The Non-Bank Credit Crunch in Mexico: Rise and Fall of an Industry

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Abstract

We study the severe credit crunch of finance companies (SOFOLES) in Mexico using firm-level data between 2001 and 2011. Our results provide supporting evidence for a liquidity shock in the form of restricted access to commercial bank loans, loans from other organizations and public debt markets—the main funding sources for their loans—as key determinants of the lending contraction during the recent financial crisis in Mexico (2007-2009). The cutback in funding explains 14 percent of the credit contraction of SOFOLES during the financial crisis. We also find a key role for other supply factors such as increased non-performing loans and the loss in credit market share to commercial banks. Demand factors, in particular, the large reduction in economic activity during the financial crisis played also an important role. Finally, our results suggest that the credit contraction of SOFOLES was preceded by exponential credit growth rates, loosening lending standards, and inadequate servicing procedures, all of which contributed to a severe portfolio deterioration and the subsequent decline in loan growth.

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Keywords: financial crisis, liquidity shock, funding shock.

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1. Introduction

During the nineties, and after the currency and financial crisis of 1994, an alternative financial sector aimed at expanding consumer and mortgage lending in Mexico was born. This parallel sector composed of non-bank financial corporations of limited purpose (Sociedades Financieras de Objeto Limitado, SOFOLES) allowed a number of households and small businesses to gain access to formal credit that commercial banks did not provide.

SOFOLES' business model is relatively simple. They are non-depository institutions that serve specific segments of the population extending commercial, consumer and mortgage loans financed through commercial bank credit, debt from capital markets, and government housing programs. Another important funding source for SOFOLES—particularly those specialized in mortgage loans—was loan securitizations. Their business model worked well during the boom times in Mexico (between 2001 and 2007). After 2007, however, and mostly as the result of spillover effects from the subprime mortgage crisis in the U.S., heightened risk aversion affected financial intermediaries' funding in Mexico and SOFOLES' funding model proved vulnerable. Most of these entities faced a harsh liquidity shock—namely, a cut in their main funding sources: bank loans, the inability to refinance debt in financial markets, and a sudden stop in the loan securitization market.

During late 2008 financial markets in Mexico were very volatile and investors became unwilling to take on or to refinance risky investments. SOFOLES were also affected by the progressive deterioration in the quality of their loan portfolios, partly caused by higher unemployment and the slowdown in the housing market. As the perception of risk deepened, a large funding withdrawal led to a sharp increase in borrowing costs. The possibility of surviving the financial storm became very tiny for many non-bank institutions.

Credit market share played an important role to further intensify the consequences of the liquidity shock. Between 2007 and 2008, SOFOLES lost significant market share to banks, as banks began expanding their mortgage credit business to previously unattended sectors towards the end of 2004. SOFOLES also lost significant market share in the mortgage loan market to the government housing funds (Infonavit and Fovissste), which became direct competitors in low-income segments of the market that SOFOLES previously dominated. In general, during those years, large banks carried out their expansion by acquiring the most successful SOFOLES. As a result of the stronger competition from banks and the government housing funds, some SOFOLES had to exit the market, others filed for bankruptcy, and many others turned into SOFOMES (similar entities with multiple

purposes and subject to less regulation). Out of the 60 SOFOLES in operation during mid 2006, only 16 remain at present.

In this paper we consider whether the large contraction in the lending of SOFOLES, and more generally, the significant decline in their financial activities, were mostly driven by supply factors. In particular, we aim to determine if the credit contraction was caused by a liquidity shock that took the form of a severe cutback in their traditional funding sources: bank loans, public debt issuances, and loan securitizations (which, on average, represent between 75 to 90 percent of their funding). We also explore other potential explanations for the credit crunch in the SOFOLES sector, among them: mismanagement issues and excessive risk taking due to soft regulation, increasing competition from commercial banks in commercial, consumer and mortgage lending, insufficient capital leading to solvency problems, and bad aggregate economic conditions (a drop in loan demand).

Our paper contributes to the literature on credit crunches and the bank lending channel in two ways. First, we use financial micro-level data for a developing country suffering from international financial contagion. Second, we look at a specific funding shock—which we argue was relatively exogenous to the actions of SOFOLES. Furthermore, we document the main sources of the credit crunch for this particular type of financial institution, similar in nature to finance companies in the U.S., for which there is also very little empirical evidence. Finally, results from the lending decomposition shed light on how important supply and demand factors are in explaining a severe credit contraction.

We first describe and analyze the series of events leading to the severe shortage in funding, to set the ground in understanding the magnitude of the liquidity shock. We then proceed to model the credit crunch using quarterly data at the firm level from 2001 to 2012. Our empirical analysis reveals that indeed the SOFOLES sector suffered from a liquidity contraction on funding from commercial banks and from the securities market. As we show, the funding reduction explained about 14 percent of the lending contraction.

To further disentangle supply from demand factors, we use our regression estimates to gauge the importance of individual determinants. In terms of economic importance, we also find a key role for other supply factors. As noted above, by the end of 2004 banking institutions fully re-launched their credit products in previously unattended sectors. As a result of fiercer competition, the loss in credit market share to commercial banks was a key determinant of the credit contraction. Demand factors, in particular, the large contraction in economic activity during the financial crisis also played a significant role. Finally, our results suggest that—like previous credit crunches in other latitudes—the credit crunch in the SOFOLES sector in Mexico was preceded by exponential credit growth rates, loosening

lending standards, and inadequate servicing procedures, all of which contributed to a severe portfolio deterioration and the subsequent decline in new loan origination. We find that non-performing loans and lower liquidity buffers play a significant role too. Finally, we do not find evidence of a significant role for equity capital.

The rest of the paper is organized as follows. The next section reviews the related literature on liquidity and funding problems in the financial sector. Section 3 presents the history and evolution of the SOFOLES sector in Mexico. Section 4 discusses our econometric analysis using data at the institution level. Section 5 concludes.

2. Related literature

Beyond some reports from the financial authorities and local press, studies about the SOFOLES sector in Mexico are almost non-existent. During their expansion, SOFOLES improved their payment systems and devised a rudimentary form of risk sharing through community mortgage insurance funds. As they also introduced greater standardization in loan contracts and servicing systems, SOFOLES evolved toward greater efficiency in mortgage lending. At the time when the sector was a dominant player in mortgage markets, Pickering (2000) reviewed the new challenges posed by increasing competition in the financial sector, and questioned the duration of their privileged position in the mortgage business.[1]

There is a vast literature on liquidity shocks, credit crunches, and their contagion through different markets and regions. For example, in the model of Allen and Gale (2000), the spillover effect of a crisis occurs when claims of troubled banks in one region decrease in value causing losses in banks, from other regions, holding those claims. Diamond and Rajan (2005) developed a model where the shrinkage of the common pool of liquidity is caused by bank failures that exacerbate aggregate liquidity shortages, and not by depositor panics or contractual links between banks.

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[1] As Pickering (200) documents, SOFOLES continued growing heavily funded by the government through a subsidized housing and mortgage program (FOVI), which allowed them to easily start reaching mortgage sectors that banks were unable to serve. This simple business model turned out to be highly profitable despite the high origination and servicing costs. Over the following years, SOFOLES also succeeded in raising funds from the securities markets and commercial banks.

Brunnermeier (2009) studies the liquidity and credit crunch in the U.S. between 2007 and 2009, and proposes a mechanism based on liquidity spirals that lead to a financial crisis. Liquidity dries up when market frictions limit optimal risk sharing and obstruct funding to flows to investors. As financial institutions in need of liquidity sell their liquid assets, prices of those assets fall with the subsequent erosion in investors' net worth, which forces the institution to sell more assets. This situation leads to a loss spiral, that is, a vicious circle as levered accounts continue selling assets at lower prices (haircuts) and increased margins (see also Brunnermeier and Pedersen, 2009). Thus, a shock in one market such as the sub-prime mortgage market in 2007-2008 was amplified to a full-blown financial crisis because of the abrupt decline in liquidity.

