Draft not for citation
Sunday, December 31, 2017

Whatever it takes: Cross-border spillovers of a major central bank intervention[*]

Carlo Alcaraz (Central Bank of Mexico)
Stijn Claessens (Federal Reserve Board)
Gabriel Cuadra (Central Bank of Mexico)
David Marques-Ibanez (European Central Bank)
Horacio Sapriza (Federal Reserve Board)

Abstract

We analyze how a major non-conventional central bank intervention, Draghi's "whatever it takes" speech, impacts lending. To avoid endogeneity problems—where local demand shocks and macroeconomic risks are hard to insulate from the effects of the intervention—we analyze lending conditions in Mexico, a banking system with diverse ownership. We compare lending conditions to the same borrower by euro area banks and other banks largely sheltered from funding shocks. We show that the intervention was effective in reducing risk-taking by euro banks. We also draw implications on banks' internal markets functioning during periods of stress and on the role of subsidiarization in reducing cross-border spillovers.

[*] Email addresses: Carlo Eduardo Alcaraz Pribaz (carloalcaraz@banxico.org.mx), Stijn Claessens (stijn.claessens@bis.org), José Gabriel Cuadra García (gcuadra@banxico.org.mx), David Marques-Ibanez (David.Marques@ecb.int). Horacio Sapriza (horacio.sapriza@frb.gov). The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Bank of Mexico, Board of Governors of the Federal Reserve System, Bank for International Settlements or the European Central Bank. We thank, in particular, Ricardo Correa and Philipp Schnabl for their very useful comments. We are also grateful to Sara Jimena Rico Straffon for her outstanding research assistance work. We like to thank the participants at the seminars held at Central Bank of Mexico, Board of Governors of the Federal Reserve System and European Central Bank for their valuable insights.

1. Introduction

The ability to provide extraordinary large amounts of liquidity is one of the most important policy tools at the disposal of a central bank, particularly during periods of financial stress. Historically the ability to provide lender of last resort (LoLR) funding has actually been one of the main reasons for the creation of central banks in many countries. By injecting funds in temporarily illiquid but solvent banks, a central bank can prevent failures related to frictions in banks' funding markets. These injections can also allow financial authorities the time to arrange for an orderly resolution of any problematic bank. And by ensuring the broad availability of liquidity during periods of financial turmoil, a central bank can prevent contagion, stem systemic risks, and thereby anchor the stability of the financial system.

During the global financial crisis, a number of central banks undertook major liquidity interventions to restore financial stability and support monetary policy transmission. Given their unprecedentedly large magnitudes, it is crucial for central banks to understand the impact of these liquidity injections on local credit markets and the real economy. A major challenge for this type of analysis, however, is that it is very difficult to isolate the effect of these interventions from other factors that led to those interventions in the first place. For example, local demand shocks, increased financial uncertainty and macroeconomic risks are among the factors contributing to the central bank's intervention but are very hard to insulate from its effects.

To overcome this major identification challenge, we study how a large monetary intervention in Europe impacted credit conditions in third countries. In particular, we assess the extent to which a major central bank liquidity operation, Draghi's "whatever it takes" announcement in July 2012, affected the supply of corporate credit and lending standards by euro area banks in Mexico—a large financial system with an important presence of both European and other foreign banks. Doing the analysis of a case of massive liquidity injection this way provides a number of advantages over previous LoLR studies.

First, the specific central bank intervention we analyze—Draghi's "whatever it takes"—was both sufficiently large and unexpected to alter markets' dynamics and to provoke large and long-lasting effects on financial markets, including sovereigns. In response to it, banks' credit spreads declined drastically in many periphery euro countries and settled to a much lower level than prior to the announcement. At the same time, banks saw their stock prices improve and their spreads on credit default swaps (CDS) narrow. Given its magnitude, the intervention had the potential to be relevant also for third countries due to spillover effects.

Second, one would need to disentangle the impact of this intervention on borrowers via the banking sector from other factors affecting borrowers at the same time. Mexico is a good laboratory in this respect as its banking system was little affected by the global financial crisis. The country did not experience any bout of financial instability, and the central bank did not need to undertake any major intervention. This alleviates concerns about local shocks affecting both banks and the real economy when, say, bad economic performance or perverse bank-

sovereign links drive outcomes, interest rates or policy interventions. At the same time, Mexico has a significant presence of foreign banks headquartered in Europe, the United Kingdom, and the United States, with those banks providing nearly half of all commercial loans. This setting—akin to Peek and Rosengren (1995, 2000)—is ideal for our purposes since by using banks' foreign activities, we avoid the risk of reverse feedbacks: Mexico's real economy is little connected to the source of the shock, in the euro area real economy, while its banking system is sufficiently exposed to financial shocks in the euro area. Furthermore, as other home countries were affected differently by shocks, and as we can further control with domestic banks' behavior, we can cleanly identify the effects of euro area liquidity shocks on the Mexican credit market.

Third, we use a comprehensive and confidential loan-level dataset comprising all bank loans granted in Mexico. This credit registry information allows for the identification of loan supply shocks by considering multi-bank firms, i.e., we can control for changes in firm-level demand for credit by analyzing firms that borrow from several banks contemporaneously. We then use a standard differences-in-differences approach to identify the effect of the announcement on lending standards on banks' lending supply, both in terms of prices and quantities, controlling for loan demand.

As such, Mexico over this period meets many requirements for an ideal "laboratory" to analyze the spillover effects of a large central bank intervention on third countries. We show that the "whatever it takes" speech altered banks' behavior significantly. Euro area banks became less aggressive both in terms of their lending volumes and interest rate pricing. We find that euro-area banks, which prior to the intervention have been pricing their loans more aggressively than other institutions, tended to revert their pricing back in line with other banks. We also show that the differences among euro-banks can be related to the amount of previous LoLR assistance. Our results stand when conducting a number of robustness tests including winsorizing, changes in time windows and placebo tests.

Our findings have important policy implications. In particular, they suggest that major LoLR operations can significantly affect lending conditions in foreign countries, including by reducing risk-taking. Even with strict regulation and supervision, including on exposures and internal transfers between headquarters and subsidiaries, there may be spillovers from headquarters to subsidiaries (and vice-versa). The reason is that, even without open liquidity or solvency issues, banks may get involved in some risk-taking abroad, in both price and quantity, in order to preserve their overall profitability when their franchise value at home is under pressure. While this may have been the case prior to the "whatever it takes" episode, the intervention significantly changed euro area banks' behavior. As this risk-taking might be difficult to detect in real-time, our results vouch for the need to pre-emptively adapt cross-border regulation, supervision and resolution of global banks, and make it well integrated to assure not only that risks do not go undetected, but also to keep incentives well-aligned.

The remainder of this paper is organized as follows. Section 2 reviews the literature on major central bank interventions. Section 3 describes the institutional setting in Mexico, how the dataset was constructed and our empirical model. Section 4 presents the main empirical findings and robustness tests. Section 5 considers some general implications and concludes.

2. Literature

Starting with the seminal papers by Peek and Rosengren (1997, 2000, 2005), there is much evidence suggesting that financial distress at the parent (home) country (bank) can affect lending and the real economy abroad (host country) via bank subsidiaries. Other shocks, such as changes in bank regulation at home, have also been found to affect lending abroad via foreign bank subsidiaries (Popov and Udell, 2012). Even countries without subsidiaries of banks from countries in financial distress can be affected due to an indirect banking channel. Schnabl (2012) for example shows that the 1998 Russian default reduced bank lending to a largely unconnected third country, Peru, due to reduced lending to Peruvian firms by international banks.

There is also consistent evidence from the 2007-2009 crisis indicating that global banks transmitted liquidity shocks internationally (Cetorelli and Goldberg, 2011, 2012; Buch, Koch, Koetter, 2016) while domestic banks exhibit more stable lending patterns than cross-border and multinational banks do. Claessens and van Horen, 2014; De Haas, van Lelyveld, 2014). Morais et al. (2016) show how changes in home country monetary policy can impact credit conditions in a third country. Other studies (e.g., Jimenez et al., 2015) find evidence consistent with the existence of an international risk-taking channel. Altogether, recent evidence suggests that with banking globalization, shocks, including central bank interventions (e.g., large liquidity injections), can have significant impact abroad due to spillovers (see Claessens, 2016, for a survey).

The analytical literature on major central banks' interventions and LoLR has a long history, starting with Thornton (1802) and Bagehot (1873). It justifies central bank's provision of liquidity, freely and against good collateral, to avert crises. More recently, Diamond and Dybvig (1983), Rochet and Vives (2004), Diamond and Rajan (2005) show theoretically that banks' inherently unstable nature can give bank creditors the incentive to run on solvent banks so that a liquidity crisis could quickly become a solvency crisis, potentially endangering systemic stability. Goodhart (1987), Goodfriend and King (1988), Goodhart (1995), Freixas, Giannini, Hoggarth, and Rochet (1999), Repullo (2000), Freixas and Rochet (2008) also consider the institutional setting of LoLR and whether supervisory and LoLR functions should be conducted by the same institutions.

