditional on the export status of the firm post-default. More specifically, we estimate equation (12) conditional on whether the firm exports during the period post-default ($x_j = 1$) or not ($x_j = 0$). Table 5 presents the results.

When the whole after-crisis period is considered (2003-2005), we find that exporters are able to fully undo the effect of the sovereign default and the devaluation (i.e., credit growth is not affected for this group of firms by the exposure of their banking network to sovereign bonds or foreign currency liabilities).[33] Exporters see a much faster increase in credit (compared to non-exporters) as a function of the size of their banking network (measured by the deposit share of the network).

[33]The negative effect of the foreign currency exposure of their banking network is still present and significantly larger than for firms that do not export when we do not control for the number of banks and the fraction of new relationships in the banking network.

Table 5: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure (by export status)

	ΔL_{jt}			
	Export Status (Post-Default)			
Dep. Variable	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$
Government Exposure 2001				
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.241***	0.197	-0.320***	0.155
	(0.000)	(0.444)	(0.000)	(0.550)
FC Exposure 01 $\overline{FC}_{j2001}$	-0.117***	-0.256	-0.106**	-0.179
	(0.006)	(0.304)	(0.012)	(0.468)
Bank Network Characteristics				
Network Size (Dep Mkt Share)$_{j2001}$	0.177***	0.764**	0.154***	0.981***
	(0.001)	(0.035)	(0.004)	(0.007)
Public Banks Network$_{j2001}$	-0.00130	-0.0106	-0.0119	-0.00887
	(0.884)	(0.853)	(0.178)	(0.876)
Dom. Private Banks Network$_{j2001}$	0.00236	0.0389	0.0151**	0.0483
	(0.718)	(0.223)	(0.019)	(0.131)
Relationship Network Characteristics				
Avg Age Relationships$_{j2001}$	0.00288***	-0.00644	0.00229**	-0.00466
	(0.009)	(0.292)	(0.036)	(0.446)
Share Top 2 Banks$_{j2001}$	0.0684**	0.279***	-0.320***	0.328*
	(0.011)	(0.002)	(0.000)	(0.069)
Number of Banks$_{j2001}$			-0.0322***	0.00578
			(0.000)	(0.699)
New Relationship Indicator$_{jt-3}$			0.0679***	0.121***
			(0.000)	(0.000)
Sector×Time FE	Yes	Yes	Yes	Yes
Period	2003-2005	2003-2005	2003-2005	2003-2005
Bank Controls	Yes	Yes	Yes	Yes
Other Firm Controls	Yes	Yes	Yes	Yes
No Observations	1,848,580	130,507	1,838,966	129,355
R-Squared	0.005	0.011	0.006	0.011

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. x_j takes a value of 1 if the firm exports between 2003-2005. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure 01" refers to the ratio of non-deposit foreign currency liabilities. "Network Size (Dep Mkt Share)" refers to the (loan-weighted) average deposit market share of the banks operating with firm j, "Public Banks Network" the (loan-weighted) average of an indicator that takes a value equal to 1 if a bank operating with firm j is a state-owned bank, "Dom. Private Banks Network" the (loan-weighted) average of an indicator that takes value equal to 1 if a bank operating with firm j is a domestically-owned private bank, "Avg Age Relationships" is the (loan-weighted) average of the age of the existing relationships between firm j and all the banks that operate with it, "Share Top 2 Banks" corresponds to the share of loans of firm j allocated to its two largest lenders, "Export Indicator" corresponds to an indicator that takes a value equal to 1 if the firm exported during 2001. Other bank network controls include the (loan-weighted) average of liquidity, leverage and net income for banks that operate with firm j in 2001. Other firm controls include a default indicator in 2001 and contemporaneous, total debt of the firm in 2001 (in real terms).

Regarding the network characteristics, an important difference between exporters and non-exporters has to do with the number of banks within the network. For non-exporters it is detrimental for credit growth to have a large number of banks participating in the network, whereas for exporters it seems to be irrelevant for credit. Finally, exporters see faster credit growth when they are able to generate new banking relationships compared to their non-exporter counterparts.

However, the timing of access to credit is affected by the firm's banking network status at the time of the crisis in 2001. Table 6 shows the same regressions as Table 5, but only considering data for 2003, right after the crisis. By only looking at data up to 2003, we can see timing differences in the access to credit even within exporters.

We find that in the immediate period after the crisis the state of the banking network mattered for the exporter's ability to increase its credit. In particular, the bank network's exposure to foreign currency was detrimental to credit growth at the firm level (not considering new banking relationships). Other network characteristics played a differential role over time. Having a network composed of mostly public banks was an impeding factor right after the crisis but became irrelevant later on. Interestingly, even already by 2003, new banking relationships were able to undo the effects of the bank's foreign currency exposure in the case of the exporting firms. However, evidence of the long-term relationships mattering is shown in the results by looking at the importance of the age of the relationship on credit growth even for exporters. This variable is significant early in the after-crisis period and loses importance later for exporting firms.

Table 6: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure (by export status), on impact in 2003

	ΔL_{jt}			
	Export Status (Post-Default)			
Dep. Variable	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$
Government Exposure 2001				
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.298***	0.0313	-0.412***	-0.110
	(0.000)	(0.943)	(0.000)	(0.802)
FC Exposure 01 $\overline{FC}_{j2001}$	-0.305***	-0.743*	-0.285***	-0.567
	(0.000)	(0.067)	(0.000)	(0.160)
Bank Network Characteristics				
Network Size (Dep Mkt Share)$_{j2001}$	0.466***	1.962***	0.367***	2.109***
	(0.000)	(0.002)	(0.000)	(0.001)
Public Banks Network$_{j2001}$	-0.0486***	-0.271***	-0.0599***	-0.253**
	(0.000)	(0.006)	(0.000)	(0.010)
Dom. Private Banks Network$_{j2001}$	0.0126	-0.0312	0.0282***	-0.0230
	(0.218)	(0.592)	(0.005)	(0.690)
Relationship Network Characteristics				
Avg Age Relationships$_{j2001}$	0.00922***	0.0168*	0.00926***	0.0185*
	(0.000)	(0.087)	(0.000)	(0.056)
Share Top 2 Banks$_{j2001}$	0.000241	0.346**	-0.645***	0.391
	(0.995)	(0.019)	(0.000)	(0.185)
Number of Banks$_{j2001}$			-0.0538***	0.00454
			(0.000)	(0.853)
New Relationship Indicator$_{jt-3}$			0.109***	0.160***
			(0.000)	(0.001)
Sector×Time FE	Yes	Yes	Yes	Yes
Period	2003	2003	2003	2003
Bank Controls	Yes	Yes	Yes	Yes
Other Firm Controls	Yes	Yes	Yes	Yes
No Observations	672,277	43,703	669,061	43,304
R-Squared	0.010	0.018	0.012	0.019

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. x_j takes a value of 1 if the firm exports between 2003-2005. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure" refers to the ratio of non-deposit foreign currency liabilities to assets. "Network Size (Dep Mkt Share)" refers to the (loan-weighted) average deposit market share of the banks operating with firm j, "Public Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a state-owned bank, "Dom. Private Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a domestically-owned private bank, "Avg Age Relationships" is the (loan-weighted) average of the age of the existing relationships between firm j and all the banks that operate with it, "Share Top 2 Banks" corresponds to the share of loans of firm j allocated to its two largest lenders, "Export Indicator" corresponds to an indicator that takes a value of 1 if the firm exported during 2001. Other bank network controls include the (loan-weighted) average of liquidity, leverage and net income for banks that operate with firm j in 2001. Other firm controls include a default indicator in 2001 and contemporaneous and total debt of the firm in 2001 (in real terms).

Using the evidence presented in Tables 5 and 6 we can infer the following: First, exporters were able to undo the effects of the default and devaluation shocks once we consider the whole after-crisis period. Second, getting financing took time and new banking relationships. That is, while exporters eventually found credit, those that were working within networks that were relatively spared from the devaluation shock were able to increase their credit earlier than the exporters that had to look for new sources of credit and establish new banking relationships.