The financial crisis of 2007-2009 originated in U.S. banks that were highly exposed to the housing bubble through mortgage loans and structured products. As Gorton (2009) pointed out, the crisis resembled a banking panic that took the form of a "run" on the repo markets, when lenders withdrew their funds en masse by declining to roll over their loan agreements and by raising their repo haircuts. Runs also occurred in other short-term funding markets for banks such as the asset-backed commercial paper market (Covitz, Liang and Suarez, 2009). Financial panic increased substantially after the collapse of Bear Stearns in March 2008 and reached a peak after the collapse of Lehman Brothers and the bailout of AIG. At the height of the crisis, fear and uncertainty spread internationally through international funding markets and hit domestic financial markets around the world through a substantial reduction in bank credit supply.

Empirical evidence on the transmission channels of international liquidity shocks on bank credit is provided by Khwaja and Mian (2008), Cetorelli and Goldberg (2010), Aiyar (2011), and Schnabl (2012). Khwaja and Mian (2008) study the impact on bank lending of Pakistan's nuclear tests in 1998 and the subsequent liquidity shock in the form of a drop in dollar-denominated deposits. The authors find that Pakistani banks with foreign funding significantly reduced their local lending. Cetorelli and Goldberg (2010) find evidence of liquidity shocks from global banks headquartered in advanced countries to bank lending in emerging economies. The authors argue that the transmission of international liquidity shocks works through three channels: (1) reduction in cross-border lending, (2) decline in lending to local affiliates in emerging economies, and (3) contraction in foreign funding to domestic banks in emerging economies.

Aiyar (2011) provides evidence of the transmission of external funding shocks for U.K. banks during the recent financial crisis. The author finds that the shock to foreign funding (an aggregate fall in external liabilities) caused a substantial reduction in domestic lending. Schnabl (2012) uses the Russian default as a liquidity shock to international banks and

shows how it ended up affecting the lending of Peruvian banks through interbank markets. He finds that foreign-owned banks contracted their lending more severely than domestic banks without access to foreign credit. As the author suggests, lending between international banks establishes a transmission channel for bank liquidity shocks that bank ownership reduces.

A recent paper by Ramcharan, Van den Heuvel, and Verani (2012) illustrates the effects of a liquidity shock transmitted from asset-backed securities (ABS) markets to a very specific sector of the U.S. financial industry. They untangle how the financial crisis of 2007-2009 and the value decline of ABS ultimately affected the lending of credit unions to consumers in the broad economy. Their findings suggest that the decline in equity capital of credit unions is associated with a significant contraction in lending over the subsequent four quarters. More specifically, their estimates indicate that the $25 billion loss in equity capital associated with the ABS losses at CCUs may have engendered a $40 billion reduction in the supply of consumer credit at NPCUs between 2009 and 2010.

Our empirical analysis builds on this literature and examines the impact of a liquidity shock within the Mexican financial sector. As a consequence of the severe liquidity shortage—mainly the result of contagion from the international financial crisis in 2008—Mexican banks drastically cut their interbank loans to SOFOLES. Increased volatility in internal capital markets during that time also made it almost impossible for SOFOLES to continue issuing new debt or to roll over existing debt. Using firm-level variation in funding sources before, during, and after the financial crisis, we are able to identify the impact of the funding shock described above on the lending of SOFOLES.

3. SOFOLES: The rise and demise of an industry

SOFOLES were created in 1994 under NAFTA negotiations and as part of the effort to promote the development of non-bank financial intermediaries similar to those already operating in the United States and Canada. One of the main objectives was to increase competition in the financial sector, historically dominated by banks, and to allow credit to reach segments of the population unattended by banks. The first SOFOLES started operations in the mortgage sector. Over the next years, several factoring and leasing companies converted their business to SOFOLES providing automobile and small business loans. During the early nineties funding alternatives for SOFOLES were limited and most resources came from shareholders.

By the end of 1994, the severe financial and banking crisis in Mexico brought a substantial market opportunity for the newly created SOFOLES, already servicing

mortgages and car loans, as commercial banks cut back their loans, retrenched from credit market, and mainly focused on renegotiating distressed loans.

The gradual development of financial markets after financial reforms that followed the 1994 crisis (e.g. pension system, bank capitalization, financial supervision and regulation), together with a more stable macroeconomic landscape, favored the booming of non-bank financial intermediaries. For several years after their creation SOFOLES operated in good financial shape. Their credit business grew at a rapid pace as funding turned inexpensive and access to debt markets improved notably during the early 2000s. In mortgage markets, government funding became particularly relevant and took the form of subsidized funds through development banks and the housing funds (Infonavit). During the early 2000, SOFOLES also gained access to the securities market, raising funds by securitizing their loan portfolios and issuing regular debt instruments.[2] In the commercial and consumer loan business, most SOFOLES heavily depended on funding from commercial banks.

During the 2000s, SOFOLES enjoyed high profitability. Return on assets (ROA) was above 3 percent, and return on equity (ROE) was close to 40 percent. With a booming construction sector, partly boosted by government policies aimed at decreasing a housing supply shortage, SOFOLES started to grant bridge loans to construction companies. At its peak, by the end of 2006, there were 60 SOFOLES in operation, underwriting more than 65 percent of the mortgages originated in the country, and providing 20 percent of the total credit to companies and families (2 percent of the GDP).

However, as economic conditions improved and more profitable opportunities came about in consumer and mortgage loans, commercial banks started to regain their market share in these sectors. By 2005, commercial banks fully returned to the credit business originating consumer and mortgage loans in market segments previously unattended. Several banking groups set targets to recapture their market share, some of them by acquiring the most successful SOFOLES.

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[2] The first issuance of Residential Mortgage Back Securities (RMBS) occurred in 2003 when GMAC Hipotecaria and Su Casita raised $53 million. This first issuance was 7 times oversubscribed and soon prompted other market participants to quickly jump to structure their own deals. Between 2004 and 2008, the market for RMBS in Mexico became very dynamic, with high demand from institutional investor. By mid 2008, debt securities funding represented about 20 percent of the SOFOLES total funding. Structured funding was concentrated at the largest entities: Metrofinanciera, Su Casita, Credito y Casa, GMAC Mexicana, ING Hipotecaria, Patromionio and Fincasa.

The new competition with banks as well as the very aggressive lending from the government housing funds created less favorable conditions for SOFOLES. Their access to stable and low funding costs was limited compared with banks. Banks had a higher comparative advantage and enjoyed a bigger customer and depositor bases. Furthermore, commercial banks and Infonavit—the largest government housing fund—started offering mortgage loans in a joint granting scheme, targeting the low income sector that SOFOLES previously dominated. Fiercer competition took place in mortgage markets as banks and SOFOLES battled to support low interest rates. With much higher funding costs, the battle was unsustainable for SOFOLES, which eventually opted to defend their market share by exploring new but more risky possibilities with less formal customers: the self-employed, and consumers with low credit scores. These practices, of course, implied loosening credit standards and inadequate servicing procedures, all of which later contributed to higher default rates and a severe deterioration of their credit portfolios.

Eventually SOFOLES lost an important part of their market share to banks as seen in Figure 1. In the face of more intense competition with commercial banks and the government housing funds, SOFOLES' profitability took a hit and declined significantly until it reached negative levels during the financial crisis in 2007-2009 (Panel A, Figure 2). From the last quarter of 2008, SOFOLES operating in the mortgage sector reported losses for every single quarter until the end of 2010.