In contrast to the theoretical work, there is a paucity of empirical studies on the financial and real effects of LoLR, especially in the context of a situation of systemic stress. Some of the reasons are apparent. First, one would need a sufficiently large crisis so that LoLR interventions can be

expected to have a meaningful impact on the economy. Also, the empirical analysis would require access to a very detailed dataset. Often it would need information on the liquidity injections by the central bank to individual institution during periods of stress. These data, in turn, would ideally be complemented with detailed information on banks' and matched borrowers' conditions. These data, however, are usually highly confidential.

Two recent papers focus on individual banks' liquidity uptake during the recent crisis in the euro area (Drechsler, Drechsel, Marques-Ibanez, Schnabl, 2016) and in the United States (Acharya, Flemming, Hrung, Sarkar, 2016). Their results suggest that while large LoLR interventions can be very helpful to restore financial stability, they can also alter banks' risk-taking incentives. From their results, it follows that it makes sense to coordinate supervisory standards with the provision of LoLR function.

ECB's president Mario Draghi "whatever it takes" speech is probably one of the largest LoLR interventions of all times.[1] In 2011 and early 2012, as Europe sank deeper into a sovereign debt crisis and continued to struggle with recessions, banking institutions and sovereigns came under unprecedented financial stress. The severe deterioration of financial and economic conditions in the region led ECB's President Mario Draghi to make his "whatever it takes" speech in London on July 26, 2012. In it, the ECB implicitly promised to provide unlimited liquidity to the markets in order to save the euro. Krishnamurthy et al. (2014) underline the "bright side" of this LoLR intervention and showed that it solved a multiple equilibria problem by avoiding a run. As a result, sovereign bond yields in the euro area periphery declined significantly and unsecured funds returned to finance banks (Acharya, Pierret, Steffen, 2015). In contrast, Acharya, Eisert, Eufinger and Hirsch (2016) focus on the "dark side" of the intervention. Using evidence from the euro area syndicated loan market, these authors argue that while the speech might have contributed to stem systemic risk, it also contributed to lending to zombie firms.

These contrasting findings show that it is hard to identify the financial and real effects of the "whatever it takes" speech. First, the intervention happened amid a situation of extreme financial stress and a number of confounding factors occurred at same time. Some of these factors, which include, inter alia, extreme uncertainty, financial instability and shifts in economic expectations, led to the intervention in the first place. Second, most studies faced important limitations in terms of data availability and many ended up using data from the syndicated loan market to assess lending conditions. This is however a very particular market in which very large loans are granted sporadically to very large corporations in which all banks participating in the syndicate charge the borrower the same price. As such, these data only cover a very small portion of borrowers that often also have access to alternative sources of funding, such as the corporate bond market. This market is also not able to shed light on how individual bank's liquidity and financial intermediation positions are affected by systemic forms of liquidity support. Ideally, as

[1] Speech by Mario Draghi, President of the European Central Bank at the Global Investment Conference in London July 26, 2012. https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html.

in Khwaja and Mian (2008), one is able to account for changes in demand conditions by considering the differential impact on lending conditions by affected and non-affected banks to the same borrower. Few studies on systemic forms of liquidity support, however, have been able to overcome both the endogeneity and the data problems.

3. Background on the Mexican Banking System, Data and Methodology

This section provides background on the Mexican banking system, details the specific data we use, and describes the methodology that we apply in our analysis.

Mexican banking system.

The Mexican banking sector has a high concentration and significant presence of foreign banks. As shown in Table 1, during the 2011-2013 period, the seven largest banks represented almost 80 percent of the assets of the Mexican banking system. Of these largest banks, five were foreign and two were domestic. Among the major foreign banks, two were from Spain, one from Canada, one from the UK, and one from the US. The subsidiaries of these global banks held more than 70 percent of total assets of the banking sector.

At the end of the first semester of 2012, i.e., just before the "whatever it takes" event, the Mexican banking sector had a capitalization ratio of 15.9 percent, substantially above the regulatory requirement of 8 percent. During the period, Mexican authorities gradually introduced Basel III, including its capital adequacy requirements. While the final implementation took place in 2013, the content of the regulations was already announced in June 2011. Basel III distinguishes bank capital in three components and the minimal requirements for these three are respectively 7, 8.5 and 10.5 percent.[2] Measured capitalization of Mexican banks was at about 16 percent in 2012, with Tier I capital representing 88.5 percent of net capital and 13.8 percent of risk-weighted assets. Table 2 reports the capitalization of the seven major banks in Mexico in 2012, categorized as euro area and non-euro area banks, with the latter to include the domestic banks. It shows that there was very little difference between the capitalization of these two types of banks at the time.

To provide a perspective on the stock market valuation of the various banks, Figure 1 shows the evolution of stock prices for five of the seven most important banks in Mexico from 2001 to 2013, with the share price deflated using the CPI and normalized to 100 in 2001. The figure illustrates that the domestic banks generally experienced a greater stock price increase over this period, and that the two euro area banks were lagging the other banks in terms of stock prices.

[2] The first is common equity tier I capital and is composed of equity and retained earnings; the second is additional tier I capital and is composed of capital instruments that comply with certain criteria of loss absorption; and the third component is tier II capital and is composed of instruments that have a high loss absorption potential but lower than that of additional tier I capital.

The liquidity of the Mexican banking sector in 2012/2013, as measured by the liquidity coverage ratio according to Basel III, shows a notable dispersion among banks, as depicted in Figure 2.[3] However, while the dispersion was large, it did not vary substantially by bank size. On average, banks satisfied the liquidity requirements of Basel III already during the period from 2011 to 2013. However, on average reported liquidity slightly fell in 2013 from previous years due to an expansion of credit to the private sector financed by the issuance of market securities, of which an important fraction had a maturity less than 30 days.

While a key feature of the Mexican banking sector is the major role played by foreign banks, their importance varies by market segment. Figure 3 shows the share of credit in four categories, credit to non-financial corporations, mortgage credit, consumer credit, and government loans, for each of the biggest seven banks (divided in domestic and foreign and reported as G7 in the graph), and the other banks (also divided in domestic and foreign). It shows that both big and small banks lend a similar portion of their credit to the corporate sector, but importantly differ regarding mortgage lending and consumer credit. Small subsidiaries of foreign banks heavily lend for consumer credit (about 50% of their portfolio, compared to around 10-20% for big banks and small domestic banks), while big banks, both foreign and domestic, tend to operate more in the mortgage sector. In particular, big banks have about 15-20% of their portfolio in mortgages, as opposed to around 5% for small domestic banks and almost nothing for foreign small banks. Loans to the government are granted more by domestic (both big and small) banks than by foreign banks, with small foreign banks started to invest in government loans only very recently.

Mexican legislation requires all foreign financial institutions operating in Mexico to do so through subsidiaries, which implies that they are separate legal entities and subject to the same capital requirements and, in general, to the same regulatory environment as Mexican institutions. Furthermore, additional prudential policies put in place before and after 2012 helped insulate the Mexican financial markets from the subprime crisis in the U.S. and the crisis in Europe. These rules ensured that the major source of funding for banks were deposits. Other policies, in particular, a number of regulations in place at the time, also affected the relationships between subsidiaries and their parent companies.[4]

As global banks play a very important role in the banking system, even with tight regulation and supervision the behavior of the parent companies abroad can have substantial implications for

[3] Notice that in 2012, the rules adopted to measure the liquidity coverage ratio were yet to be established with certainty. Rules changed in 2013.

[4] Specifically: i) limits on foreign currency positions, which prevented banks from being exposed to imbalances between long-term foreign currency liabilities and short-term home currency assets in the presence of important swings in the exchange rate, in place since mid-1990's; ii) caps on exposures to related counterparties that directly limited the exposure of subsidiaries to their parent banks, thereby reducing potential spillovers from problems affecting parent companies, in place since 2011; and iii the requirement to seek authorization for transfers of assets for more than 25% of capital between subsidiaries and parent companies to ensure that they take place under market conditions, announced in October 2012.

the Mexican economy. One way in which spillovers from parent banks to subsidiaries can take place is through excess credit or transfer of assets between the two entities at prices far from market conditions. For example, if the parent bank has trouble increasing its capital under stressed market conditions, it may reduce the credit granted to its subsidiaries. Or if a subsidiary is substantially exposed to the parent company through its lending, the subsidiary itself may end up in trouble. Similarly, the parent bank may sell risky assets to the subsidiary at artificially high prices, thereby increasing its capital at the expense of the subsidiary. The risks of these and other such operations occurring is very tightly monitored, however, by the Comision Nacional Bancaria y de Valores (CNBV), and none of such operations took place in 2012, as mentioned in the Financial Stability Report of Banco de Mexico for that year.

Data.

We use loan-level data on credit amounts and interest rates at a monthly frequency from the Mexican credit registry from July 2009 to December 2013. The database is maintained by the CNBV, and the Banco de Mexico has full access to the data. The specific form used is Form R04-C. The requirement to report is applicable to all credit institutions, financial institutions with multiple purposes, financial institutions with single purpose, multiple service banks, and development banks. The data we analyze refer only to so called multiple-service banks, thus covering all commercial banks. The data cover almost all loans, as the cutoff for reporting is very low, at 5000 Mexican pesos.