At the relationship level (Section 6), as part of the identification strategy, we used only firms with multiple banking relationships (i.e., relationships of firms that operated with two or more banks). In this section, we also incorporated firms that have only one banking relationship and include the number of banks as part of the network controls to capture differences at the relationship level. We find that firms that operated with a larger number of banks (prior to the crisis) saw their credit growth decline more than those with a smaller number of banks. In addition, we follow Khwaja and Mian (2008) who use the correlation between the supply and demand effects implied by the difference between an OLS estimate of the relationship-level regression and the fixed effects (FE) estimates already presented in Section 6 to back out the potential bias of our firm-level estimates of the impact of banks' exposure to sovereign debt and foreign currency.[34] We estimate equation 11 and find that the covariance between the exposure measures and the firm fixed effect is positive, implying that, if anything, our firm-level estimates underestimate the true effect (i.e., the true effect is between our estimates presented in Table 4 and a more negative number).

Next, we explore further the channels by which firms might be able to undo the effects of credit supply shocks and analyze at the firm level the probabilities of default, being an exporter and generating new relationships.

7.2 Additional Firm-Level Effects

In this section, we discuss additional effects of lenders' exposure to sovereign default and currency risk. Guided by the availability of data, we focus on the likelihood of borrowers switching banks (starting new relationships) after the lenders are hit by the shock, the borrowers' extensive margin of exports and the probability of borrowers' default after the crisis.

[34] A bias could arise if, for example, more profitable exporters were better able to adapt to the adverse macro environment after the default and devaluation.

7.2.1 Effects on the Probability of Starting New Relationships

In this subsection, we study the likelihood of firms starting new relationships and switching lenders after the crisis hits the banks they were previously borrowing from. We measure this probability by creating a dummy $d_{i,j}$ that takes a value of 1 if, for any pair (i, j), firm j never borrowed from bank i in the past. Then, we calculate a loan-weighted average $\sum_{i=1}^{N_j} \omega_i^j d_i^j$ of all the dummies for firm j, where ω represents the share of total loans for firm j granted by bank i.

The results in Table 7 indicate that higher exposure of the network to both sovereign debt and currency risk makes borrowers more likely to have to bear the costs of switching lenders and to start new relationships. Table A.12 in the Appendix shows the full set of regression specifications related to the probability of starting new relationships. Also, a larger network and a larger share of public banks seems to be associated with a higher likelihood of switching. Borrowers who tend to work with just a few lenders (i.e., borrowers in very "concentrated" relationships) are less prone to switching. Interestingly, having been an exporter before the shock hits does not significantly affect the probability of switching. In our opinion, this is an interesting finding since our hypothesis had been that an exporter, and thus likely a larger borrower with higher market power, would be more likely to switch to take advantage of better terms negotiated with new lenders. Intuitively, a longer relationship is associated with a lower probability of switching. This is consistent with what the industrial organization literature on switching costs finds, and it is related to lenders accumulating information on the borrowers over time and borrowers finding it costly to start signaling this information to new lenders when starting a new relationship (see Sharpe (1990) and Duqi, Tomaselli, and Torluccio (2017)). Older relationships should be the ones in which lenders have accumulated more information on the borrowers so that this effect becomes stronger the older the relationship.

Table 7: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure on Probability of Starting a New Relationship

Dependent Variable	Probability of New Relationship (post-crisis)			
Government Exposure 2001				
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	0.322***	0.273***	0.272***	0.289***
	(0.000)	(0.000)	(0.000)	(0.000)
FC Exposure 01 $\overline{FC}_{j2001}$			-0.154***	0.122***
			(0.000)	(0.000)
Banking Network Characteristics				
Public Banks Network$_{j,2001}$	-0.0138***	-0.00739	-0.0364***	0.0118*
	(0.001)	(0.105)	(0.000)	(0.069)
Dom. Private Banks Network$_{j,2001}$	-0.0631***	-0.101***	-0.0775***	-0.0956***
	(0.000)	(0.000)	(0.000)	(0.000)
Network Size (Dep.Mkt.share)$_{j,2001}$	-0.145***	0.00860	-0.0934***	-0.0186
	(0.000)	(0.824)	(0.007)	(0.638)
Relationship Characteristics				
Avg Age Relationship$_{j,2001}$	-0.0182***	-0.0148***	-0.0168***	-0.0154***
	(0.000)	(0.000)	(0.000)	(0.000)
Share Top 2 Banks$_{j,2001}$	-0.0564***	-0.0700***	-0.0589***	-0.0708***
	(0.000)	(0.000)	(0.000)	(0.000)
Exporter Indicator (in 2001)	0.00991	0.0103	0.00943	0.0107*
	(0.117)	(0.104)	(0.136)	(0.092)
Sector × Time FE	yes	yes	yes	yes
Other Bank/Network Controls	no	yes	no	yes
Other Borrower Controls	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005
N	1,979,087	1,979,087	1,979,087	1,979,087
R-squared	0.082	0.087	0.083	0.087

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. x_{ij} takes a value of 1 if the relationship between firm i and bank j is new. x_j is the (loan-weighted) average for firm j accross all relationships. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure" refers to the ratio of non-deposit foreign currency liabilities. "Network Size (Dep Mkt Share)" refers to the (loan-weighted) average deposit market share of the banks operating with firm j, "Public Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a state-owned bank, "Dom. Private Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a domestically-owned private bank, "Avg Age Relationships" is the (loan-weighted) average of the age of the existing relationships between firm j and all the banks that operate with it, "Share Top 2 Banks" corresponds to the share of loans of firm j allocated to its two largest lenders, "Exporter Indicator" corresponds to an indicator that takes a value of 1 if the firm exported during 2001. Other bank network controls include the (loan-weighted) average of liquidity, leverage and net income in 2001 for all banks that operate with firm j in each period. Other firm controls include the total value of debt in 2001 and the lagged probability of default.

7.2.2 Effects on the Extensive Margin of Exports

Table 8 presents our results regarding the effect on the extensive margin of exports of the default and devaluation shocks in addition to those of bank network characteristics. Table A.13 in the Appendix shows the full set of regression specifications related to the probability of remaining an exporter after the crisis. We measure the likelihood that the firm is an exporter post-sovereign debt crisis by creating a dummy that takes the value of 1 if the firm is an exporter post-crisis. We then regress this likelihood on the variables that characterize the lenders' exposure to both default and currency risk and on the same indicators that characterize the borrower and the type of network that firm j borrows from.

As expected, higher exposure of the lenders to sovereign debt is associated with a lower probability that the borrower is still able to export post-default. The exposure to foreign currency liabilities (especially to those that were not "pesified") also significantly lowers this probability. These results are in line with those in Castagnino, D'Amato, and Sangiácomo (2013) who find that having more access to bank credit facilitates firms' entry into export markets. However, they are different from the results in Paravisini et al. (2014) who find no effects of credit access on the extensive margin of entry into new export markets for Peruvian firms. Moreover, this probability is significantly reduced when the network of I_j banks that the firm borrows from is composed mostly of public banks or private domestic banks instead of foreign banks, which we interpret as indicating that exporters tend to be linked to foreign banks. The larger the network and the larger the total stock of debt held pre-default, the higher the probability of being an exporter after the default. On the other hand, a larger concentration of the debt among just the top two banks in the network exerts a negative impact on the probability of exports after the crisis. Last, how long the firm has been borrowing from its network does not seem to have a statistically significant impact on the extensive margin of exports.

Regarding the controls that describe the firm, we find that having been in an irregular or default state pre-crisis lowers the likelihood of being productive enough to be able to export after the crisis has passed (see Table A.13).