3.1 Changes in regulation

In an effort to ease their financial trouble and to help them manage the increased competition from banks, changes in government regulation were introduced in 2006. New regulatory rules allowed some of the non-bank intermediaries to operate unregulated and unsupervised. Under the new rules, institutions that opted for the new regulatory scheme were converted into SOFOMES (multiple purpose financial societies). Capital levels, loan loss provisions, and internal processes organization for SOFOMES would no longer be monitored. Only SOFOLES or SOFOMES affiliated with banks or financial groups would remain supervised and regulated under the new laws. In practice, the new rules implied that after conversion into SOFOM, a SOFOL stopped reporting financial statements to the National Banking and Securities Commission (CNBV).

During early 2007 four relatively large SOFOLES converted into SOFOMES. By 2008, only 30 SOFOLES retained their charter. The newly created SOFOMES stayed in the credit business as usual but enjoyed the benefit of moving from heavy regulation to no regulation at all. As a result of these changes, all related parties—namely, authorities, investors and

cretidors--failed to keep control of SOFOMES' operations, overlooking their lack of transparency and the lower quality of their portfolios.

3.2 *The financial crisis and the liquidity crunch*

The financial turmoil in 2008, and more specifically the collapse of short-term funding markets around the world, overlapped with other factors contributing to the drastic cut in the funding of SOFOLES. Until June 2008, Mexico seemed untouched by the breakdown of securitization markets and the failure of financial institutions in the United States. Early that year, the primary market for RMBS was still very active and all financial institutions were conducting business as usual. Around 30 SOFOLES were already deregulated and transformed into SOFOMES. Although the sector was struggling to maintain its market share, it was still profitable and credit portfolios continued to grow.

By August 2008, however, new issues of securities, especially RMBS, went to standby as demand slowed down (Figure 2, panel C). The global liquidity crunch became manifest through higher interest rates in long-term government bonds and raised concerns that the U.S. financial crisis would soon spread in Mexico.

As was the case in many other parts of the world, the failure of Lehman Brothers and the bailout of AIG in October 2008 had a huge impact on the Mexican financial market, though in unexpected ways. In the days following the announcement of the failure of Lehman Brothers, the Mexican peso devalued significantly in response to the expected outflow of funds and to investor "flight to safety" strategies. This situation worsened as soon as it came to light that during the months leading up to the crisis, some non-financial corporations in Mexico were betting against the U.S. dollar through exotic derivatives. Margin calls to cover positions required enormous purchases of U.S. dollars causing a sharp increase in market volatility and further currency depreciation. Most margin calls were not met and ended up in default.

In the middle of the financial storm the third largest SOFOL, Metrofinanciera, was severely hit by fraud allegations as the company made public that US $300 million in loan payments from homebuilders were never transferred to RMBS's trusts, and instead, went directly to the company accounts.[3] As corruption practices at Metrofinanciera unfolded,

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[3] Highly reliant on new RMBS issuances, the company hoped that the misuse of funds would not be revealed. However, those issuances came to a halt as the crisis erupted and fraud was put in evidence. See Factiva, "Housing Pessimists Chew on Metrofinanciera; Company puts figure on money owed to the trusts", Asset Securitization Report, December 2008.

funding to SOFOLES almost vanished. Widespread mistrust on the SOFOLES/SOFOMES industry quickly spread out through financial markets and precipitated a large withdrawal of funds. By the first quarter of 2009, Metrofinanciera defaulted on its debt and was almost immediately followed by Hipotecaria Credito y Casa, which also struggled with soaring bad loans and difficulties in refinancing its short term debt. During the following months several SOFOLES were merged or acquired by financial groups to be able to continue their operations, and others like Dexia, subsidiary of the Belgian Dexia Bank, were closed because of the cut of funding from the parent company. All surviving institutions had to be recapitalized to cover the increasing levels of non-performing loans.

At the height of the crisis in the fall of 2008, the mortgage sector was severely hurt by volatile market conditions. Interestingly, SOFOLES proved to be good financial intermediaries while they remained supervised and regulated by their creditors; however, as banks and debt-holders overlooked SOFOLES risk taking, the portfolio deterioration became imminent. By early 2009, non-performing loan (NPL) ratios on mortgage loans hit double digits (Figure 2, panel D). At the same time, credit markets were hit by a drop in loan demand resulting from rampant unemployment rates, the slowdown in the housing markets, and a severe recession. As shown in the upper panel of Figure 3, GDP dropped more than 10 percent between June 2008 and June 2009.

Given the severity of conditions, government authorities, banks, and SOFOLES entered into an agreement to refinance and restructure some of the liabilities from institutions operating in the mortgage sector such as Casa Mexicana, Credito Inmobiliario, Hipotecaria Su Casita, and Fincasa. The government, mainly through the development bank Sociedad Hipotecaria Federal (SHF), provided credit enhancements by guaranteeing 65 percent of new debt issuances and offered credit lines to alleviate immediate liquidity needs (which partly substituted for commercial bank funding). The credit enhancements were instrumental in allowing the less troubled SOFOLES to raise funds from securities market during 2009.

Between 2009 and 2010, SOFOLES were facing multiple challenges: a large and sudden drop in external funding, rising delinquencies in their loan portfolios—particularly in the construction pools—small asset valuations, and weak capital levels. Despite the government aid, a vicious circle emerged directing the sector to its collapse: the deterioration of loans led to decreasing income and further needs for loan loss reserves; at the same time, risk perception abruptly jumped and, as a result, funding was cut even more or the cost of it became unaffordable. Without enough short-term funds SOFOLES were unable to support daily operations, to originate new loans, or to restructure past-due ones, all of which could provide cash inflows. Because of this vicious cycle, very few SOFOLES managed to survive.

As the lower level of Figure 1 illustrates, loan growth (blue line) and bank funding (red line) are highly correlated during our entire sample period (correlation coefficient is 0.94). These plots confirm that the business model of SOFOLES is relatively simple; they fund their loans using bank loans. Some institutions, mainly the largest ones, issue debt securities.

4. Data and Methodology

We collect information at the firm level using quarterly data from 2001 through 2011 for approximately 70 SOFOLES. The sample period includes both a pre-crisis period (2001-2006) and the financial crisis in Mexico (2007-2009). Using panel data estimation our main hypothesis of a liquidity shock being a key driver of the loan growth rate of SOFOLES is tested using the following regression:

$$\Delta \log(loan_{i,t}) = \alpha_1 time_t + \alpha_2 entity_i + \beta_1 \Delta Interbank\ loan_{i,t-1} + \beta_2 \Delta Debt_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{s,t}$$

In this specification, our dependent variable, $\Delta \log(loan_{i,t})$, is the quarterly growth rate of total loans of SOFOL i during quarter t. Among our explanatory variables, included in the regression with lagged values, $Interbank\ loan_{i,t-1}$ is the percent change in interbank loans and $\Delta Debt_{i,t-1}$ is the percent change in market debt. These are the main variables of interest and measure the funding sources available to finance loans. We control for firm specific characteristics in vector $X_{i,t-1}$ including: size (log of total assets), capital (equity capital/total assets), holdings of liquid assets (liquid assets/total assets), a proxy for loan quality (Non-performing loans/total loans), and profits (return on equity/ average assets).

Our specification also includes time dummies, $time_t$, to account for time effects in lending such as seasonal effects and any other macroeconomic changes affecting all institutions equally and simultaneously; and firm-fixed effects, $entity_i$, to account for unobserved heterogeneity, when this heterogeneity is constant over time and correlated with the other independent variables in the model.