The data cover various types of loans, including non-revolving credit lines, revolving credit line, credit with a single disposition, syndicated loans, company card credit line, productive chains, currency liquidation, and current account credit with undefined purpose (working capital). Table 4 shows the distribution of all loans across the various types of credit for each of the largest nine banks operating in Mexico. The table makes clear that most loans (about 55%) are so called single disposition. It also shows that the interest rates are similar, except for the rate for syndicated loans, which are much larger and often denominated in US dollars.

The database includes direct and contingent loans, including bridge loans, and distinguishes between new loans and loans that were provided in previous months. The database covers actual interest payments as well as other loan data, including the reference rate, spread over the reference rate, frequency of repricing, maturity date, denomination, amount of fee charged when opening the credit (or loan), term and term to maturity, and any guarantees, including their type. It also includes whether the loan is current or non-performing, the number of days overdue if non-performing, and its so called qualification, which is a form of risk rating.

The database covers loans to companies as well as to physical persons with entrepreneurial activities and destined to their commercial or financial activities. The data we include in our

analysis refer to private non-financial companies. Some firm-specific information is captured as well in the database, such as the address of the firm (state of municipality where the credit is physically located), the main sector in which the firm operates, as well as its age and size (number of employees and gross income of previous year).

We also use monthly data from Markit and Haver on credit default swap (CDS) spreads and equity prices for the selected banks operating in Mexico during the period of analysis, where the prices refer to the headquarter entities in case of the foreign banks. The list of all the variables used in the study and the corresponding data sources are detailed in Table 1.

The severe deterioration of financial and economic conditions in the euro area in 2011 and early 2012 is reflected in the block's bank equity and CDS prices, which were also significantly affected by Draghi's speech in July 2012. Figure 4 plots bank equity prices for various foreign individual banks and sector aggregates around the years of the speech. The figure indicates that these banks varied in their valuation before and after Draghi's announcement, with bank equity prices of European banks exhibiting a down trend before the event. The announcement by Draghi in July of 2012 (shaded June-August period) proved to be a turning point for European bank equities. Bank CDS spreads, shown in Figure 5, also show that the shocks varied by banks, with euro area banks being hit harder before Draghi's announcement and benefitting more after it. Figure 6 suggests that the shocks came in large part via changes in sovereign risks, with sovereign yields of the peripheral euro area countries increasing markedly and reaching historical heights before the July 2012 announcement, as shown for Spain. Following the speech by ECB's President Draghi in July 2012, marked again together with the previous and following month by the shaded area in the plot, Spanish bond yields declined substantially. In contrast, Mexican and U.S. sovereign yields exhibited a declining trend through most of the period.

Methodology.

There are changes in the behavior of some banks operating in Mexico around the time of the major ECB policy intervention in 2012, but simple comparisons do not allow us to make any inferences as they do not control for other factors. Specifically, demand and other shocks affecting borrowers could explain differences in credit extended and interest rate charged. The main formal methodology we use in this paper to tease out causal effects is the difference-in-difference (diff-in-diff) regression test. This methodology allows us to assess the effects of major central bank policy interventions on banks' lending and risk taking, while addressing any concerns about reverse causality, omitted variables and other potential sources of endogeneity that might confound the inference. The diff-in-diff regression accounts for any time-invariant differences, including in banks' business models or institutional environments that might affect banks' behavior differently.

We apply the diff-in-diff test to a sample of banks in such a way that we can confidentially attribute the effects we find to the policy intervention. Specifically, by using banks' foreign activities, we avoid the risk of reverse feedbacks that may occur, for instance, when bad economic performance or perverse bank-sovereign links in the home country drive the specific policy interventions. It is also unlikely that the banks' financial and economic conditions at home influenced the overall economic and financial environment in Mexico. In addition, as our sample of foreign banks is from different home countries, we have different home-country financial and economic conditions and policy interventions. Moreover, our sample also includes domestic banks, which allows us to further control for local financial and economic developments. Finally, we can control for any change in firms' demand for external financing and for any change in their riskiness because we use the full credit registry data of the country where the subsidiaries of the foreign banks are located, Mexico. This means we can analyze how the lending to multi-bank firms, i.e., those firms that borrow from more than one bank, changes differently across affected banks and whether the ECB policy intervention affected some of the major foreign banks operating in Mexico.

Our analysis focuses on the changes in the growth rate of bank credit and the level of interest rates granted by banks to firms. Simple diff-in-diff t-tests (nor reported) already shows that there are statistically significant differences in how euro banks varied in their lending conditions from non-euro banks before and after the event. Specifically, we find that the difference in the average monthly growth rates of credit to all Mexican firms between euro bank and non-euro banks was a percentage points lower after the event compared to before, with the difference statistically significant at the 1% level. And the average interest rate charged on credit to all Mexican firms by euro bank and non-euro banks was some 20 basis points higher after the event compared to before, with the difference again statistically significant at the 1% level. Similar comparisons prevail for the sample of multibank firms.

Our formal identification strategy is based on the use of multi-bank firms to control for any shock to the demand for external financing at the firm level. It was initially developed by Khwaja and Mian (2008) and subsequently bene used by many others, including in domestic studies (e.g., Degryse and Ongena, 2009; Jimenez, Ongena, Peydro and Saurina, 2012), and in cross-border banking analyses (e.g,, Cetorelli and Goldberg, 2011; Popov and Udell, 2012; Kalemli-Ozcan, Papaioannou and Peydro, 2013; Minoiu and Reyes, 2013; Cerutti, 2015; and Cerutti, Hale and Minoiu, 2015).[5] We apply this diff-in-diff methodology using a panel structure. In the most general form, the specification we use is as follows:

[5] See Jakovljević, Degryse and Ongena, (2015) for a review of empirical research on the design and impact of regulation and events in the banking sector.

$$\Delta loan_{ijt} = \beta_0 + firm_i + period_t + bank_j + location_k + \beta_1 treatedbank_j * treatmentperiod_t + \beta_2 firm_i * period_t + \varepsilon_{ijt} \quad , \qquad (1)$$

where $\Delta loan_{ijt}$ is the log difference in the amount of lending, in the form of general credit ("una disposicion" loans), to firm *i* by bank *j* at time *t*; $firm_i$ is the firm fixed effect; $period_t$ is a monthly time dummy variable; $bank_j$ is a bank fixed effect; $location_k$ is a firm-specific location; $treatedbank_j$ is a dummy variable that is one for the bank that is "treated" by the central bank policy interventions (1 for all euro area banks, and 0 for all other banks); $treatmentperiod_t$ is a dummy variable equal to one for the period when there is an event (in the base case 1 for July – October 2012 to cover the "whatever it takes" period) that treats one (or more) of the banks, and zero for all other months; and the $firm_i$*$period_t$ dummy variables control for any shocks to individual firm-level demand or riskiness in a given month. We are interested in the coefficient β_1 which captures the (differential) effect of the central bank policy announcement on the affected banks.

We also run similar regressions for the level of interest rates charged, $interest_{ijt}$. For both sets of regressions, we start the tests with a limited set of control variables which we then expand in various steps to the full set of fixed effects. Note that we cannot use all these fixed effects at the same time. For instance, we cannot use location and firm fixed effects in the same regression, as it would be an inconsistent specification. Similarly, we cannot include firm fixed effects and firm*period fixed effects in the same regression.

These regressions are run over windows before and after the specific event so as to analyze how the behavior of affected banks differently changes. The base period for the "whatever it takes" event is March to October 2012, so it is centered three months on both sides of the July 2012 event. The use of these three month windows is to accommodate the fact that loans are not necessarily extended every period to each firm, creating fluctuations in monthly balances not necessarily related to the event. The use of a specific windows entails some assumptions, so in our robustness tests we use alternative periods as placebo tests.

In addition to the tests for the multibank firms, we conduct diff-in-diff regressions where we analyze the lending behavior, measured by loan amounts and interest rates, of the various banks to all firms, i.e., to both multi-bank and single-bank firms. The specification for all firms is largely the same as for multi-bank firms. However, since for the single-bank firms we cannot use firm*period fixed effects (we can use firm fixed effects though), we have to adapt the specification so as to still control, albeit to a lesser degree, for demand and other firm-level shocks. Consistent with the recent literature, in these additional tests we use location*period and industry dummy variables to control for changes in demand or other shocks to firms. We thus use the following specification for these regressions:

$$\Delta loan_{ijt} = \beta_0 + firm_i + period_t + bank_j + location_k + \beta_1 treatedbank_j * treatmentperiod_t + \varepsilon_{ijt}. \qquad (2)$$

The all-firm regressions provide a clean way to test for the effects of interventions on different banks, unless there are shocks occurring to the firms that are related in some systemic way to what happens to the banks. This possibility is fully controlled for in the regressions that include only multi-bank firms, so those regression results only reflect the effects of euro area foreign banks' change in behavior in lending to these firms. Therefore, we can exclude any omitted factors and interpret these regression results with causality in mind. While there is still a possibility of omitted factors in the single-bank firms regressions, the fact that we study the effects of a shock at home on credit conditions in a third country, greatly mitigates the likelihood that these effects do create biases. For example, it would have to be the case that shocks and events in the euro area affect the demand for external financing or riskiness of single-bank firms in Mexico, through trade or other links, in such systematic ways that the dummy variables being used do not control for already.[6]

4. Empirical Results and Robustness

Main regression results

Diff-in-diff results for multi-bank firms. Table 5 provides the results for the base regressions, where the dependent variable is the monthly growth rate in the loan to firm *j* from bank *i* in period *t,* the treatment bank dummy variable refers to the euro area banks, and the treatment effect dummy variable refers to the "whatever it takes" speech. The base period is March to October 2012, with the value of the treatment dummy variable equal to 1 from July 2012. The regressions progressively increase in their use of fixed effect dummy variables. In column 1, no fixed effects are included; in column 2, location fixed effects are included; in column 3, firm fixed effects are included (dropping the location effects); in column 4 we use firm and location fixed effects; in column 5 we consider firm*treatment period fixed effects; and in column 6 we use firm*period fixed effects.