Table 8: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure on Extensive Margin of Exports

Dependent Variable	Probability of Export $x_{j,2002} = 1$ (post-crisis)			
Government Exposure 2001				
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.0333*	-0.0636***	-0.0421**	-0.0687***
	(0.069)	(0.001)	(0.021)	(0.001)
FC Exposure 01 $\overline{FC}_{j2001}$			-0.0270**	-0.0384***
			(0.018)	(0.006)
Banking Network Characteristics				
Public Banks Network$_{j,2001}$	-0.0577***	-0.0541***	-0.0616***	-0.0602***
	(0.000)	(0.000)	(0.000)	(0.000)
Dom. Private Banks Network$_{j,2001}$	-0.00899***	-0.00872***	-0.0115***	-0.0105***
	(0.000)	(0.002)	(0.000)	(0.000)
Network Size (Dep.Mkt.Share)$_{j,2001}$	0.173***	0.131***	0.182***	0.140***
	(0.000)	(0.000)	(0.000)	(0.000)
Relationship Characteristics				
Avg Age Relationship$_{j,2001}$	0.000121	-0.0000341	0.000369	0.000159
	(0.783)	(0.939)	(0.403)	(0.724)
Share Top 2 Banks$_{j,2001}$	-0.130***	-0.129***	-0.130***	-0.128***
	(0.000)	(0.000)	(0.000)	(0.000)
Total Debt$_{j,2001}$	0.00890***	0.00901***	0.00888***	0.00904***
	(0.000)	(0.000)	(0.000)	(0.000)
Sector × Time FE	yes	yes	yes	yes
Other Bank/Network Controls	no	yes	no	yes
Other Firm Controls	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005
N	1,979,087	1,979,087	1,979,087	1,979,087
R-squared	0.149	0.149	0.149	0.149

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. x_j takes a value of 1 if the firm exports between 2003-2005. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure" refers to the ratio of non-deposit foreign currency liabilities to assets. "Network Size (Dep Mkt Share)" refers to the (loan-weighted) average deposit market share of the banks operating with firm j, "Public Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a state-owned bank, "Dom. Private Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a domestically-owned private bank, "Avg Age Relationships" is the (loan-weighted) average of the age of the existing relationships between firm j and all the banks that operate with it, "Share Top 2 Banks" corresponds to the share of loans of firm j allocated to its two largest lenders. Other bank network controls include the (loan-weighted) average of liquidity, leverage and net income for banks that operate with firm j in 2001. Other firm controls include the total value of debt in 2001 and the lagged borrower's default indicator.

7.2.3 Effects on Borrowers Default

In this section we study the effects of lenders' exposure to sovereign default on borrowers (private sector) default. We measure the latter's default probability by creating a dummy $d_{i,j}$ that takes a value of 1 if the loan from bank i to firm j is classified by the Central Bank as in credit situation either 4 (high risk/insolvent) or 5 (written off).[35] Then, we calculate a loan-weighted average $\sum_{i=1}^{N_j} \omega_{i,j} d_{i,j}$ of all the dummies for firm j, where ω represents the share of total loans for firm j granted by bank i.

The results in Table 9 show that sovereign default tends to spillover to the private sector since higher exposure of the lenders' portfolio to defaulted government bonds in 2001 is significantly associated with higher probability of default of the borrowers during the period 2003-2005.[36] Firms that borrow from either public banks or private domestic banks tend to default less than those engaged in a network composed mostly of foreign banks. Also, borrowers who work with a larger network (as measured by the deposit market share of all the lenders they borrow from) or mostly from the top 2 banks are less likely to default post-sovereign crisis. Older relationships are associated with default being more likely. Last, being an exporter before the crisis is associated with a reduction in the likelihood of default.

[35] The credit situation of a loan can take 5 values: 1 normal situation, 2 low risk, 3 medium risk, 4 high risk/insolvent, 5 written off.

[36] The full set of results is presented in Table A.14 in the Appendix.

Table 9: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure on Borrowers Default

Dependent Variable	Borrowers Default (post-crisis)			
Government Exposure 2001				
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	0.407***	0.387***	0.0993**	0.259***
	(0.000)	(0.000)	(0.012)	(0.000)
FC Exposure 01 $\overline{FC}_{j2001}$			-0.903***	-0.964***
			(0.000)	(0.000)
Banking Network Characteristics				
Public Banks Network$_{j,2001}$	-0.0118**	-0.0288***	-0.145***	-0.181***
	(0.040)	(0.000)	(0.000)	(0.000)
Dom. Private Banks Network$_{j,2001}$	-0.300***	-0.330***	-0.380***	-0.373***
	(0.000)	(0.000)	(0.000)	(0.000)
Network Size (Dep.Mkt.Share)$_{j,2001}$	-0.586***	-0.256***	-0.266***	-0.0309
	(0.000)	(0.000)	(0.000)	(0.568)
Relationship Characteristics				
Avg Age Relationship$_{j,2001}$	0.00433***	0.00826***	0.0125***	0.0130***
	(0.000)	(0.000)	(0.000)	(0.000)
Share Top 2 Banks$_{j,2001}$	-0.308***	-0.333***	-0.319***	-0.324***
	(0.000)	(0.000)	(0.000)	(0.000)
Exporter Indicator (in 2001)	-0.421***	-0.417***	-0.417***	-0.415***
	(0.000)	(0.000)	(0.000)	(0.000)
Total Debt$_{j,2001}$	0.00894***	0.00687***	0.00810***	0.00768***
	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity$_{j,2001}$		1.022***		-0.758***
		(0.000)		(0.000)
Leverage$_{j,2001}$		-0.621***		-0.352***
		(0.000)		(0.000)
Net Income$_{j,2001}$		-5.002***		-4.954***
		(0.000)		(0.000)
Sector × Time FE	yes	yes	yes	yes
Other Bank/Network Controls	no	yes	no	yes
Other Firm Controls	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005
N	2,078,412	2,078,412	2,078,412	2,078,412
R-squared	0.151	0.157	0.165	0.166

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. The dependent variable is an average of a categorical variable that takes values between 4 (high risk/insolvent) and 5 (written off) for loans in different degrees of default. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure 01" refers to the ratio of non-deposit foreign currency liabilities to assets in 2001. "Network Size (Dep.Mkt.Share)" refers to the (loan-weighted) average deposit market share of the banks operating with firm j, "Public Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a state-owned bank, "Dom. Private Banks Network" is the (loan-weighted) average of an indicator that takes a value of 1 if a bank operating with firm j is a domestically-owned private bank, "Avg Age Relationships" is the (loan-weighted) average of the age of the existing relationships between firm j and all the banks that operate with it, "Share Top 2 Banks" corresponds to the share of loans of firm j allocated to its two largest lenders, "Exporter Indicator" corresponds to an indicator that takes a value of 1 if the firm exported during 2001. Other bank network controls include the (loan-weighted) average of liquidity, leverage and net income for banks that operate with firm j in 2001. Other firm controls include the total value of debt in 2001.

8 Conclusion and Policy Implications

We study the bank credit channel around the largest sovereign default in world history: that of Argentina in 2001, which was followed within a month by a 250% currency devaluation. The fact that the debt crisis coincided with a currency crisis that raised output and, therefore, the demand for credit by firms in the export sector allows for a useful strategy to identify credit supply from credit demand shocks. As it is well documented, informational asymmetries in credit markets make banking relationships long lasting and difficult to replace (see Bleger and Rozenwurcel (2000), Berger, Klapper, and Udell (2001), and Escudé et al. (2001)). We propose a matching model where banks and firms set up lending relationships that are costly to replace and that become long lasting. In the model, a negative shock to the supply of credit hurts firms, especially those that face a positive investment shock. We then use the theory to guide our design of the empirical model that identifies shocks to credit supply from those to credit demand by resorting to variation in our data at the relationship level, i.e., variation across banks for any given borrower.

We benefit from access to a very rich proprietary dataset at the bank-firm level (i.e., relationship-level) for the universe of firms and banks in Argentina and detailed data on the type of sovereign bond holdings and on the currency portfolio composition by banks of different characteristics (big vs small, private vs public, etc.). We use the exposure to government bonds and foreign currency liabilities to identify credit supply shocks, and we then quantify the extent to which relationships of banks that were more exposed to the macroeconomic shock suffer more. Through a variety of robustness checks, we can confidently conclude that this channel is statistically significant and quantitatively important.