In alternative specifications, we also consider macroeconomic aggregates such as a proxy for interest rate spreads to control for general trends in the cost of credit, GDP growth, to capture aggregate economic conditions, and therefore, a rough proxy for real loan demand, and the market share of commercial banks in total credit markets, to account for the impact of higher competition from banks in credit markets.

According to our hypothesis of a liquidity shock leading to a contraction in lending, we expect positive and significant coefficients on SOFOLES funding sources ($\beta_1 > 0$ and $\beta_2 > 0$). Intuitively, and according to a simple business model, more funding allows SOFOLES to originate more loans and sustain higher loan growth. We also hypothesize that institutions with more liquid assets and equity capital, or with better credit quality (modest credit losses) may have been in better shape to withstand the effects of the liquidity shock. Liquidity restrictions in the form of increased costs of funding, together with lax lending policies and decreased market share, may have also resulted into severe financial distress and a general contraction of their financial activities, or even the possibility of failure.

Our analysis uses the cross-sectional variation in the funding sources available for SOFOLES during our sample period, which allows us to identify the impact of a supply shock (funding shock) on lending. In addition, our econometric tests rely on the number of SOFOLES that remain in the sample throughout the entire period.

4.1 Summary Statistics

Table 1 presents some descriptive statistics for the entire sample, divide by four subsamples: pre-crisis (2001-2006), crisis1 (2007:Q1-2008:Q2), crisis2 (2008:Q3 -2009:Q4), and post-crisis (2010-2011:Q3) periods.

Loan growth slows down for the median entity from the pre-crisis period (9 percent) to the crisis1 period (6 percent), and then declines abruptly to 0 percent in crisis2 and negative 1.3 percent during the post-crisis period. Interbank loan growth follows a very similar pattern, suggesting that indeed SOFOLES finance their loans using interbank loans as the main funding source. Interbank loan growth slows down for the median entity from the pre-crisis period (8 percent) to the crisis1 period (6 percent), and then declines abruptly to 0 percent in crisis2 and negative 1.6 percent in the post-crisis period.

Consistent with the narrative of section 3, table 1 also shows that during the financial crisis in Mexico, profitability of the SOFOLES sector drops as the credit quality of their loan portfolio deteriorates dramatically. The median SOFOL saw a drop in ROA from 2 percent in the pre-crisis period to about 0.7 percent in the crisis2 period, precisely the time when their non-performing loan to total loan ratio more than doubled during the crisis (from 4 percent to 9 percent) and tripled by the end of the port-crisis period during the post-crisis period (the ratio reaches 15 percent by year end 2011).

4.2 Econometric Results

Table 2 presents our basic regression results using four different specifications: columns (1) and (3) are pooled OLS regressions with firm-level clustered standard errors (with and without time effects respectively), column (2) is a pooled quantile (median) regression, and column (4) is a fixed effects regression. In all specifications, all variables enter the regression with the expected sign and almost all are significant. More importantly, in all specifications we find positive and significant coefficients on interbank loans and debt, our main variables of interest, providing empirical support to our main hypothesis of a liquidity shock. The coefficient of interbank loans in the OLS model of column 3 is 0.17 and suggests that a 15 percentage point decrease in the growth rate of interbank loans leads to 2.5 percentage point contraction in the loan growth rate.

To account for the possibility of omitted variables resulting from unobserved firm characteristics, we exploit the panel structure of our data using a firm fixed effect model as shown in column (4) of table 2. The coefficient of 0.08 on interbank loans is about half the ones in the OLS regression, suggesting that firm heterogeneity in the form of unobserved factors contribute significantly to our OLS estimates.

Table 2 also shows that other firm characteristics such as the liquid asset ratio and the non-performing loan ratio are also key determinants of the loan growth behavior. Using the fixed effect regression model, our estimates indicate that a 10 percentage point decrease in the liquid asset ratio implies a loan growth decline of about 3 percentage points, whereas a 5 percentage point increase in the non-performing loan ratio drops the loan growth rate by 1.7 percentage points. Surprisingly, we do not find any significant role for the equity capital to assets ratio. A potential explanation for this result is that sources of capital shocks affecting SOFOLES, such as loan losses, may be already captured through non-performing loans and more generally the profitability measure.

So far our estimates in table 2 control for firm heterogeneity but do not necessarily capture the role of loan demand. To deal with this concern, we include in our regression analysis the annualized growth of GDP. To better control for the effect of other specific aggregate factors on the lending of SOFOLES, such as a general trend in interest rates and the competition of banks in credit markets, we also include an interest rate spread (measured as the difference between the interbank and the government bond (CETES) rates, and shown in the lower panel of Figure 3), and the market share of banks in credit markets. All these macro variables are also included with a lagged value.

Table 3 presents the results for the same specifications (OLS, quantile, and fixed effect regressions) in columns (1) through (3). Since we are including macro variables, we drop the

time (quarterly) dummies and include instead four quarter dummies to control for seasonal effects. As before, most variables are significant and enter the regression with the expected sign. Furthermore, the coefficients on our proxies for the liquidity shock and the other firm controls are relatively similar in magnitude to those in table 2. Out of our three macro controls, only GDP growth and the commercial bank market share seem relevant and suggest an important role for loan demand and market competition. Using column (1), in which both variables are significant, our estimates indicate that a 20 percentage point decline in the annualized growth of GDP leads to a 3.1 percentage point decline in loan growth. A 10 percentage point increase in the market share of commercial banks in credit markets reduces the SOFOLES loan growth by 4.7 percentage points.

SOFOLES diversify their loan portfolio and over time they specialized in different market segments. To control for different type of loans, Table 4 presents the results using the specification that includes macroeconomic controls for three different types of SOFOLES (columns 1 through 3), depending on whether they specialize in commercial (e.g. equipment) loans, mortgage loans and consumer (e.g. credit card and auto) loans.[4] Given the restrictions in the number of observations available for each type of SOFOLES, we also add two columns to include SOFOLES operating in commercial and mortgage loans (column 4), and consumer and mortgage loans (column 5).

As before, size and non-performing loans are key explanatory variables of the loan growth across all specifications, that is, for all SOFOLES types. Holdings of liquid assets are a significant determinant only for SOFOLES in the commercial loan sector. Interestingly, the coefficients on our proxies for the liquidity shock are significant only for the mortgage SOFOLES. This result suggests that institutions that specialized in mortgage lending were the ones affected by the severe cutback in bank funding. The coefficient on bank loans for commercial and consumer SOFOLES is still positive but insignificant, suggesting weak evidence of a liquidity shock for those entities. The coefficient on interbank loans in column 2 is 0.25 suggesting that a 15 percentage point decrease in the growth rate of interbank loans leads to 3.8 percentage point contraction in the loan growth rate of SOFOLES specializing in mortgage loans. Unlike results in previous tables, the aggregate measure of liquidity shock given by the interest rate spread is a key explanatory variable. Our estimates suggest that a

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[4] We grouped SOFOLES by type based on their loan share. For example, mortgage SOFOLES are those with more than 50 percent of loan share in mortgage loans. As a robustness exercise, we also use loan growth regressions for different types of loans (commercial, real estate, and consumer) and obtained qualitatively similar results, though in those cases the number of observations becomes very small for some loan categories. For those reasons we report the results using SOFOLES type defined by loan shares only.

30-basis point increase in the spread led to a 2 percentage point contraction in the loan growth of mortgage SOFOLES.

When we look at institutions operating in mortgage and commercial loans (column 4) and those in mortgage and consumer loans (column 5), the coefficient on interbank loans is positive and significant. This is consistent again with the idea that the effect of the liquidity shock mostly affected mortgage SOFOLES. Our estimates suggest that the effect of the cut in bank loans was almost double for SOFOLES operating in the mortgage and consumer loan markets relative to those in the mortgage and commercial loan markets.