The various regression results consistently show that the euro area banks decreased the growth rate of their loans following Draghi's "whatever it takes" speech, as the coefficient of the euro area*post dummy variable is highly statistically significant and negative in and of similar value all the 6 columns. In terms of magnitude, the reduction is between 0.91 and 0.76 percentage points per month, a considerable slowdown in the growth rate, which for all banks on average

[6] In addition to testing explicitly treatment vs. non-treatment on the basis of a single coefficient, we also ran these regressions in a panel, i.e., on the month by month growth rates, which provides us with results in the form of dummy variables for each bank*period. The coefficients for these various dummy variable thus indicate whether any bank deviated significantly in their month-to-month behavior from the other banks at any points in time over the period. These methods deliver very similar results in that they show a break in behavior around the same points in time that we use to center the diff-in-diff tests (not reported).

before the event is about 2.3 percentage points per month. The little change observed in the regression results by the inclusion of the various sets of fixed effects point to the robustness of our findings, including to demand and other shocks that affect firms differently. Of course, as more dummy variables are added, the explanatory power of the regressions increase, to almost 50 percent in the richest specification. These findings thus provide strong evidence that the "whatever it takes" speech was a major central bank intervention that managed to reduce the incentives of some euro area banks to engage in more aggressive lending in foreign markets.

We next conduct a similar set of regressions considering the level of the interest rate charged by banks. Table 6 reports these findings. We again document consistent results, in that the euro area banks adjusted upward the interest rate they charged on their loans following the "whatever it takes" speech, as the coefficient of the euro area*post dummy interaction variable is highly statistically significant and positive in all 6 columns. The economic impact of this change in euro area banks' interest rate behavior is not as large as for the loan amounts, as the rates go up by between 17 and 24 basis points, reflecting moderate increases relative to the mean interest rate charged by all banks, which is some 12 percentage points. The consistent results nevertheless imply that these banks, which had been charging lower rates to the same borrowers compared to other banks before the event, reverted their behavior after the event. As with the loan growth regressions, the explanatory power of the interest rate regressions increase as we add in the controls, reaching about 70 percent in the richest specification.

Diff-in-diff results for all firms. The previous analysis in this section considered only multi-bank firms, allowing us to perfectly control for changes in firm characteristics. However, depending on the shocks and policy interventions at home, some banks might change their lending differently across distinct types of firms, such as multi-bank and single-bank firms. Single-bank firms are quantitatively relevant, as this lending, while smaller per firm, represents a significant portion of overall lending. Additionally, in response to shocks or interventions, some of the banks may react differently in their lending to firms that are also engaged in borrowing relationships with other banks rather than on a unique basis. Moreover, given information asymmetries, relationship-based lending tends to be more prevalent for single-bank firms. This means that while banks also compete with other banks for single-bank firms, this is typically on the basis of different forms of competition, as reviewed by Degryse and Ongena (2005).[7]

More generally, banks may adjust loans to firms to a different extent for particular reasons, such as having a stronger preference for exposures to some sectors because of past engagements or specialization; or they may have specific risk preferences (De Jonghe, Dewachter, Mulier, Ongena, and Schepens (2016) provide evidence of such effects). Accordingly, banks could

[7] See also Degryse, Cerqueiro, and Ongena (2007) and Jakovljević, Degryse and Ongena, (2015). For instance, as switching cost are higher for single-bank firms and hold-up costs can arise, one could expect banks to find it easier to (temporarily) adjust the interest rate for such borrowers.

respond differently to shocks and policy interventions in their lending to single-bank firms compared to their lending to multi-bank firms. Therefore, we next conduct these same regressions to test if there are statistically significant differences in lending for euro area banks compared to other banks, or among the banks more generally, but now for all firms, i.e., the union of multi-bank and single-bank firms. The only exception is that we cannot include the specification with firms*period fixed effects (i.e., we drop the specification of column 6 that we used in Tables 5 and 6 for multi-bank firms).

Results for all firms are reported in Table 7 for the lending volumes and in Table 8 for the interest rates. As with the sample of multi-bank firms, we report regression results for the differences between euro-area and all other banks. As seen from Table 7, we again document that the monthly loan growth of euro-area banks is lower after the policy intervention relative to all the other banks by about 1 percentage point, with effects statistically significant in a similar way across all 5 specifications. These effects are very comparable to the ones for the multi-bank firms.[8] As such, we can be confident that the effects we find reflect the overall adjustments by banks to the shocks and not specific other adjustments in lending strategies.

In terms of interest rates, Table 8, the effects are also broadly the same, in that rates across all firms are some 11 to 21 basis points lower before the policy event for the euro area banks, i.e., the rates were adjusted upward. These regression results thus show again that there is also some adjustment in the interest rate for the single-bank firms.[9]

Robustness

We next conduct a number of robustness tests. We start by considering alternative comparison groups and different time windows. Lastly, we run a number of econometric robustness tests.

Comparisons groups. To assess the effects of the ECB intervention, we have focused so far on the difference between the euro area banks and all other banks, with the latter group including all foreign and domestic banks. While this comparison is natural to understand the impact of Draghi's policy announcement on banks' behavior, there may be effects of the intervention that vary among the euro area banks.

[8] Although the regressions that control for the firm fixed effects (columns 3 and 4) show slightly lower effects than the other specifications in the table, some 20 basis points less, i.e., there is some adjustment in the loan amounts that varies by the characteristics of the single-bank firms, we also found this in the multi-bank firm regression that control for fixed effects, albeit slightly lower differences, 15 basis points.

[9] Again, the regressions that control for the firm fixed effects (columns 3 and 4) show slightly lower economic effects, a difference of 11 basis points compared to 20 basis points in the other regressions, but once more this result is comparable to the multibank interest rate regression result, where the differences change from 24 basis points to 17 basis points.

Therefore, now we run a number of iterations on treatment and control groups, using the same regression specification as in the last column of Tables 5 and 6, which correspond to the specification with the most stringent controls, i.e., firm*period fixed effects. We start with multibank firms and analyze loan growth rates and interest rates. Rather than present the detailed results for all the possible combinations, which would take a considerable amount of space, in Table 9 we summarize these tests in the form of a matrix, where we just report the treatment*period coefficients, showing in the columns the treated and in the rows the non-treated banks, with significance levels next to them. In panel A of this table we report the results for loan amounts and in panel B those for interest rates. In Table 10 we repeat this for all firms, using the specification of the last column of Tables 7 and 8.

The results for multi-bank firms in Table 9 clearly indicate that the central bank interventions not only affected euro-area banks as a group, but also that the impact differed among the euro-area banks. This shows up in the fact that, as a group, the behavior of the euro-area banks is different from that of all other banks. This is also the case for the difference with the Mexican, domestic banks. The highly significant coefficients of -0.831, and -0.881 respectively indicate that these euro-area banks increased lending more before the event and cut-back afterwards, including relative to Mexican banks. When splitting the sample of euro area banks, row 2 and 3, however, we do find evidence of large differences among the euro-area banks, since, while both coefficients for the two individual euro area banks' comparisons with all the other banks remain negative and strongly statistically significant, they vary: one is about ½ percentage points and the other almost 1 percentage points. Overall, it thus appears that the effect of the central bank action on lending was concentrated on the euro-area banks, and on one bank in particularly more so. This bank, which can be labelled a low liquidity bank, at least as suggested by confidential data on ECB liquidity support, thus appears to have accounted the most for the identified change in behavior following the 'whatever it takes' speech.

Panel B in Table 9 shows the results for the same set of regressions, but now for the interest rates charged on multibank firms in the periods before and after the event. The panel shows that the interest rate charged was lower before the event for the group of euro-area banks relative to the group of all other banks. Somewhat different from the results for lending, we do not find evidence of large differences among the euro-area banks' interest rates, as the coefficients for these various comparisons remain between 19 and 11 basis points for the individual banks. Although there still could be differences among the individual euro area banks, these regression results so far suggest that there were none in interest rates. This could be because, even though shocks and policy events affected banks differently, competition among the euro-area banks made them all lower rates in similar amounts before the event to these multi-bank firms. Note that, since these regressions control for firm characteristics with fixed effects, these effects are not due to differences in the (pool of) firms' riskiness.