In addition, we explore to what extent firms might be able to undo this effect by switching lenders. If that was the case, our results based on the relationship-level data would overstate the negative effects on the supply of credit around a sovereign debt and currency crisis. By aggregating borrowing at the firm level, we find that the exposure of firms' banking network to foreign currency liabilities still has a negative effect on firms' credit. Also, the exposure of firms' banking network to sovereign debt appears to hurt only firms that do not export post sovereign default. Only exporters (who benefited from the devaluation) are able to partially undo the effect.

In summary, our results uncover some banking relationships being more fragile than others, i.e., those in which borrowers are linked to banks highly exposed to sovereign default risk. We present evidence consistent with our theoretical model that lenders' exposure to defaulted sovereign bonds and foreign currency liabilities causes credit to shrink at the loan level, and that some of these effects can be mitigated by firm (or sector) idiosyncratic

characteristics that make them raise their productivity after the shock.

From our findings we derive a handful of normative implications that would allow borrowers to switch from bank to bank more smoothly and efficiently. It would be worthwhile for regulators to improve access to public information on profits and balance sheet ratios of borrowers and to direct efforts at helping firms "locked in" more fragile relationships be able to better signal their creditworthiness to additional lenders. This could be achieved through the establishment or strengthening of credit bureaus that can rate their assets or develop standardized formulas for lenders to assess these firms' projects and balance sheets. Other mechanisms with the potential of easing the formation of new lending relationships include government-sponsored borrower guarantees, changes in risk-weighted capital requirements for banks, or even differential tax treatment to borrowers of exposed banks.

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A-1 Data Appendix

We use data from the Central Bank of Argentina's credit registry (called Central de Deudores). Our original sample expands from June 1999 to December 2005. While we use firm and bank-level information prior to the default and the devaluation, we focus the analysis on how credit and other variables evolved from June 2002 to December 2005. This sample contains 202,438 firms and 344,105 bank relationships (or loans). We apply the following filters:

1. For each firm and period, we aggregate the loans (in real terms) with all banks. Call this variable "total debt." For each firm, we compute the maximum value (over the time series) of total debt. To remove outliers we eliminate firms in the bottom 5% (very small firms) and top 2% of the distribution of maximum total debt.

2. We eliminate firms that report 12 or fewer observations.

3. We exclude government sector firms. We also exclude firms in the financial sector.

4. We eliminate lending relationship observations that are in the top or bottom 5% of the distribution of (quarterly) loan growth.

We are left with 97,279 firms and 159,312 lending relationships. Of these, there 33,333 firms with more than one lending relationship.

Table A.1 provides summary statistics at the firm level.

Table A.1: Summary Statistics (Firm Level)

	Firm Export Status					
	$x_j = 0$			$x_j = 1$		
Variable	Avg.	Median	Std. Dev.	Avg.	Median	Std. Dev.
Pre-Crisis Variables						
Sov. Debt Exposure $\overline{E}_{j2001}$	0.083	0.075	0.048	0.085	0.077	0.048
FC Exposure $\overline{FC}_{j2001}$	0.216	0.238	0.085	0.232	0.250	0.074
Liquidity Asset Ratio$_{j2001}$	0.085	0.085	0.026	0.088	0.085	0.023
Leverage Asset Ratio$_{j2001}$	0.901	0.908	0.046	0.899	0.898	0.036
Net Income Asset Ratio$_{j2001}$	0.003	0.004	0.010	0.005	0.005	0.006
Public Banks Network$_{j2001}$	0.339	0.000	0.448	0.173	0.000	0.328
Dom. Private Banks Network$_{j2001}$	0.323	0.000	0.439	0.435	0.263	0.442
Network Size (Dep Mkt Share)$_{j2001}$	0.081	0.089	0.051	0.078	0.086	0.041
Number of Banks$_{j2001}$	1.47	1.00	0.94	1.88	1.25	1.30
Avg Age Relationships$_{j2001}$ (months)	20.75	25.25	7.47	20.39	24.13	7.15
Share Top 2 Banks$_{j2001}$	0.983	1.000	0.064	0.959	1.000	0.098
Export Indicator$_{j2001}$	0.000	0.000	0.000	0.605	1.000	0.489
Firm Debt$_{j2001}$ (real, 000s)	45.41	10.78	115.02	115.29	31.41	321.06
Default Indicator$_{j2001}$	0.326	0.000	0.447	0.041	0.000	0.182
Contemporaneous Variables						
New Relationship Indicator$_{jt}$	0.321	0.000	0.455	0.333	0.000	0.449
Default Indicator$_{jt}$	0.461	0.000	0.499	0.125	0.000	0.331
Sov. Debt Exposure $\overline{E}_{jt}$	0.199	0.186	0.124	0.184	0.182	0.104
FC Exposure $\overline{FC}_{jt}$	0.142	0.128	0.105	0.159	0.153	0.098
Liquidity Asset Ratio$_{jt}$	0.121	0.116	0.067	0.112	0.108	0.066
Leverage Asset Ratio$_{jt}$	0.903	0.921	0.089	0.902	0.919	0.078
Net Income Asset Ratio$_{jt}$	-0.009	-0.003	0.035	-0.008	-0.003	0.032
Public Banks Network$_{jt}$	0.313	0.000	0.447	0.174	0.000	0.349
Dom. Private Banks Network$_{jt}$	0.323	0.000	0.439	0.435	0.263	0.442
Network Size (Dep Mkt Share)$_{jt}$	0.069	0.047	0.069	0.059	0.047	0.053
Number of Banks$_{jt}$	1.37	1.00	0.82	1.68	1.00	1.14
Avg Age Relationships$_{jt}$ (months)	43.04	45.00	20.05	43.26	45.00	20.05
Share Top 2 Banks$_{jt}$	0.990	1.000	0.050	0.979	1.000	0.070
Firm Debt$_{jt}$ (real, 000s)	45.74	7.41	105.47	87.94	14.87	160.98

Note: Export Status x_j takes a value of 1 if the firm exports between 2003-2005. Variables are loan-weighted averages at the firm level.
Source: Central Bank of Argentina.

Table A.2 shows the distribution of banking relationships for the firms in our sample (pre- and post-default/devaluation) as the fraction of firms and as the fraction of total loans.

Table A.2: Distribution of Banking Relationships

Pre-Default / Devaluation

	Fraction of Firms			Fraction of Loans		
# Banking		Export Status			Export Status	
Relationships	All	$x_j = 0$	$x_j = 1$	All	$x_j = 0$	$x_j = 1$
1	69.86	71.06	51.81	34.69	37.48	21.13
2	19.28	18.92	24.60	27.42	27.18	28.58
3	6.24	5.91	11.19	15.64	15.32	17.17
4	2.63	2.39	6.30	10.31	9.39	14.78
5	1.03	0.90	2.96	5.34	4.77	8.12
6-10	0.95	0.80	3.09	6.36	5.67	9.70
> 10	0.02	0.02	0.05	0.24	0.19	0.52

Post-Default / Devaluation

	Fraction of Firms			Fraction of Loans		
# Banking		Export Status			Export Status	
Relationships	All	$x_j = 0$	$x_j = 1$	All	$x_j = 0$	$x_j = 1$
1	76.20	77.18	61.72	41.64	43.90	23.97
2	16.15	15.69	22.92	27.02	26.64	29.86
3	4.71	4.43	8.87	14.47	13.75	20.06
4	1.71	1.58	3.57	7.94	7.52	11.25
5	0.67	0.61	1.52	4.27	3.97	6.66
6-10	0.55	0.49	1.38	4.54	4.13	7.93
> 10	0.01	0.01	0.02	0.10	0.09	0.26

Note: *Pre-default /devaluation* corresponds to year 2001. *Post-default/devaluation* corresponds to the average of years 2003-2005. Export Status x_j takes a value of 1 if the firm exports between 2003-2005. Fraction of Firms corresponds to the ratio of firms in a given bin to the total number of firms. Fraction of Loans corresponds to the ratio of loans in a bin to total loans.
Source: Central Bank of Argentina.