The positive and significant coefficient of the market share of banks in credit markets indicates that the expansion in bank lending occurred simultaneously with the growth in SOFOLES mortgage lending. In other words, the competition from banks occurred in sectors other than mortgage loans (e.g. mostly in commercial loans). One interpretation of this positive effect is that rather than competing with each other, commercial banks and SOFOLES were granting mortgages to different segments of the population.[5]

Overall, our findings provide support for our hypothesis and suggest a role for the liquidity shock in explaining the sharp contraction of SOFOLES lending during the financial crisis in Mexico. This seems to be the case mainly for those institutions specialized in mortgage loans. However, our analysis suggests that other factors such as deterioration in loan credit quality, lower liquidity buffers, reduced loan demand, and increased market competition, all play a significant role.

4.3 Loan Growth Decomposition

To determine the importance of each of our explanatory variables, and in an effort to disentangle supply and demand factors in loan growth, we employ a loan growth decomposition based on our regression estimates. Table 5 shows these results. Columns (1) and (2) of the table show the variation in the loan growth rate as well as each of the explanatory variables in our regression model between mid 2005—the peak in the credit cycle—and mid-2009. During this time period, SOFOLES saw a large contraction of their loan growth (27 percentage points). Interbank loans and debt issuance also experienced a significant decline (20 percent and 11 percent, respectively). Furthermore, economic conditions deteriorated sharply as the annualized growth of GDP dropped from 17 percent to negative 44 percent and interest rate spreads widened by 37 percentage points.

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[5] Most likely banks were extending mortgage loans to high-income and prime customers whereas SOFOLES essentially attended low income and less than prime customers.

We use our OLS estimates in table 3 to obtain the implied impact of individual factors. We prefer this specification as most of the explanatory variables, in particular the macroeconomic aggregates, are statistically significant. Column (4) shows that our model has significant explanatory power and explains 97 percent of the loan contraction during the period of analysis. Column (5) shows that the contraction in funding sources— proxies for the liquidity shock—together explain 14 percent of the lending decline. Our measure of the funding contraction nets out the effect of the severe cut in loans from commercial banks because it includes the government liquidity provision to SOFOLES through loans from development banks, as illustrated by the bottom right panel of Figure 2 using aggregate information. Liquidity buffers and non-performing loans are also important and account for 16 percent and 7 percent of the loan decline respectively. Table 5 also illustrates that loan demand, proxied by GDP growth, is the most important factor, accounting for 35 percent of the decline in loan growth. Furthermore, heightened competition in credit markets from commercial banks is also significant, and accounts for 18 percent of the loan contraction.

To summarize, our results are consistent with our liquidity shock hypothesis though its role in explaining the severe credit crunch of Mexican SOFOLES is outperformed by demand factors, in particular the large contraction in economic activity and the loss in credit market share to commercial banks, in accordance with the analysis in section 3.

5. Conclusions

In the aftermath of the 1994 financial crisis in Mexico, SOFOLES emerged as the most viable alternative to cover the demand in consumer and mortgage lending in Mexico. This parallel sector allowed a number of households and small businesses to gain access to formal credit that commercial banks did not provide. However, in less than 15 years the sector passed from an impressive boom to a near collapse.

In this study we provide supporting evidence for our hypothesis that the large contraction in the lending of SOFOLES was explained by a liquidity shock. The empirical analysis using quarterly data at the firm level reveals that the sector suffered from a liquidity contraction on funding from commercial banks and from the securities market. The funding reduction was a key determinant, explaining about 14 percent of the lending contraction. Demand factors, in particular the large contraction in economic activity and the loss in credit market share to commercial banks also explain the decline in SOFOLES loan growth. Fraudulent practices, exponential credit growth rates, loose lending standards, and inadequate servicing procedures before the crises also contributed to accelerate the liquidity

drainage. We find that non-performing loans and lower liquidity buffers play a significant role too.

Our analysis has some caveats given the data restrictions. First, we do not address the implications of a potential survivorship bias in our estimation, as a large number of SOFOLES dropped out of the ample either due to bankruptcy or to deregulation. Second, the impact attributed to the liquidity shock through bank loans may be understated as we cannot separate, at the firm-level, the magnitude of the government loans extended by development banks and the housing funds. The government stepped in to compensate for the collapse of debt markets and the restricted access of SOFOLES to commercial bank loans, and thus the drop in interbank loans reflects already this compensation. Of course, this latter problem works somewhat in our favor as it biases our estimates of finding a sizable effect of the cutback in funding from commercial banks.

Finally, our results on the credit crunch in a non-banking sector, such as the Mexican SOFOLES, also have important policy implications. Although relieving non-depository financial intermediaries from strict regulation may seem a reasonable policy response during difficult times, deregulation and lack of supervision may bring unintended consequences. As the Mexican experience seems to suggest, it is likely that some of the actions of unsupervised financial institutions end up deepening the abrupt cut in lending from banks and financial markets, exacerbating the impact of the shock on the lending of those intermediaries that remain subject to regulation.

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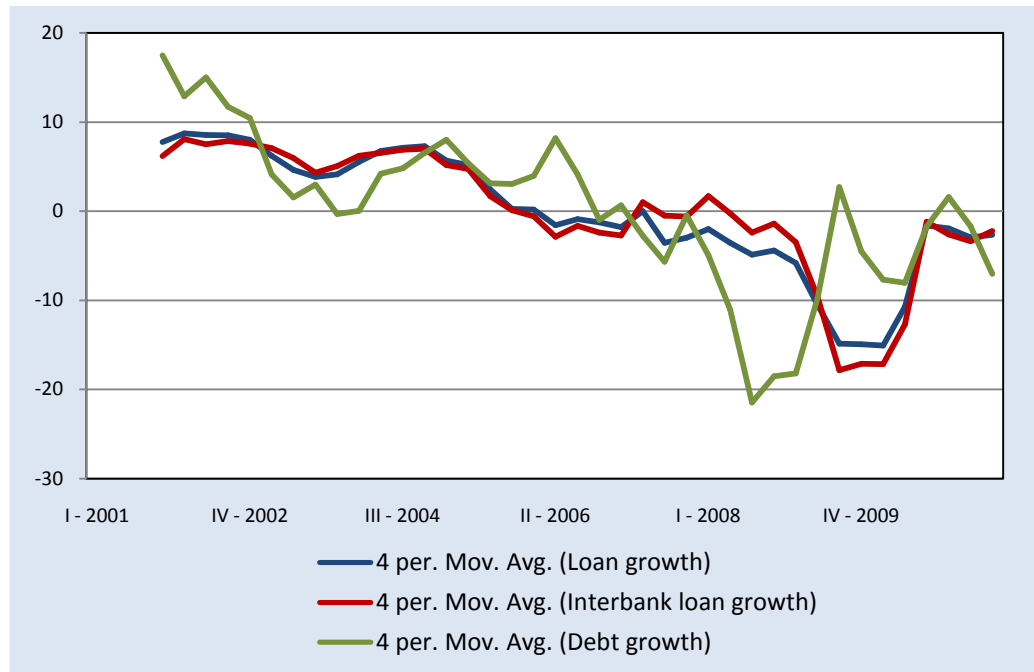Aiyar, Sh. (2011). "How did the crisis in international funding markets affect bank lending? Balance sheet evidence from the United Kingdom." Bank of England. Working Paper No. 424.