Banks could have differed with respect to lending to single-bank firms, however. We therefore also run the various combinations of regressions for all firms, the union of multi-bank and single-bank firms. Table 10 shows the results again for the different combinations of control and treatment groups, with in panel A the results reported for loan amounts and in panel B for interest rates. The findings are qualitatively similar to those for the multi-bank firms: the growth rate in loans for the euro-area banks is less than that of other banks while interest rates are lower.

There are some sharper differences though among the euro area banks, since the difference in loan growth for one of the euro-area banks is now about 1.2 percentage points, while it was 0.7 percentage points before for the multibank firms, and the interest rate is some 10 basis points lower, less so compared to 22 basis points difference for this bank in its multibank lending. While the behavior in terms of loan growth of this one euro-area bank is different from that of other banks, this is not the case for the other euro area bank. In terms of interest rate behavior, there are less notable economic differences in how each of the individual euro area banks compare to all the other banks. Overall, this suggests that the one euro bank was more aggressive in its single-bank firm lending while, in terms of price, perhaps because of the various forms of competition, there was more of a degree of equalization in interest rates. Note that these regression results control for time-invariant differences in the (pool of) firms' riskiness, but not for all changes affecting firms over time, which could account for some of the differences.

Windows of study. The second set of robustness checks concerns the window of time we use to study the effects of the policy event. It could be the case that it takes quite some time for the effects of the policy event to show up in bank behavior in this foreign, i.e., Mexican, market; after all, effects would have to operate through the internal markets of the banks. It could also be that the normal volatility in lending makes a short-window before or after the event not so well suited to identify effects. At the same time, it could be that the event played out quicker than the base window implies. Since we have no strong priors as to what the time-frame is over which banks adjust their internal operations, we both start and end the period earlier as well later compared to the base specification, which is March-October 2012.

Table 11 reports the results for the regressions that compare euro area banks with all other banks for multi-bank firms using firm*period fixed effects. To save space, the tables only reports the coefficients for the treatment*period dummies. It is clear that in terms of loan growth rates regression results are not much affected by the window: as shown in the table, if anything, effects are stronger if a longer window is used before and afterwards as coefficients are then somewhat higher, about 1.6 (February-November) or 1.5 (January-December) percentage points compared to 0.83 percentage points in the base regression. This seems, however, mostly due to the longer window before the event, since using a February-October window (i.e., the same end date, but an earlier start date) gives a higher coefficient, -1.4, compared to using a March-November window (i.e., the same start date, but a later end date), -1.1. Comparisons are similar for the sample of all firms (not reported).

In terms of interest rates, it also appears that shifts in the window do not change the main conclusion that euro area banks adjusted their interest rate upward for these firms after the event. Effects vary from a high of 27 basis points for the January-December window to a low of 19 basis points for the base window. As such, they suggest that the 19 basis points is a lower bound on the degree to which euro area banks adjusted their interest rates in response to the policy intervention. Again these regression results hold when using the other combinations of treatment and control groups, and also when using all firms. As such, it suggests that there was a major shift in lending behavior around the time of the "whatever it takes" speech.

Econometric robustness. Our last set of robustness test involves econometric robustness. In particular, we explore different clustering techniques, as well as different forms of trimming observations. Table 12 again provides the regression results with clustering at the bank level, for the base specification with the full set of fixed effects, and also showing different windows. The table results make clear that the way in which the clustering is done has very little effect on the statistical significance of the results. The table also shows that trimming at the 2 and 98 percentiles or at the 5 and 95 percentiles does not change the main results for loan growth rates or interest rates, also regardless of how the clustering is done. The size of the coefficients becomes slightly smaller when winsorizing is performed at the 5 and 95th percentile, but the statistical significance largely remains.

5. Conclusions

We analyze how a major non-conventional central bank intervention, Draghi's "whatever it takes" speech, impacts lending conditions. To avoid endogeneity problems—where local demand shocks and macroeconomic risks are hard to insulate from the effects of the intervention—we analyze changes in lending conditions in Mexico, a banking system with diverse ownership. Comparing local lending conditions to the same borrower with other banks largely sheltered from funding shocks, we show that the intervention reduced risk shifting by euro area banks.

We can draw implications from our analysis for banks internal markets' functioning during periods of stress and the role of subsidiarization in avoiding cross-border spillovers. Our finding suggest that even with very strict regulation and supervision, including on exposures and internal transfers between headquarters and subsidiaries, there can be spillovers from one headquarters to subsidiaries (and vice-versa). The channel is presumably more complex. Without open liquidity or solvency issues, it can still the case that banks get involved in some risk-taking abroad, in both price and quantity, as they try to preserve their overall profitability when their franchise value at home is under pressure. This may have been the case in the euro area prior to the "whatever it takes." This type of risk taking is possibly harder to detect in the aggregate data, as it requires the analysis of individual loan decisions. It also means that the regulation and supervision of global banks needs to be well integrated to assure not only that risks do not go undetected—which is

never fully possible, but more importantly to also assure that incentives remain aligned between all parties.

REFERENCES

Acharya, V., T. Eisert, C. Eufinger, and C. Hirsch (2015). Whatever it takes: The real effects of unconventional monetary policy, SAFE Working Paper Series 152.

Acharya, V., M.J. Fleming, W.B. Hrung and A. Sarkar (2017). Dealer financial conditions and lender-of-last-resort facilities, *Journal of Financial Economics* 123, 1 81-107.

Acharya, V. and S. Steffen (2015). The "greatest" carry trade ever?: Understanding eurozone bank risks, *Journal of Financial Economics* 115 (2), 215–236.

Acharya, V., D. Pierret and S. Steffen (2016). Lender of last resort versus buyer of last resort: The impact of the European Central Bank actions on the bank-sovereign nexus, ZEW Discussion Papers 16-019.

Albertazzi, U. and M. Bottero (2013). Foreign bank lending: Evidence from the global financial crisis, NBER Chapters, in: NBER International Seminar on Macroeconomics 2013, 22-35.

Amiti, M. and D.E. Weinstein (2013). How much do bank shocks affect investment? Evidence from matched bank-firm loan data, NBER Working Papers 18890.

Bagehot, W. (1873). *Lombard Street, A Description of the Money Market,* Henry S. King & Co., London.

Bordo, M. D. (1990). The lender of last resort: Alternative views and historical experience, Economic Review 76, 18–29.

Buch C.M. and L.S. Goldberg (2015). International banking and liquidity risk transmission: Lessons from across countries, *IMF Economic Review*, 63(3) 377-410.

Caballero, Ricardo J., Takeo Hoshi, and Anil K. Kashyap (2008). Zombie lending and depressed restructuring in Japan, American Economic Review 98, 1943–1977.

Caccavaio, M., L. Carpinelli, G. Marinelli and E. Sette (2015). International banking and liquidity risk transmission: Evidence from Italy, *IMF Economic Review*, 63(3), 568-584.

Cetorelli N. and L.S. Goldberg (2012). Follow the money: Quantifying domestic effects of foreign bank shocks in the great recession, *American Economic Review*, 102(3), 213-18.

Claessens, Stijn (2016). "Global Banking: Recent Developments and Insights from Research," *Review of Finance*, pp. 1-43.

De Haas R., N. Van Horen (2013). Running for the exit? International bank lending during a financial crisis, *Review of Financial Studies* 26(1), 244-285.

De Jonghe, O., H. Dewachter, K. Mulier, S. Ongena and G. Schepens (2016). Some borrowers are more equal than others: Bank funding shocks and credit reallocation. https://ssrn.com/abstract=2774441.

Di Maggio, M., A. Kermani and C. Palmer (2016). How quantitative easing works: Evidence on the refinancing channel, *NBER Working Paper Series* 22638.

Diamond, D. W. and P.H. Dybvig (1983), Bank runs, deposit insurance and liquidity, *Journal of Political Economy* 91, 401–419.

Diamond, D.W. and R.G. Rajan (2011). Fear of fire sales, illiquidity seeking, and credit freezes, *Quarterly Journal of Economics* 126, 557–591.

Drechsler, I., T. Drechsel, D. Marques-Ibanez and P. Schnabl (2016). Who borrows from the lender of last resort?, *Journal of Finance* 71(5), 1933-1974.

Farhi, E. and J. Tirole (2014). Deadly embrace: Sovereign and financial balance sheets doom loops, Working Paper, Harvard University.

Fratzscher M., M. Lo Duca and R. Straub (2016). ECB unconventional monetary policy: Market impact and international spillovers, *IMF Economic Review* 64(1), 36-74.

Freixas, X., B. Parigi and J.-C. Rochet (2004). The lender of last resort: A 21st century approach, *Journal of the European Economic Association* 2, 1085-1115.

Goldstein, I. and A. Pauzner (2005). Demand-deposit contracts and the probability of bank runs, *Journal of Finance* 60, 1293–1327.

Goodhart, C. (1999). Myths about the lender of last resort, *International Finance* 2:3 339-360.

Kerl, C. and C. Koch (2015). International banking and liquidity risk transmission: Evidence from Germany, *IMF Economic Review* 63(3), 496-514.