Table A.3 shows the distribution of the age of banking relationships for the firms in our sample (years 2003-2005). Relationships in the 21-25 months (year 2001), 46-50 months (year 2003), 61-65 months (year 2004) and 71-75 months (year 2005) bins correspond to firms with relationships that started at the beginning of our sample and operated continuously. Firms in the 1-5 months and 6-10 months bins are firms with banking relationships that started during the corresponding calendar year (there are some firms with new banking relationships in the 11-15 months bin). In the year 2004, we observe a large increase in the lower end of the age distribution and a significant decline in the fraction of relationships at the top end of the distribution.

Table A.3: Distribution of Age of Banking Relationships

	Fraction of Banking Relationships							
	Year 2001		Year 2003		Year 2004		Year 2005	
Age Relationship	Export Status		Export Status		Export Status		Export Status	
(months)	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$
1-5	5.42	5.80	3.47	4.12	6.00	6.61	2.09	4.50
6-10	7.39	9.34	2.56	3.12	5.67	4.89	5.56	6.34
11-15	5.45	6.06	6.63	5.78	3.51	4.30	7.76	6.26
16-20	6.92	7.25	1.42	1.67	2.48	2.83	5.94	4.71
21-25	74.82	71.55	4.18	4.56	7.36	6.72	3.41	4.12
26-30			4.28	4.60	0.00	0.00	2.58	2.85
31-35			6.12	7.81	3.73	3.85	2.70	2.93
36-40			4.58	5.07	3.91	4.15	5.04	4.43
41-45			5.75	6.27	3.97	4.58	1.86	2.30
46-50			61.00	56.99	4.97	6.10	3.38	3.57
51-55					4.50	4.54	3.19	3.45
56-60					10.42	9.82	4.96	5.38
61-65					43.48	41.60	3.39	3.59
66-70							4.75	4.94
71-75							43.40	40.64

Note: Export Status x_j takes a value of 1 if the firm exports between 2003-2005. Fraction of Banking Relationships corresponds to the ratio of banking relationships in a given bin to the total number of banking relationships.
Source: Central Bank of Argentina.

Table A.4 shows the sectoral allocation of credit by the banking sector in Argentina.

Table A.4: Allocation of Bank Credit by Sector

Sector	All Banks	Public	Private	Foreign
Wholesale & Retail	27.3	27.3	27.0	33.0
Agriculture	18.3	18.3	16.0	6.4
Construction	6.4	6.4	7.2	6.7
Transportation and warehousing	6.2	6.2	6.1	8.7
Food	5.9	5.9	5.4	5.0
Textiles	4.7	4.7	4.8	4.7
Real estate and rental	4.1	4.1	5.5	5.2
Services	3.1	3.1	3.7	2.9
Machinery	2.9	2.9	3.0	3.3
Metal-mechanic	2.8	2.8	2.9	3.2
Manufacturing	2.6	2.6	2.6	3.7
Chemical Products	2.3	2.3	2.5	3.4
Rubber products	2.1	2.1	2.1	2.9
Paper products	1.8	1.8	1.8	2.0
Other manufacturing	1.7	1.7	1.9	1.4
Other	1.5	1.5	1.1	0.7
Editorial and Printing	1.4	1.4	1.5	1.7
Hotels and restaurants	1.1	1.1	1.4	1.1
Automobiles	1.0	1.0	1.1	0.9
Mineral non-metallic	0.9	0.9	0.9	1.0
Oil & Mining	0.6	0.6	0.5	0.7
Educational services	0.5	0.5	0.5	0.9
Utilities	0.5	0.5	0.4	0.2
Fishing	0.2	0.2	0.1	0.2
Oil refining	0.0	0.0	0.0	0.1
Tobacco products	0.0	0.0	0.0	0.0

Source: Central Bank of Argentina.

A-2 Bank-Level Regressions: Robustness Checks

We use the following specification to study the correlation between the change in loans to the private non-financial sector (ℓ_{it}) between period t and period $t-1$ for bank i (measured as a 3-month change) and a measure of exposure to government debt in 2001 prior to default (E_{i2001}) and a measure of exposure to the devaluation via non-deposit foreign currency liabilities (FC_{i2001}). We also include a set of bank-level controls (X_{it}) and month fixed effects (α_t):

$$\Delta\ell_{it} = \alpha_t + \beta_1 E_{i2001} + \beta_2 FC_{i2001} + \beta_3 X_{it-1} + u_{it}. \tag{A.2.1}$$

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_{it-1} includes liquidity, leverage, the level of loans to the private non-financial sector, and profitability as measured by banks' net income.

Table A.5: Bank-Level Effects of Sovereign Debt Exposure

Dep. Variable	$\Delta\ell_{it}$				
Government Exposure					
Sov. Debt Exposure 01	-0.845**	-0.923**	-0.985**	-0.973**	-0.0649
	(0.047)	(0.030)	(0.018)	(0.023)	(0.983)
Debt Exp. 01 × Big				-0.127	
				(0.905)	
Debt Exp. 01 × Priv.					-0.818
					(0.796)
Debt Exp. 01 × Pub					-1.593
					(0.630)
Bank Characteristics					
Liquidity$_{t-3}$	1.353***	1.553***	1.393***	1.391***	1.389***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage$_{t-3}$	-0.622***	-0.755***	-0.431***	-0.432***	-0.436***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
(log) Real assets$_{t-3}$		0.0501**	0.0219	0.0231	0.0229
		(0.024)	(0.314)	(0.336)	(0.294)
Net Income$_{t-3}$			2.387***	2.386***	2.386***
			(0.000)	(0.000)	(0.000)
Constant	0.322***	-0.275	-0.138	-0.153	-0.156
	(0.005)	(0.338)	(0.624)	(0.619)	(0.581)
Bank Type×Time FE	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
No Observations	3220	3220	3220	3220	3220
R-squared	0.029	0.03	0.077	0.077	0.077

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01.

Table A.6: Bank-Level Effects of Sovereign Debt & Foreign Currency Exposure

Dep. Variable	$\Delta\ell_{it}$				
Government Exposure					
Sov. Debt Exposure 01	-0.721*	-0.747*	-0.847**	-0.880**	0.313
	(0.095)	(0.084)	(0.045)	(0.047)	(0.920)
FC Exposure 01	-0.298	-0.495**	-0.386*	-0.373*	-0.447
	(0.118)	(0.014)	(0.051)	(0.062)	(0.137)
Debt Exp. 01 × Big				0.215	
				(0.867)	
Debt Exp. 01 × Priv.					-1.126
					(0.722)
Debt Exp. 01 × Pub					-0.992
					(0.765)
FC Exp. 01 × Big				-0.401	
				(0.456)	
FC Exp. 01 × Priv.					0.260
					(0.495)
FC Exp. 01 × Pub					-2.807***
					(0.003)
Bank Characteristics					
Liquidity$_{t-3}$	1.239***	1.440***	1.306***	1.296***	1.341***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage$_{t-3}$	-0.633***	-0.824***	-0.487***	-0.490***	-0.582***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
(log) Real assets$_{t-3}$		0.0692***	0.0370	0.0468*	0.0466**
		(0.003)	(0.109)	(0.084)	(0.045)
Net Income$_{t-3}$			2.371***	2.361***	2.364***
			(0.000)	(0.000)	(0.000)
Constant	0.394***	-0.382	-0.222	-0.335	-0.335
	(0.001)	(0.188)	(0.434)	(0.307)	(0.244)
Bank Type×Time FE	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
No Observations	3220	3220	3220	3220	3220
R-squared	0.029	0.032	0.078	0.078	0.081

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01.

A-3 Relationship-Level Regressions: Robustness Checks

This section presents results from additional relationship-level regressions that we run following the specification in equation (11). The model of changes in credit from bank i to firm j in period t that we estimate is

$$\Delta\ell_{ijt} = \rho_{jt} + \beta_1 E_{i2001} + \beta_2 FC_{i2001} + \beta_3 R_{ijt-1} + \beta_4 X_{it-1} + e_{ijt},$$

where $\rho_j t$ are firm-time fixed effects, E_{i2001} and FC_{i2001} are defined as before and capture bank j exposure to the sovereign default and devaluation in 2001, R_{ijt-1} are controls that capture the characteristic of the relationship between bank i and firm j (e.g., age of the relationship, concentration) and X_{it-1} are standard bank-level characteristics such as bank size (measured by assets), liquidity, leverage, and profitability.