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Figure 1: SOFOLES LENDING AND FUNDING

A. Credit portfolio as percentage of total credit, 2001-2011

SOFOLES Loans as % of total credit market (left axis)

Banks Loans as % of total credit market (right axis)
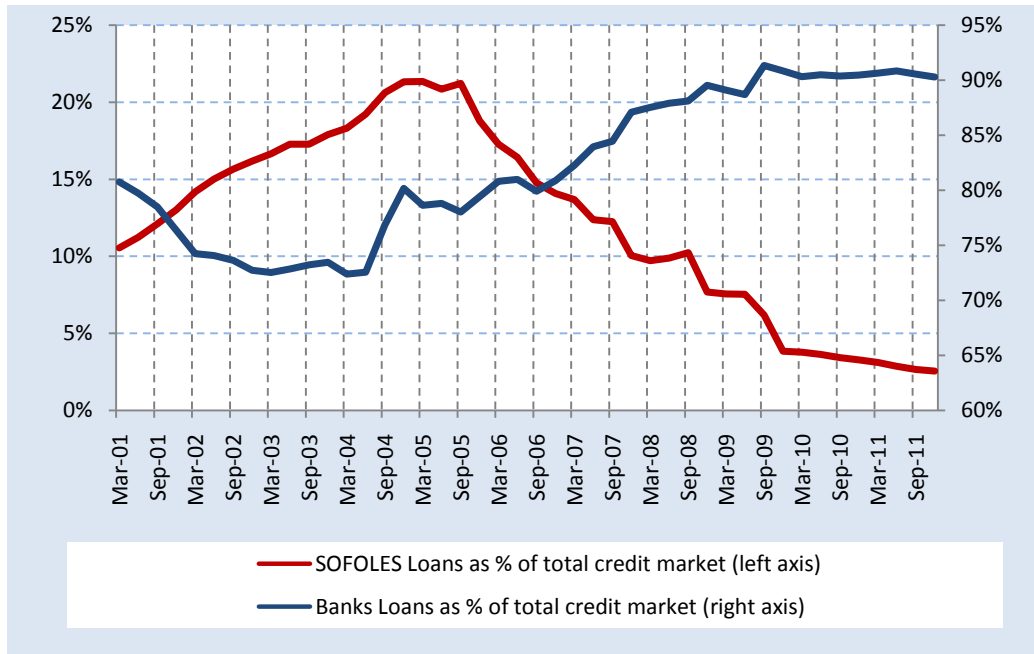
B. Loan growth and Funding growth, 2001-2011

4 per. Mov. Avg. (Loan growth)

4 per. Mov. Avg. (Interbank loan growth)

4 per. Mov. Avg. (Debt growth)

Figure 2: SOFOLES Financial Performance 2001 -2011

A. Profitability: Return on Equity and Returns on Assets
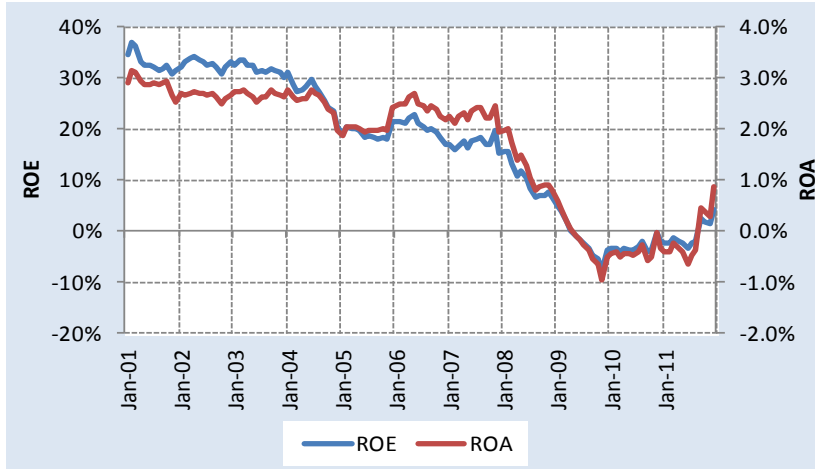
B. Capital Ratio
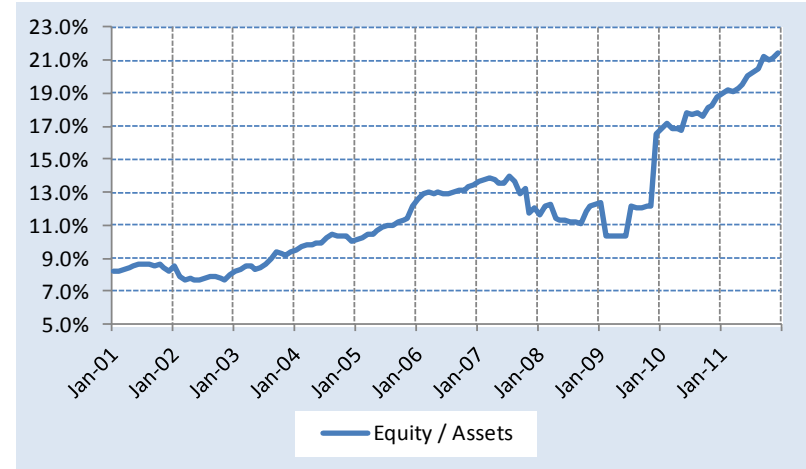
C. Funding Composition (% of Total Assets)

D. Non-performing Loans/Total Loans by Type

Figure 3: Mexico GDP Growth and Interest Rate Spread

A. GDP Annual Growth

Annual Real GDP Growth (%)

B. Interest Rate Spread (Interbank rate - Treasury Rate)

Interest rate spread (BP)
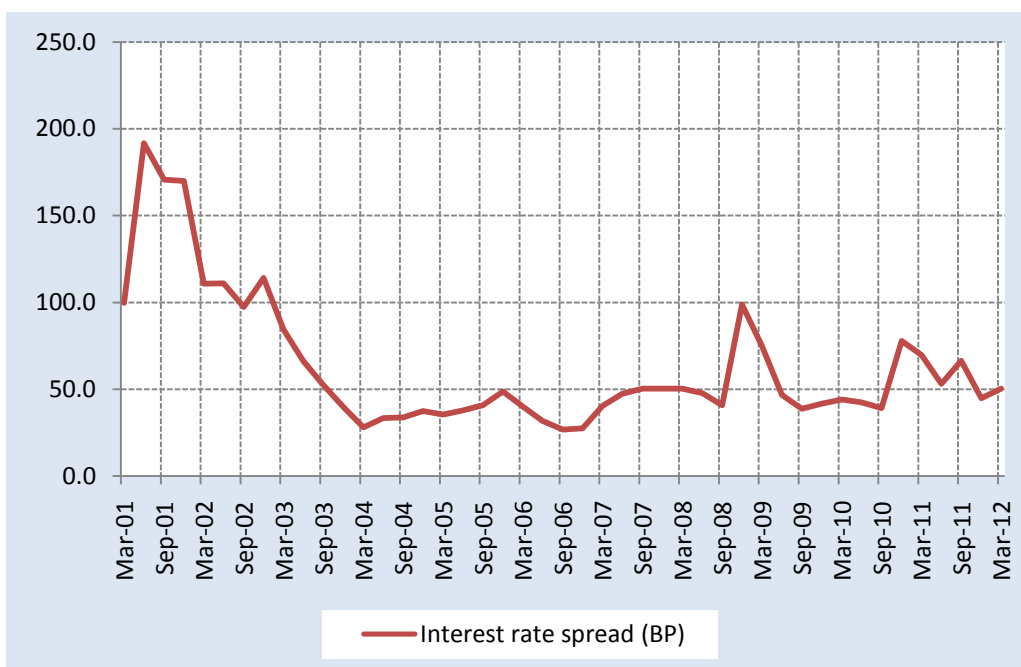
Table 1: SOFOLES, Summary Statistics, 2001-2011