Khwaja A.I. and A. Mian (2008). Tracing the impact of bank liquidity shocks: Evidence from an emerging market, *American Economic Review* 98(4), 1413-42.

Khwaja A.I. and A. Mian and Z. Bilal (2010). Dollars dollars everywhere, nor any dime to lend: Credit limit constraints on financial sector absorptive capacity, *Review of Financial Studies* 23(12), 4281-4323.

Morais, B., J.L. Peydro, and C. Ruiz Ortega (2015). The international bank lending channel of monetary policy rates and quantitative easing: credit supply, reach-for-yield, and real effects, The World Bank Policy Research Working Paper Series 7216.

Haas R. and I. Lelyveld (2014). Multinational banks and the global financial crisis: Weathering the perfect storm?, *Journal of Money, Credit and Banking* 46(s1), 333-364, 02.

Peek, J. and E.S. Rosengren (2005). Unnatural selection: Perverse incentives and the misallocation of credit in Japan, *American Economic Review* 95(4), 1144-1166.

Praet, P. (2016). The ECB and its role as lender of last resort during the crisis, Speech at the Committee on Capital Markets Regulation conference on The lender of last resort: An international perspective, Washington DC.

Rochet, J.-C. and X. Vives (2004). Coordination failures and the lender of last resort: Was Bagehot right after all? *Journal of the European Economic Association* 2, 1116–1147.

Schnabl, P. (2012). The international transmission of bank liquidity shocks: Evidence from an emerging market, *Journal of Finance* 67(3), 897-932.

Stein, J. C. (2014). Banks as Patient Debt Investors, At the American Economic Association/American Finance Association Joint Luncheon, Philadelphia, Pennsylvania, January 3.

Thornton, H. (1802). *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*, Nabu Press, London.

Uhlig, H. (2013). Sovereign default risk and banks in a monetary union, *German Economic Review* 15, 23-41.

Veronesi, P. and L. Zingales (2010). Paulson's gift, *Journal of Financial Economics*, 97(3), 339-368.

Table 1: Mexican Banking System

Commercial Banks	2011		2012		2013	
	Number	(%) Assets	Number	(%) Assets	Number	(%) Assets
I. Subsidiaries of foreign financial institutions	**15**	**72.5**	**15**	**70.7**	**14**	**70.4**
a. United States	5	20.8	5	20.3	5	20.0
b. Euro	2	33.8	2	33.4	2	33.5
c. Others	8	17.9	8	16.9	7	16.9
II. National banks	**27**	**27.5**	**28**	**29.3**	**32**	**29.6**
Total	**42**	**100**	**43**	**100**	**46**	**100**

Source: Comisión Nacional Bancaria y de Valores

Table 2: Capital, Asset and Capital Adequacy Ratio (2012)
Million pesos

	Non-euro	Euro	Total
Capital	294,210	247,934	542,145
Risk Weighted Assets	1,888,050	1,599,571	3,487,621
Capital Adequacy Ratio (%)	**15.58**	**15.5**	**15.54**

Source: Comisión Nacional Bancaria y de Valores

Table 3

Data Description

This table describes the variables used in the empirical analyses, i.e. differences-in-differences and panel regressions.
We use all firms in the clean database. We exclude loans with errors in their maturity dates and 75 loans that expire in December 2049. We winsorized growth rates of outstanding amounts at the 2nd and 98th percentiles. We winsorized interest rates at levels 0.1% and 70%.

Variable	Variable Definition	Source
Outstanding amount	Outstanding balance (in Mexican pesos) of the commercial credit at the end of the period, including receivable accrued interest, capitalized or refinanced interest, comissions or any other concept.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Interest rate	Weighted average of the interest rates used to calculate the interest payment of the period, using ouststading amounts as weights.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Type of credit	Credits are grouped into four categories according to their main characteristics: 1. Revolving. Credits granted for given amount, for a indefinite or a fixed term, over which the borrower can make one or more dispositions whose sum does not exceed the original amount contracted. 2. Single disposition. Credits granted with only one disposition. 3. Non revolving. Credits granted for a given amount and for a fixed term. 4. Syndicated. Credits granted by a group of banks, with the objective of diversifying the risk when the amount of the credit approved is very large.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Spanish	Dummy variable that takes the value 1 if the loan was granted by a Spanish bank.	Created by the authors with R04C database.
Post "Whatever it takes"	Dummy variable that takes the value 1 for the period July-October 2012, i.e. the period post "Whatever it takes"	Created by the authors with R04C database.
Bank	Dummy variable that includes a category for each of the 9 banks included in our sample.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Firm	Dummy variable that includes a different category for each firm.	Comisión Nacional Bancaria y de Valores (CNBV). R04C database.
Location	Includes a different category for each state in Mexico, as well as a category for "Other country".	Adapted by authors from R04C database.

Table 4: Summary statistics for outstanding amount and interest rate

By bank and type of credit

This table shows the total credit during the period July 2009-December 2014. We use all firms in the clean database. We exclude loans with errors in their maturity dates; 75 loans that expire in December 2049, and loans whose values of outstanding amount or interest rates are on the top 1 percent or on the bottom 1 per cent of the distribution.

		Outstanding Amount (MNX)					Interest Rate (%)			
Bank	Obs	Mean	Std. Dev.	Min	Max	Total outstanding amount	Mean	Std. Dev.	Min	Max
Revolving										
Banamex	1,113,668	985,560	2,512,232	139	24,830,892	1,097,586,290,727	14.98	2.63	3.18	26.00
BBVA_Bancomer	629,728	1,190,899	3,004,688	150	24,900,000	749,942,141,061	10.89	3.01	0.00	25.00
Santander	531,997	1,260,582	2,872,300	139	24,912,045	670,625,808,355	10.39	3.35	0.00	23.00
HSBC	542,017	344,063	1,515,519	139	24,792,497	186,488,027,092	8.57	2.06	0.01	26.00
BanBajio	1,272,657	736,351	1,853,304	139	24,788,507	937,122,419,398	10.10	2.92	2.45	28.00
Inbursa	204,643	351,354	1,641,518	176	24,090,915	71,902,233,552	17.96	3.04	4.77	26.00
Scotiabank	62,448	1,682,158	2,848,191	139	24,569,800	105,047,430,981	7.58	1.82	2.65	14.95
BanRegio	214,325	1,953,911	3,076,521	140	24,721,407	418,771,959,108	11.00	2.78	4.29	22.32
Banorte	477,053	1,949,330	2,736,276	144	24,625,500	929,933,492,703	12.48	2.85	0.00	22.00
Total						5,167,419,802,977				
Single disposition										
Banamex	6,804	1,021,940	1,006,571	186	10,003,931	6,953,281,285	13.57	2.75	0.00	22.90
BBVA_Bancomer	7,309,642	379,653	1,503,110	139	24,902,622	2,775,124,669,931	9.11	2.63	0.00	25.00
Santander	1,306,261	1,361,414	2,515,127	139	24,906,911	1,778,362,015,511	10.87	3.54	0.00	25.45
HSBC	5,479,063	186,072	943,269	139	24,986,844	1,019,500,211,612	14.76	6.77	0.00	44.00
BanBajio	193,769	2,013,441	3,447,076	154	24,644,152	390,142,389,447	10.58	3.17	5.19	27.82
Inbursa	387,335	564,952	1,995,583	163	24,800,000	218,825,492,756	17.23	3.53	0.00	21.50
Scotiabank	6,329	6,613,616	5,414,070	361	24,795,447	41,857,576,986	8.35	1.69	4.00	13.32
BanRegio	13,647	1,265,639	2,596,821	237	23,107,065	17,272,179,827	11.66	2.94	4.30	16.98
Banorte	2,553,536	645,027	1,915,388	139	24,895,067	1,647,099,784,880	11.67	2.86	0.00	25.00
Total						7,895,137,602,235				
Non-revolving										
Banamex	454,917	1,568,609	3,020,753	164	24,850,102	713,587,002,998	11.75	3.45	0.00	25.00
BBVA_Bancomer	2	1,860,003	0	1,860,003	1,860,003	3,720,006	7.88	0.00	7.88	7.88
HSBC	567,488	297,036	1,550,404	240	24,482,179	168,564,242,081	24.30	5.91	1.00	42.00
BanBajio	179,384	1,883,653	2,940,617	148	24,682,275	337,897,209,494	8.96	2.21	2.35	31.62
Inbursa	46,193	1,526,336	3,189,384	304	24,177,887	70,506,047,175	15.22	3.59	5.29	22.00
Scotiabank	48,565	4,548,472	5,063,296	357	24,915,417	220,896,544,485	7.85	1.53	0.00	15.30
BanRegio	315,185	1,180,705	2,703,045	139	24,746,662	372,140,466,179	11.97	2.45	3.28	21.57
Total						1,883,595,232,418				
Syndicated										
Banamex	151	7,715,876	5,385,495	934,129	20,920,741	1,165,097,291	9.13	0.89	7.78	11.81
HSBC	207	10,848,279	4,992,154	814,026	20,321,635	2,245,593,746	6.93	1.43	1.00	12.57
Banorte	11,013	8,923,237	6,048,951	97,400	24,893,991	98,271,608,717	6.98	0.85	0.00	12.03
Total						101,682,299,754				

Table 5

Diff-in-diff regressions explaining monthly growth rates of loans of multibank firms

* p<0.1; ** p<0.05; *** p<0.01. Standard errors in parentheses. We restrict data to the period from March to October 2012. We winsorized growth rates at the 2nd and 98th percentiles. We clustered standard errors at the bank level.