Table A.7: Relationship-Level Effects of Sovereign Debt Exposure

Dep. Variable	$\Delta\ell_{ijt}$				
Government Exposure					
Sov. Debt Exposure 01	-0.105***	-0.0348**	-0.0370**	0.487***	0.142***
	(0.000)	(0.050)	(0.037)	(0.000)	(0.000)
Debt Exp. 01 × Big				-0.511***	
				(0.000)	
Debt Exp. 01 × Priv.					-0.230***
					(0.000)
Debt Exp. 01 × Pub					-0.291***
					(0.000)
Bank Characteristics					
Liquidity$_{it-3}$	-0.0348**	-0.0245*	-0.0578***	-0.0819***	-0.0710***
	(0.010)	(0.072)	(0.000)	(0.000)	(0.000)
Leverage$_{it-3}$	0.280***	0.285***	0.267***	0.301***	0.287***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Real assets$_{it-3}$	1.68e-10***	4.73e-10***	3.09e-10***	3.92e-10***	3.69e-10***
	(0.007)	(0.000)	(0.000)	(0.000)	(0.000)
Net Income$_{it-3}$	0.210***	0.205***	0.207***	0.384***	0.386***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relationship Characteristics					
Age Pair$_{ijt-3}$		-0.00115***	-0.00130***	-0.00187***	-0.00182***
		(0.000)	(0.000)	(0.000)	(0.000)
Rank Bank$_{ijt-3}$			-0.0453***	-0.0415***	-0.0420***
			(0.000)	(0.000)	(0.000)
Firm×Time FE	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
No Observations	1,221,373	1,221,373	1,221,373	1,015,029	1,015,029
R-squared	0.183	0.183	0.186	0.209	0.209

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. "Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001.

Table A.8: Relationship-Level Effects of Sovereign Debt and Foreign Currency Exposure

Dep. Variable			$\Delta \ell_{ijt}$		
Sov. Debt Exposure 01	-0.0873***	-0.0473***	-0.0487***	0.548***	0.398***
	(0.000)	(0.008)	(0.006)	(0.000)	(0.000)
FC Exposure 01	-0.230***	-0.192***	-0.181***	-0.428***	-0.568***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Debt Exp. 01 × Big				-0.688***	
				(0.000)	
Debt Exp. 01 × Priv.					-0.905***
					(0.000)
Debt Exp. 01 × Pub					-0.569***
					(0.000)
FC Exp. 01 × Big				0.385***	
				(0.000)	
FC Exp. 01 × Priv.					0.680***
					(0.000)
FC Exp. 01 × Pub					0.575***
					(0.000)
Bank Characteristics					
Liquidity$_{t-3}$	-0.123***	-0.102***	-0.131***	-0.115***	-0.0897***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage$_{t-3}$	0.250***	0.258***	0.242***	0.109***	0.0111
	(0.000)	(0.000)	(0.000)	(0.000)	(0.488)
Real assets$_{t-3}$	3.70e-10***	5.23e-10***	3.57e-10***	4.49e-10***	5.20e-10***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Net Income$_{t-3}$	0.174***	0.177***	0.181***	0.336***	0.315***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relationship Characteristics					
Age Pair$_{ijt-3}$		-0.000698***	-0.000880***	-0.00163***	-0.00182***
		(0.000)	(0.000)	(0.000)	(0.000)
Rank Bank$_{ijt-3}$			-0.0450***	-0.0417***	-0.0417***
			(0.000)	(0.000)	(0.000)
Bank Type×Time FE	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
No Observations	1,221,373	1,221,373	1,221,373	1,015,029	1,015,029
R-squared	0.183	0.184	0.186	0.209	0.209

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01."Sov. Debt Exposure 01" refers to the ratio of domestic government bonds to assets in 2001. "FC Exposure" refers to the ratio of non-deposit foreign currency liabilities to assets in 2001.

A-4 Firm-Level Regressions: Robustness Checks

This section presents results from additional firm-level regressions where we add firm characteristics as additional controls (Table A.9) or we condition by the exporter status of the borrower (Table A.10).

Table A.9: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure

Dep. Variable	ΔL_{jt}					
Government Exposure 2001						
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.0904**	-0.142***	-0.194***	-0.211***	-0.274***	-0.290***
	(0.027)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
FC Exposure 01 $\overline{FC}_{j2001}$		-0.156***		-0.131***		-0.118***
		(0.000)		(0.002)		(0.005)
Bank Network Characteristics						
Network Size (Dep Mkt Share)$_{j2001}$	0.261***	0.314***	0.182***	0.211***	0.168***	0.194***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)
Public Banks Network$_{j2001}$	-0.00306	-0.0261***	0.0142**	-0.00638	0.00196	-0.0165*
	(0.595)	(0.000)	(0.022)	(0.469)	(0.750)	(0.060)
Dom. Private Banks Network$_{j2001}$	0.0255***	0.0108*	0.00851	0.00228	0.0210***	0.0154**
	(0.000)	(0.074)	(0.170)	(0.723)	(0.001)	(0.016)
Relationship Network Characteristics						
Avg Age Relationships$_{j2001}$	0.00105	0.00249**	0.00195*	0.00261**	0.00153	0.00213*
	(0.312)	(0.024)	(0.063)	(0.017)	(0.143)	(0.051)
Share Top 2 Banks$_{j2001}$	0.119***	0.116***	0.119***	0.120***	-0.256***	-0.253***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of Banks$_{j2001}$					-0.0308***	-0.0306***
					(0.000)	(0.000)
New Relationship Indicator$_{jt-3}$					0.0725***	0.0727***
					(0.000)	(0.000)
Firm Characteristics						
Export Indicator$_{j2001}$	0.123***	0.122***	0.122***	0.122***	0.133***	0.133***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln Firm Debt$_{j2001}$	-0.0380***	-0.0381***	-0.0381***	-0.0379***	-0.0334***	-0.0333***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Default Indicator$_{jt-3}$	-0.0519***	-0.0547***	-0.0522***	-0.0537***	-0.103***	-0.104***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Default Indicator$_{j2001}$					0.120***	0.120***
					(0.000)	(0.000)
Sector×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
Bank Controls	No	No	Yes	Yes	Yes	Yes
No Observations	1,979,087	1,979,087	1,979,087	1,979,087	1,968,321	1,968,321
R-Squared	0.005	0.005	0.005	0.005	0.006	0.006

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01.

Table A.10: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure (by export status)