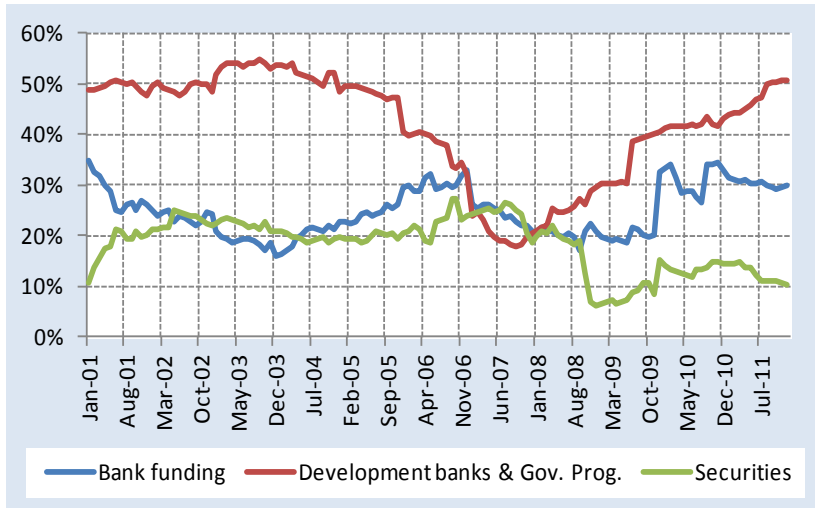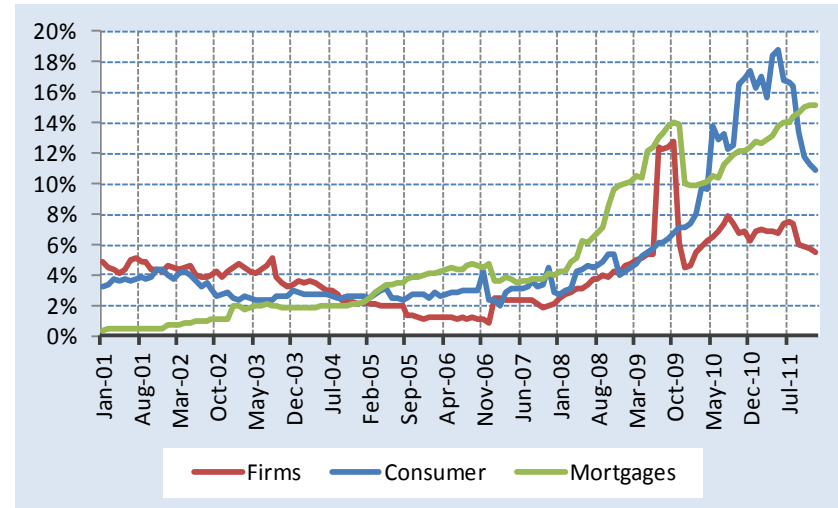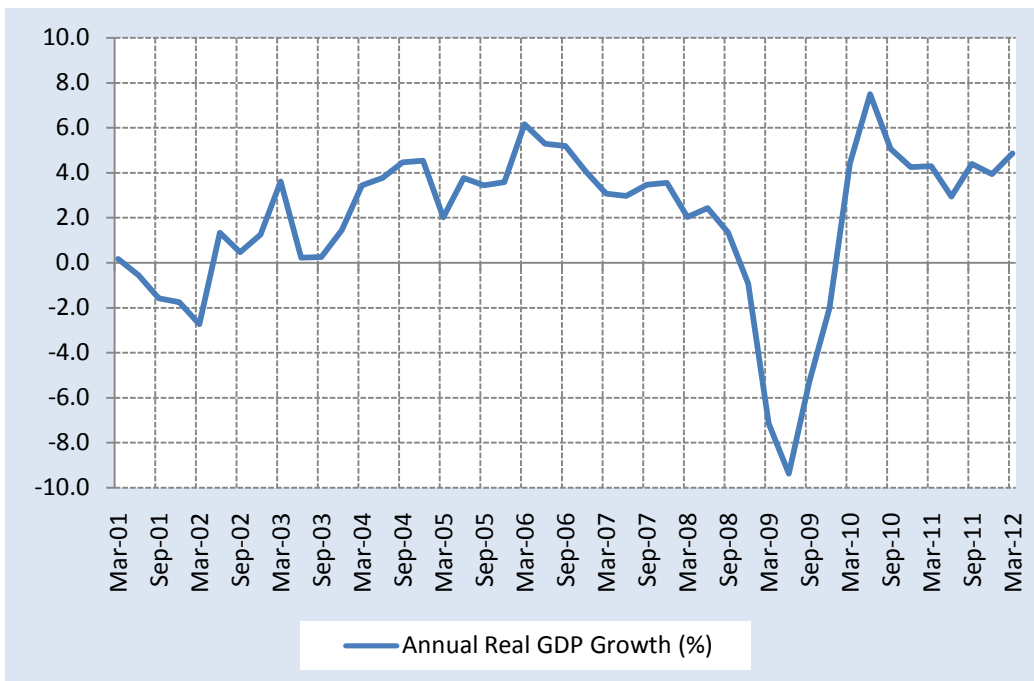| Pre Crisis (2001:Q1-2006:Q4)	Mean	Median	Min	Max	Std. Dev.
Loans / Assets	0.819	0.911	0.000	2.006	0.274
Liquid Assets / Assets	0.150	0.053	-0.024	0.997	0.239
Net Income / Assets	0.769	2.134	-201.604	49.562	16.396
Non Performing Loans / Loans	0.041	0.012	0.000	0.540	0.082
Equity Capital / Assets	0.289	0.155	0.006	1.031	0.293
Loan Growth	17.660	8.550	-428.351	511.997	47.159
Interbank Loans / Assets	0.609	0.703	0.000	0.992	0.294
Interbank Loan Growth	15.444	8.230	-423.717	613.658	47.114
Number of Banks	42	35	32	60	

Crisis 1 (2007:Q1-2008:Q2)	Mean	Median	Min	Max	Std. Dev.
Loans / Assets	0.818	0.878	0.000	1.198	0.186
Liquid Assets / Assets	0.105	0.060	0.001	0.990	0.149
Net Income / Assets	-0.155	1.132	-240.947	47.825	17.793
Non Performing Loans / Loans	0.043	0.020	0.000	0.549	0.072
Equity Capital / Assets	0.243	0.170	0.004	0.997	0.231
Loan Growth	9.124	5.771	-74.533	236.388	26.856
Interbank Loans / Assets	0.641	0.723	0.000	0.994	0.246
Interbank Loan Growth	8.171	5.996	-561.742	236.219	50.542
Number of Banks	41	39	32	51	

Crisis 2 (2008:Q3-2009:Q4)	Mean	Median	Min	Max	Std. Dev.
Loans / Assets	0.802	0.866	0.026	1.067	0.182
Liquid Assets / Assets	0.095	0.062	0.001	0.518	0.097
Net Income / Assets	0.003	0.676	-77.466	38.817	12.119
Non Performing Loans / Loans	0.093	0.040	0.000	0.651	0.141
Equity Capital / Assets	0.191	0.156	0.001	0.683	0.144
Loan Growth	-2.596	0.332	-464.595	82.813	46.255
Interbank Loans / Assets	0.721	0.766	0.000	0.988	0.183
Interbank Loan Growth	-1.708	0.625	-483.225	111.455	45.906
Number of Banks	25	26	20	29	

Post Crisis (2010:Q1-2011:Q4)	Mean	Median	Min	Max	Std. Dev.
Loans / Assets	0.796	0.871	0.289	1.474	0.205
Liquid Assets / Assets	0.095	0.053	0.001	0.636	0.130
Net Income / Assets	-0.700	0.530	-43.782	28.158	9.132
Non Performing Loans / Loans	0.145	0.064	0.000	0.950	0.191
Equity Capital / Assets	0.216	0.160	0.023	0.758	0.161
Loan Growth	-0.890	-1.262	-46.935	36.447	11.324
Interbank Loans / Assets	0.707	0.784	0.193	0.931	0.178
Interbank Loan Growth	-0.667	-1.643	-63.253	37.156	13.608
Number of Banks	19	19	19	19	