Monthly loan growth rates	(1)	(2)	(3)	(4)	(5)	(6)
Euro (1 if euro bank)	-1.244	-1.235	-1.872	-1.864	-1.853	-1.848
	(2.103)	(2.119)	(1.424)	(1.421)	(1.419)	(1.767)
Post (1 if July-October 2012)	0.427	0.424	-1.136	-1.139		
	(0.344)	(0.343)	(0.307)***	(0.307)***		
Euro*Post	**-0.914**	**-0.914**	**-0.766**	**-0.761**	**-0.801**	**-0.831**
	(0.353)**	(0.351)**	(0.316)**	(0.315)**	(0.060)***	(0.114)***
Location fixed effects	No	Yes	No	Yes	No	No
Firm fixed effects	No	No	Yes	Yes	No	No
Post*firm fixed effects	No	No	No	No	Yes	No
Firm*period fixed effects	No	No	No	No	No	Yes
R^2	0.001	0.001	0.090	0.090	0.144	0.446
N	347,385	347,385	347,385	347,385	347,385	347,385

Table 6

Diff-in-diff regressions explaining interest rates of multibank firms

* p<0.1; ** p<0.05; *** p<0.01. Standard errors in parentheses. We restrict data to the period from March to October 2012. We use the same number of observations as the loan growth rate regressions. We clustered standard errors at the bank level. We winsorized interest rates at levels 0.1% and 70%.

Interest rates	(1)	(2)	(3)	(4)	(5)	(6)
Euro (1 if euro bank)	-1.983	-2.1	-1.749	-1.752	-1.762	-1.761
	(1.087)	(1.071)*	(0.589)**	(0.587)**	(0.597)**	(0.734)**
Post (1 if July-October 2012)	-0.191	-0.19	-0.131	-0.131		
	(0.079)**	(0.078)**	(0.047)**	(0.048)**		
Euro*Post	**0.244**	**0.244**	**0.165**	**0.166**	**0.192**	**0.193**
	(0.080)**	(0.079)**	(0.050)**	(0.050)**	(0.039)***	(0.049)***
Location fixed effects	No	Yes	No	Yes	No	No
Firm fixed effects	No	No	Yes	Yes	No	No
Post*firm fixed effects	No	No	No	No	Yes	No
Firm*period fixed effects	No	No	No	No	No	Yes
R^2	0.058	0.081	0.699	0.700	0.704	0.710
N	347,385	347,385	347,385	347,385	347,385	347,385

Table 7

Diff-in-diff regressions explaining monthly growth rates of loans of all firms

* p<0.1; ** p<0.05; *** p<0.01. Standard errors in parentheses. We restrict data to the period from March to October 2012. We winsorized growth rates at the 2nd and 98th percentiles. We clustered standard errors at the bank level.

Monthly loan growth rates	(1)	(2)	(3)	(4)	(5)
Euro (1 if euro bank)	-2.01	-1.907	-2.064	-2.056	-2.032
	(2.280)	(2.275)	(1.364)	(1.362)	(1.527)
Post (1 if July-October 2012)	0.417	0.413	-1.105	-1.106	
	(0.313)	(0.313)	(0.330)**	(0.330)**	
Euro*Post	**-0.983**	**-0.994**	**-0.785**	**-0.782**	**-0.809**
	(0.316)**	(0.327)**	(0.545)	(0.545)	(0.121)***
Location fixed effects	No	Yes	No	Yes	No
Firm fixed effects	No	No	Yes	Yes	No
Post*firm fixed effects	No	No	No	No	Yes
R^2	0.001	0.002	0.142	0.142	0.235
N	829,782	829,782	829,782	829,782	829,782

Table 8

Diff-in-diff regressions explaining interest rates of all firms

* p<0.1; ** p<0.05; *** p<0.01. Standard errors in parentheses. We restrict data to the period from March to October 2012. We did not cluster standard errors. We winsorized interest rates at levels 0.1% and 70%. We clustered standard errors at the bank level.

Interest rates	(1)	(2)	(3)	(4)	(5)
Euro (1 if euro bank)	-1.845	-2.11	-1.724	-1.727	-1.761
	(1.070)	(1.027)*	(0.597)**	(0.596)**	(0.628)**
Post (1 if July-October 2012)	-0.139	-0.143	-0.103	-0.103	
	(0.068)*	(0.069)*	(0.042)**	(0.042)**	
Euro*Post	**0.196**	**0.214**	**0.109**	**0.109**	**0.191**
	(0.069)**	(0.067)**	(0.044)**	(0.044)**	(0.038)***
Location fixed effects	No	Yes	No	Yes	No
Firm fixed effects	No	No	Yes	Yes	No
Post*firm fixed effects	No	No	No	No	Yes
R^2	0.054	0.086	0.850	0.851	0.859
N	829,782	829,782	829,782	829,782	829,782

Table 9: Robustness checks: changing treatment and control groups. Coefficient for multibank firms.

Panel A: Loans Amounts			
Treatment (row) / Control	**Non-Euro**	**Non-Euro + Euro bank 2**	**Non-Euro + Euro bank 1**
Euro	-0.831***		
Euro bank 1	-0.660***	-0.434**	
Euro bank 2	-1.136***		-0.894**

Panel B: Interest Rates			
Treatment (row) / Control (column)	**Non-Euro**	**Non-Euro + Euro bank 2**	**Non-Euro + Euro bank 1**
Euro	0.193***		
Euro bank 1	0.215***	0.189***	
Euro bank 2	0.161***		0.113**

Table 10: Robustness checks: changing treatment and control groups. Coefficient for all firms.

Panel A: Loans Amounts

Treatment (row) / Control (column)	**Non-Euro**	**Non-Euro + Euro bank 2**	**Non-Euro + Euro bank 1**
Euro	-0.782		
Euro bank 1	-1.157**	-1.079**	
Euro bank 2	-0.305		-0.015

Panel B: Interest Rates

Treatment (row) / Control (column)	**Non-Euro**	**Non-Euro + Euro bank 2**	**Non-Euro + Euro bank 1**
Euro	0.109**		
Euro bank 1	0.097*	0.083*	
Euro bank 2	0.115**		0.091**

Table 11

Economic Robustness Checks. Changing study period, winsorizing and clustering. Specification 4 (location & firm fixed effects)

This table summarizes the following robustness checks for specification 4 that includes location and firm fixed effects: i) modifying the study period, ii) winsorizing loans' growth rates and interest rates at 5th-95th percentiles and 2nd-98th percentiles, and iii) clustering at bank level. Our base specification for loans includes winsorizing at percentiles 2nd and 98th, and clustering at the bank level. Our base specification for interest rates includes winsorizing at interest rate levels 0.1% and 70%, and clustering at the bank level. This table includes the Spanish*Post estimated coefficient of specification 4, which includes location and firm fixed effects. The base study period is March-October 2012. Shaded cells show the base specification results. * p<0.1; ** p<0.05; *** p<0.01.

Study period	Loans (monthly growth rates)				Interest rates					
	No clustering		Clustering		No clustering			Clustering		
	Win. P2-P98	Win. P5-P95	Win. P2-P98	Win. P5-P95	Win. Int. rate 0.1-70%	Win. P2-P98	Win. P5-P95	Win. 0.1-70%	Win. P2-P98	Win. P5-P95
Panel A: All firms										
March-October 2012	-0.782***	-0.628***	-0.782	-0.628	0.109***	0.104***	0.082***	0.109**	0.104**	0.082***
February-November 2012	-1.411***	-0.839***	-1.411***	-0.839*	0.130***	0.122***	0.094***	0.130*	0.122**	0.094**
January- December 2012	-1.172***	-0.668***	-1.172***	-0.668*	0.178***	0.161***	0.125***	0.178**	0.161**	0.125***
February- October 2012	-1.266***	-0.788***	-1.266**	-0.788*	0.119***	0.112***	0.086***	0.119**	0.112**	0.086**
March- November 2012	-0.925***	-0.679***	-0.925	-0.679	0.120***	0.114***	0.090***	0.120**	0.114**	0.090**
Panel B: Multibank firms										
March-October 2012	-0.761***	-0.620***	-0.761**	-0.620*	0.166***	0.155***	0.126***	0.166**	0.155***	0.126***
February-November 2012	-1.483***	-0.899***	-1.483**	-0.899***	0.190***	0.176***	0.140***	0.190**	0.176**	0.140***
January- December 2012	-1.298***	-0.737***	-1.298*	-0.737**	0.241***	0.218***	0.173***	0.241**	0.218**	0.173***
February- October 2012	-1.300***	-0.822***	-1.300**	-0.822***	0.177***	0.164***	0.131***	0.177**	0.164**	0.131***
March- November 2012	-0.950***	-0.699***	-0.950**	-0.699*	0.179***	0.167***	0.136***	0.179**	0.167***	0.136***