	ΔL_{jt}											
	Export Status$_j$ Post-Default											
Dep. Variable	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$
Government Exposure 2001												
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.129***	0.478**	-0.225***	0.237	-0.306***	0.184	-0.172***	0.285	-0.241***	0.197	-0.320***	0.155
	(0.002)	(0.043)	(0.000)	(0.351)	(0.000)	(0.473)	(0.000)	(0.253)	(0.000)	(0.444)	(0.000)	(0.550)
FC Exposure 01 $\overline{FC}_{j2001}$							-0.135***	-0.396**	-0.117***	-0.256	-0.106**	-0.179
							(0.000)	(0.024)	(0.006)	(0.304)	(0.012)	(0.468)
Bank Network Characteristics												
Network Size (Dep Mkt Share)$_{j2001}$	0.232***	0.800**	0.150***	0.739**	0.129**	0.963***	0.278***	0.903***	0.177***	0.764**	0.154***	0.981***
	(0.000)	(0.015)	(0.005)	(0.041)	(0.015)	(0.008)	(0.000)	(0.006)	(0.001)	(0.035)	(0.004)	(0.007)
Public Banks Network$_{j2001}$	0.000395	0.00459	0.0171***	0.0288	0.00473	0.0187	-0.0195***	-0.0532	-0.00130	-0.0106	-0.0119	-0.00887
	(0.946)	(0.902)	(0.006)	(0.500)	(0.443)	(0.660)	(0.008)	(0.235)	(0.884)	(0.853)	(0.178)	(0.876)
Dom. Private Banks Network$_{j2001}$	0.0235***	0.0836***	0.00799	0.0492	0.0202***	0.0555*	0.0107*	0.0477	0.00236	0.0389	0.0151**	0.0483
	(0.000)	(0.001)	(0.202)	(0.109)	(0.001)	(0.072)	(0.082)	(0.112)	(0.718)	(0.223)	(0.019)	(0.131)
Relationship Network Characteristics												
Avg Age Relationships$_{j2001}$	0.00158	-0.0115**	0.00231**	-0.00818	0.00177*	-0.00589	0.00280**	-0.00673	0.00288***	-0.00644	0.00229**	-0.00466
	(0.130)	(0.044)	(0.028)	(0.167)	(0.092)	(0.321)	(0.012)	(0.268)	(0.009)	(0.292)	(0.036)	(0.446)
Share Top 2 Banks$_{j2001}$	0.0664**	0.287***	0.0675**	0.281***	-0.323***	0.331*	0.0642**	0.279***	0.0684**	0.279***	-0.320***	0.328*
	(0.013)	(0.001)	(0.012)	(0.002)	(0.000)	(0.067)	(0.016)	(0.002)	(0.011)	(0.002)	(0.000)	(0.069)
Number of Banks$_{j2001}$					-0.0324***	0.00589					-0.0322***	0.00578
					(0.000)	(0.694)					(0.000)	(0.699)
New Relationship Indicator$_{jt-3}$					0.0677***	0.121***					0.0679***	0.121***
					(0.000)	(0.000)					(0.000)	(0.000)
Firm Characteristics												
Export Indicator$_{j2001}$	0	-0.0464**	0	-0.0463**	0	-0.0374*	0	-0.0472**	0	-0.0468**	0	-0.0378*
	(.)	(0.016)	(.)	(0.016)	(.)	(0.052)	(.)	(0.015)	(.)	(0.015)	(.)	(0.050)
Ln Firm Debt$_{j2001}$	-0.0384***	-0.0351***	-0.0384***	-0.0356***	-0.0339***	-0.0317***	-0.0385***	-0.0360***	-0.0383***	-0.0359***	-0.0337***	-0.0319***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Default Indicator$_{jt-3}$	-0.0346***	-0.304***	-0.0348***	-0.306***	-0.0855***	-0.300***	-0.0371***	-0.308***	-0.0361***	-0.307***	-0.0866***	-0.301***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Default Indicator$_{j2001}$					0.117***	0.0458					0.117***	0.0443
					(0.000)	(0.243)					(0.000)	(0.259)
Sector×Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
Bank Controls	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
No Observations	1,848,580	130,507	1,848,580	130,507	1,838,966	129,355	1,848,580	130,507	1,848,580	130,507	1,838,966	129,355
R-Squared	0.005	0.011	0.005	0.011	0.006	0.011	0.005	0.011	0.005	0.011	0.006	0.011

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01.

Table A.11: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure (by export status), on impact in 2003

	ΔL_{jt}											
	Export Status$_j$ Post-Default											
Dep. Variable	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$	$x_j = 0$	$x_j = 1$
Government Exposure 2001												
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.179***	0.817*	-0.253***	0.180	-0.369***	0.00567	-0.293***	0.264	-0.298***	0.0313	-0.412***	-0.110
	(0.006)	(0.051)	(0.000)	(0.676)	(0.000)	(0.989)	(0.000)	(0.540)	(0.000)	(0.943)	(0.000)	(0.802)
FC Exposure 01 $\overline{FC}_{j2001}$							-0.330***	-1.115***	-0.305***	-0.743*	-0.285***	-0.567
							(0.000)	(0.000)	(0.000)	(0.067)	(0.000)	(0.160)
Bank Network Characteristics												
Network Size (Dep Mkt Share)$_{j2001}$	0.368***	1.910***	0.400***	1.935***	0.306***	2.090***	0.472***	2.162***	0.466***	1.962***	0.367***	2.109***
	(0.000)	(0.001)	(0.000)	(0.003)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)
Public Banks Network$_{j2001}$	-0.0109	-0.188***	-0.000598	-0.160**	-0.0152	-0.168**	-0.0599***	-0.352***	-0.0486***	-0.271***	-0.0599***	-0.253**
	(0.219)	(0.004)	(0.951)	(0.039)	(0.114)	(0.029)	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)	(0.010)
Dom. Private Banks Network$_{j2001}$	0.0533***	0.0758	0.0269***	-0.00129	0.0415***	-0.000207	0.0218**	-0.0265	0.0126	-0.0312	0.0282***	-0.0230
	(0.000)	(0.105)	(0.006)	(0.982)	(0.000)	(0.997)	(0.024)	(0.622)	(0.218)	(0.592)	(0.005)	(0.690)
Relationship Network Characteristics												
Avg Age Relationships$_{j2001}$	0.00565***	0.00365	0.00782***	0.0120	0.00792***	0.0148	0.00865***	0.0171*	0.00922***	0.0168*	0.00926***	0.0185*
	(0.000)	(0.686)	(0.000)	(0.203)	(0.000)	(0.111)	(0.000)	(0.078)	(0.000)	(0.087)	(0.000)	(0.056)
Share Top 2 Banks$_{j2001}$	0.00434	0.368**	-0.00223	0.352**	-0.653***	0.396	-0.000328	0.347**	0.000241	0.346**	-0.645***	0.391
	(0.918)	(0.013)	(0.958)	(0.017)	(0.000)	(0.180)	(0.994)	(0.018)	(0.995)	(0.019)	(0.000)	(0.185)
Number of Banks$_{j2001}$					-0.0543***	0.00463					-0.0538***	0.00454
					(0.000)	(0.850)					(0.000)	(0.853)
New Relationship Indicator$_{jt-3}$					0.109***	0.157***					0.109***	0.160***
					(0.000)	(0.001)					(0.000)	(0.001)
Firm Characteristics												
Export Indicator$_{j2001}$	0	-0.0381	0	-0.0376	0	-0.0332	0	-0.0408	0	-0.0392	0	-0.0345
	(.)	(0.263)	(.)	(0.268)	(.)	(0.325)	(.)	(0.230)	(.)	(0.248)	(.)	(0.308)
Ln Firm Debt$_{j2001}$	-0.0587***	-0.0696***	-0.0593***	-0.0713***	-0.0515***	-0.0660***	-0.0588***	-0.0725***	-0.0589***	-0.0723***	-0.0511***	-0.0667***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Default Indicator$_{jt-3}$	0.141***	-0.115***	0.139***	-0.118***	0.0516***	-0.148***	0.135***	-0.126***	0.135***	-0.123***	0.0481***	-0.150***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Default Indicator$_{j2001}$					0.179***	0.239***					0.178***	0.233***
					(0.000)	(0.000)					(0.000)	(0.000)
Sector×Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Period	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
Bank Controls	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
No Observations	672,277	43,703	672,277	43,703	669,061	43,304	672,277	43,703	672,277	43,703	669,061	43,304
R-Squared	0.010	0.017	0.010	0.018	0.012	0.019	0.010	0.018	0.010	0.018	0.012	0.019

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01.