Full Sample (2001:Q1-2011:Q4)	Mean	Median	Min	Max	Std. Dev.
Loans / Assets	0.816	0.901	0.000	2.006	0.249
Liquid Assets / Assets	0.133	0.056	-0.024	0.997	0.210
Net Income / Assets	0.397	1.665	-240.947	49.562	15.708
Non Performing Loans / Loans	0.055	0.019	0.000	0.950	0.107
Equity Capital / Assets	0.266	0.159	0.001	1.031	0.265
Loan Growth	12.385	6.539	-464.595	511.997	42.726
Interbank Loans / Assets	0.633	0.726	0.000	0.994	0.272
Interbank Loan Growth	10.711	5.818	-561.742	613.658	45.845
Number of Banks	36	34	19	60	

Table 2: SOFOLES Loan growth Regression

	Dependent Variable: Loan Growth			
	OLS	Quantile Regression	OLS with time Fixed Effects	OLS with Time and Firm Fixed Effects
Size (log of Total Assets)	-1.318**	-1.329***	-1.129**	-9.520***
	[0.509]	[0.282]	[0.495]	[1.816]
Non-Performing Loans	-44.169***	-31.350***	-39.769***	-34.265***
	[6.246]	[3.754]	[6.668]	[6.933]
Net Income / Total Assets	-0.220**	-0.068	-0.268***	-0.16
	[0.097]	[0.041]	[0.097]	[0.099]
Liquid Assets / Total Assets	31.746***	6.833*	33.453***	29.193***
	[7.855]	[3.736]	[8.005]	[9.167]
Equity / Total Assets	6.017	-2.572	8.09	9.521
	[7.314]	[3.047]	[6.618]	[10.866]
Growth in bank funding	0.183***	0.207***	0.167***	0.082***
	[0.036]	[0.013]	[0.037]	[0.031]
Growth in Debt securities	0.065***	0.058***	0.045**	0.039*
	[0.015]	[0.020]	[0.019]	[0.021]
Constant	14.403***	16.099***	6.067	75.040***
	[5.020]	[2.483]	[5.427]	[15.989]
Observations	1228	1228	1228	1228
R^2	0.26	0.15	0.32	0.44
Robust standard errors in brackets				
* significant at 10%; ** significant at 5%; *** significant at 1%				

Table 3: SOFOLES: Loan Growth Regression with macro variables

	Dependent Variable: Loan Growth		
	OLS	Quantile Regression	OLS with Firm Fixed Effects
Size (log of Total Assets)	-1.178**	-1.038***	-9.744***
	[0.498]	[0.279]	[1.703]
Non-Performing Loans	-40.600***	-26.603***	-34.130***
	[6.827]	[3.733]	[6.248]
Net Income / Total Assets	-0.262***	-0.095**	-0.16
	[0.094]	[0.041]	[0.097]
Liquid Assets / Total Assets	33.250***	9.636***	27.823***
	[7.947]	[3.673]	[9.126]
Equity / Total Assets	7.786	-1.365	9.037
	[6.596]	[3.018]	[10.892]
Growth in bank funding	0.167***	0.202***	0.082***
	[0.036]	[0.013]	[0.030]
Growth in Debt securities	0.042**	0.034*	0.034
	[0.016]	[0.020]	[0.021]
Real GDP Growth (Annualized)	0.156*	0.046	0.1
	[0.082]	[0.066]	[0.077]
Commercial Bank Market Share	-0.471***	-0.337***	-0.176
	[0.084]	[0.065]	[0.162]
(Interbank - Treasury) Spread	1.644	0.45	-2.706
	[1.552]	[1.027]	[1.911]
Constant	49.476***	40.268***	92.525***
	[9.014]	[6.074]	[10.107]
Observations	1228	1228	1228
R^2	0.30	0.17	0.43
Robust standard errors in brackets			
* significant at 10%; ** significant at 5%; *** significant at 1%			

Table 4: SOFOLES: Loan Growth Regression by Type of SOFOLES

	Dependent Variable: Loan Growth				
	Commercial	Mortgage	Consumer	Commercial and Mortage	Consumer and Mortgage
Size (log of Total Assets)	-12.777***	-10.723***	-9.362***	-10.966***	-10.281***
	[3.413]	[2.488]	[2.279]	[2.179]	[1.764]
Non-Performing Loans	-36.155***	-45.417***	-65.095***	-37.230***	-42.448***
	[8.521]	[17.074]	[22.139]	[7.170]	[13.558]
Net Income / Total Assets	-0.191	0.024	0.106	-0.276**	0.094
	[0.137]	[0.289]	[0.103]	[0.127]	[0.112]
Liquid Assets / Total Assets	26.042***	26.554	8.493	27.197***	19.201
	[12.147]	[19.664]	[20.187]	[10.361]	[12.747]
Equity / Total Assets	9.249	3.217	-0.190	5.839	5.886
	[15.428]	[27.255]	[18.986]	[13.618]	[14.398]
Growth in Interbank Liabilities	0.022	0.249***	0.056	0.085**	0.159***
	[0.039]	[0.059]	[0.044]	[0.034]	[0.041]
Growth in Debt	-0.036	0.047*	0.029	0.033	0.041**
	[0.060]	[0.025]	[0.020]	[0.027]	[0.079]
Real GDP Growth (Annualized)	0.161	-0.108	0.145	0.060	0.017
	[0.130]	[0.110]	[0.107]	[0.094]	[0.079]
Commercial Bank Market Share	-0.163	0.454*	-0.152	-0.079	0.280*
	[0.293]	[0.246]	[0.224]	[0.198]	[0.160]
(Interbank - Treasury) Spread	-3.393	-7.326***	-3.173	-3.697*	-4.887**
	[3.272]	[2.585]	[3.721]	[2.248]	[2.171]
Constant	96.098***	62.967***	87.113***	88.149***	65.268***
	[18.560]	[12.300]	[19.379]	[11.859]	[11.234]
Observations	614	388	226	1002	614
R^2	0.44	0.58	0.57	0.42	0.55
Robust standard errors in brackets					
* significant at 10%; ** significant at 5%; *** significant at 1%					

Table 5: SOFOLES Loan Growth Decomposition

	Mean value at Peak (2005:Q3) (1)	Mean value at (2009:Q2) (2)	Change (3) = (2) - (1)	Implied impact 1/ (4)	Implied impact (%) (4)
Loan growth (quarterly)	22.53	-5.27	-27.80	-27.00	100%
Size (log of Total Assets)	6.33	7.24	0.90	-1.07	4%
Non-Performing Loans	0.05	0.09	0.04	-1.81	7%
Net Income / Total Assets	-1.52	0.68	2.20	-0.58	2%
Liquid Assets / Total Assets	0.20	0.07	-0.13	-4.29	16%
Equity / Total Assets	0.39	0.18	-0.21	-1.61	6%
Growth in Interbank Liabilities	13.37	-6.76	-20.13	-3.36	12%
Growth in Debt	10.43	-1.03	-11.46	-0.48	2%
Real GDP Growth (Annualized)	17.32	-43.98	-61.30	-9.56	35%
Commercial Bank Market Share	78.81	89.11	10.30	-4.85	18%
Aggregate Interest Rate Spread	0.38	0.75	0.37	0.61	-2%

1/ Implied impact is obtained by multiplying coefficients of OLS model in Table 2 by the change in each explanatory variable in column (3)