Table A.12: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure on Probability of New Relationships

Dependent Variable	Probability of New Relationship					
Government Exposure 2001						
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	0.322***	0.273***	0.330***	0.272***	0.289***	0.343***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FC Exposure 01 $\overline{FC}_{j2001}$				-0.154***	0.122***	0.0973***
				(0.000)	(0.000)	(0.000)
Banking Network Characteristics						
Public Banks Network$_{j,2001}$	-0.0138***	-0.00739	0.00149	-0.0364***	0.0118*	0.0168***
	(0.001)	(0.105)	(0.739)	(0.000)	(0.069)	(0.008)
Dom. Private Banks Network$_{j,2001}$	-0.0631***	-0.101***	-0.109***	-0.0775***	-0.0956***	-0.104***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Network Size (Dep.Mkt.Share)$_{j,2001}$	-0.145***	0.00860	0.0704*	-0.0934***	-0.0186	0.0486
	(0.000)	(0.824)	(0.066)	(0.007)	(0.638)	(0.212)
N_{2001}			-0.000563			-0.000720
			(0.779)			(0.719)
Relationship Characteristics						
Avg Age Relationship$_{j,2001}$	-0.0182***	-0.0148***	-0.0121***	-0.0168***	-0.0154***	-0.0126***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share Top 2 Banks$_{j,2001}$	-0.0564***	-0.0700***	-0.00382	-0.0589***	-0.0708***	-0.00624
	(0.000)	(0.000)	(0.876)	(0.000)	(0.000)	(0.799)
Exporter Indicator in 2001	0.00991	0.0103	-0.00513	0.00943	0.0107*	-0.00480
	(0.117)	(0.104)	(0.413)	(0.136)	(0.092)	(0.444)
Total Debt$_{j,2001}$	-0.0270***	-0.0284***	-0.0266***	-0.0271***	-0.0285***	-0.0267***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Prob. of borrower default$_{j,t-3}$	-0.116***	-0.120***	-0.0154***	-0.119***	-0.119***	-0.0145***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Prob. of borrower default$_{j,2001}$			-0.187***			-0.187***
			(0.000)			(0.000)
Liquidity$_{j,2001}$		0.960***	1.026***		1.183***	1.203***
		(0.000)	(0.000)		(0.000)	(0.000)
Leverage$_{j,2001}$		-0.425***	-0.504***		-0.459***	-0.531***
		(0.000)	(0.000)		(0.000)	(0.000)
Net Income$_{j,2001}$		0.917**	0.653		0.916**	0.653
		(0.041)	(0.135)		(0.041)	(0.136)
Sector×Time FE	yes	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
N	1,979,087	1,979,087	1,979,087	1,979,087	1,979,087	1,979,087
R-squared	0.082	0.087	0.114	0.083	0.087	0.114

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. The dependent variable takes a value of 1 if the relationship is a new relationship established at time t.

Table A.13: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure on Extensive Margin of Exports

Dependent Variable	Probability of Export $x_{j,2002} = 1$ (post-crisis)					
Government Exposure 2001						
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	-0.0333*	-0.0636***	-0.0509**	-0.0421**	-0.0687***	-0.0569***
	(0.069)	(0.001)	(0.010)	(0.021)	(0.001)	(0.004)
FC Exposure 01 $\overline{FC}_{j2001}$				-0.0270**	-0.0384***	-0.0450***
				(0.018)	(0.006)	(0.001)
Banking Network Characteristics						
Public Banks Network$_{j,2001}$	-0.0577***	-0.0541***	-0.0510***	-0.0616***	-0.0602***	-0.0581***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dom. Private Banks Network$_{j,2001}$	-0.00899***	-0.00872***	-0.00973***	-0.0115***	-0.0105***	-0.0119***
	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)
Network Size (Dep.Mkt.Share)$_{j,2001}$	0.173***	0.131***	0.147***	0.182***	0.140***	0.157***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N_{2001}			0.00692***			0.00699***
			(0.000)			(0.000)
Relationship Characteristics						
Avg Age Relationship$_{j,2001}$	0.000121	-0.0000341	0.000579	0.000369	0.000159	0.000806*
	(0.783)	(0.939)	(0.198)	(0.403)	(0.724)	(0.074)
Share Top 2 Banks$_{j,2001}$	-0.130***	-0.129***	-0.0386	-0.130***	-0.128***	-0.0375
	(0.000)	(0.000)	(0.166)	(0.000)	(0.000)	(0.179)
Total Debt$_{j,2001}$	0.00890***	0.00901***	0.00875***	0.00888***	0.00904***	0.00879***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
New Relationship Indicator$_{j,t-3}$			0.00423*			0.00430*
			(0.058)			(0.054)
Prob. of borrower default$_{j,t-3}$	-0.108***	-0.108***	-0.0851***	-0.109***	-0.108***	-0.0855***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Prob. of borrower default$_{j,2001}$			-0.0401***			-0.0402***
			(0.000)			(0.000)
Liquidity$_{j,2001}$		0.0928***	0.111***		0.0227	0.0291
		(0.008)	(0.001)		(0.584)	(0.483)
Leverage$_{j,2001}$		0.0842***	0.0675***		0.0948***	0.0799***
		(0.000)	(0.000)		(0.000)	(0.000)
Net Income$_{j,2001}$		0.572***	0.515**		0.572***	0.515***
		(0.004)	(0.010)		(0.004)	(0.010)
Sector × Time Fixed Effects	yes	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
N	1,979,087	1,979,087	1,968,321	1,979,087	1,979,087	1,968,321
R-squared	0.149	0.149	0.152	0.149	0.149	0.152

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. The dependent variable takes a value of 1 if the firm is an exporter post-default between 2003-2005.

Table A.14: Firm-Level Effects of Sovereign Debt and Foreign Currency Exposure on Borrowers Default

Dependent Variable	Borrowers Default (post-crisis)					
Government Exposure 2001						
Sov. Debt Exposure 01 $\overline{E}_{j2001}$	0.407***	0.387***	0.0940***	0.0993**	0.259***	0.0244
	(0.000)	(0.000)	(0.003)	(0.012)	(0.000)	(0.448)
FC Exposure 01 $\overline{FC}_{j2001}$				-0.903***	-0.964***	-0.521***
				(0.000)	(0.000)	(0.000)
Banking Network Characteristics						
Public Banks Network$_{j,2001}$	-0.0118**	-0.0288***	-0.0461***	-0.145***	-0.181***	-0.128***
	(0.040)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dom. Private Banks Network$_{j,2001}$	-0.300***	-0.330***	-0.189***	-0.380***	-0.373***	-0.213***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Network Size (Dep.Mkt.Share)$_{j,2001}$	-0.586***	-0.256***	-0.410***	-0.266***	-0.0309	-0.291***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.568)	(0.000)
N_{2001}			0.0351***			0.0358***
			(0.000)			(0.000)
Relationship Characteristics						
Avg Age Relationship$_{j,2001}$	0.00433***	0.00826***	-0.00568***	0.0125***	0.0130***	-0.00303***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share Top 2 Banks$_{j,2001}$	-0.308***	-0.333***	-0.0716*	-0.319***	-0.324***	-0.0581
	(0.000)	(0.000)	(0.068)	(0.000)	(0.000)	(0.138)
Exporter Indicator in 2001	-0.421***	-0.417***	-0.211***	-0.417***	-0.415***	-0.212***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total Debt$_{j,2001}$	0.00894***	0.00687***	-0.00862***	0.00810***	0.00768***	-0.00812***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
New Relationship Indicator$_{j,t-3}$			-0.00973**			-0.00880**
			(0.014)			(0.026)
Prob. of borrower default$_{j,2001}$			0.674***			0.669***
			(0.000)			(0.000)
Liquidity$_{j,2001}$		1.022***	0.544***		-0.758***	-0.410***
		(0.000)	(0.000)		(0.000)	(0.000)
Leverage$_{j,2001}$		-0.621***	-0.113***		-0.352***	0.0308
		(0.000)	(0.006)		(0.000)	(0.431)
Net Income$_{j,2001}$		-5.002***	-2.324***		-4.954***	-2.309***
		(0.000)	(0.000)		(0.000)	(0.000)
Sector × Time FE	yes	yes	yes	yes	yes	yes
Other Bank/Network Controls	no	yes	no	no	yes	no
Other Firm Controls	yes	yes	yes	yes	yes	yes
Period	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005	2003-2005
N	2,078,412	2,078,412	1,968,321	2,078,412	2,078,412	1,968,321
R-squared	0.151	0.157	0.478	0.165	0.166	0.480

Note: p-values in parentheses. *p<0.10, **p<0.05, ***p<0.01. The dependent variable takes a value of 1 if the firm defaults on its loans between 2003-2005.