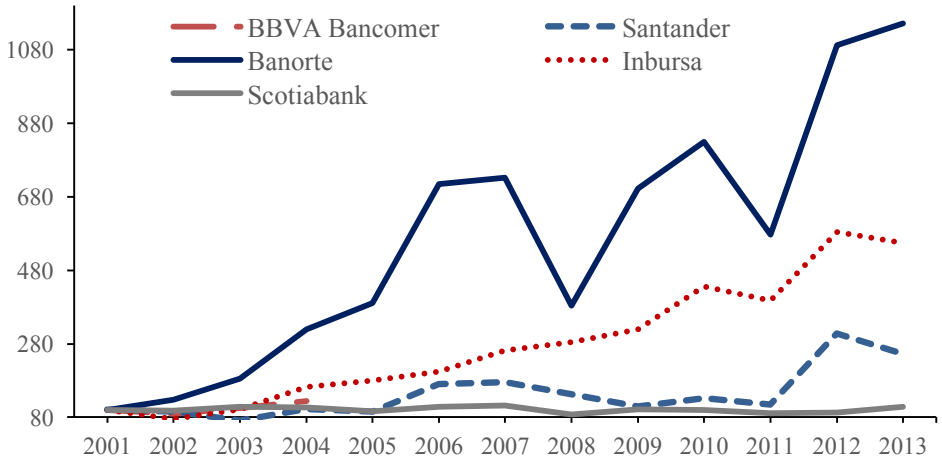
Table 12

Economic Robustness Checks. Changing study period, winsorizing and clustering. Specification 6 (firm*period fixed effects)

This table summarizes the following robustness checks: i) modifying the study period, ii) winsorizing loans' growth rates and interest rates at 5th-95th percentiles, and iii) 2nd-98th percentiles, and clustering at bank level. Our base specification for loans includes winsorizing at percentiles 2nd and 98th, and clustering at the bank level. Our base specification for interest rates includes winsorizing at interest rate levels 0.1% and 70%, and clustering at the bank level. This table includes the Spanish*Post estimated coefficient of specification 6, which includes fixed effects for the interaction between firm and period. Multibank firms. The base study period is March-October 2012. Shaded cells show the base specification results. * p<0.1; ** p<0.05; *** p<0.01.

Study period	Loans (monthly growth rates)				Interest rates					
	No clustering		Clustering		No clustering			Clustering		
	Win. P2-P98	Win. P5-P95	Win. P2-P98	Win. P5-P95	Win. Int. rate 0.1-70%	Win. P2-P98	Win. P5-P95	Win. 0.1-70%	Win. P2-P98	Win. P5-P95
March-October 2012	-0.831***	-0.621***	-0.831***	-0.621**	0.193***	0.179***	0.148***	0.192***	0.179***	0.148***
February-November 2012	-1.588***	-0.911***	-1.588**	-0.911***	0.219***	0.202***	0.164***	0.219***	0.202***	0.164***
January- December 2012	-1.470***	-0.773***	-1.470**	-0.773**	0.273***	0.246***	0.199***	0.273***	0.246***	0.199***
February- October 2012	-1.365***	-0.823***	-1.365**	-0.823***	0.207***	0.191***	0.156***	0.207***	0.191***	0.156***
March- November 2012	-1.054***	-0.709***	-1.054***	-0.709***	0.204***	0.190***	0.156***	0.204***	0.190***	0.156***

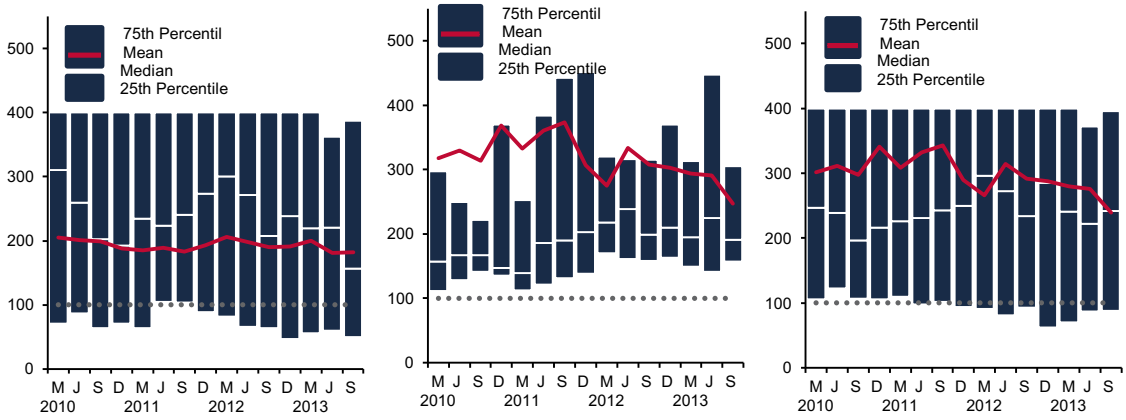
Figure 1: Stock Prices[10]
(2001=100)



Source: Bloomberg

Figure 2: Banks' Liquidity

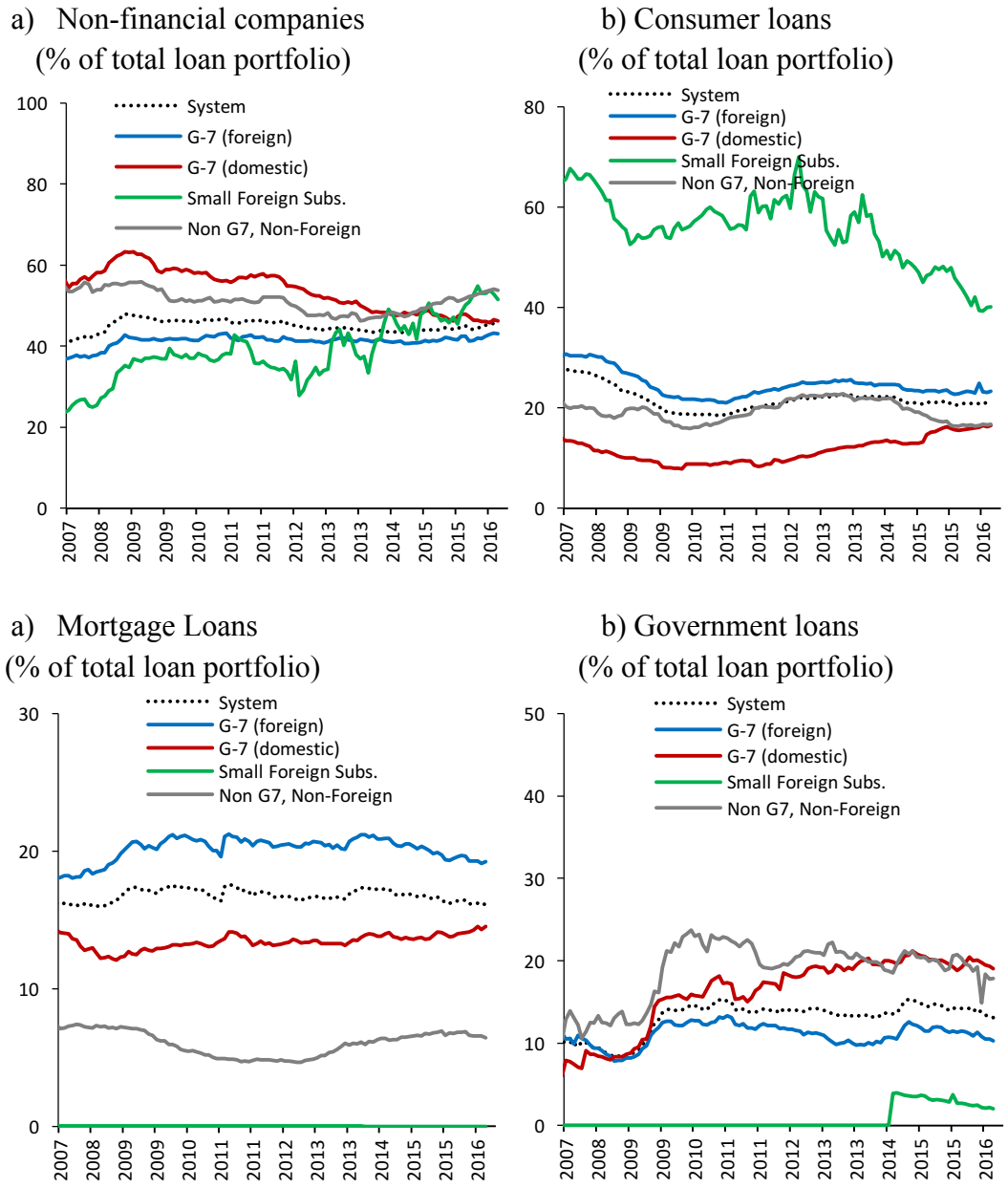
a) Banking System b) Large Banks c) Small Banks



Source: Bank of Mexico

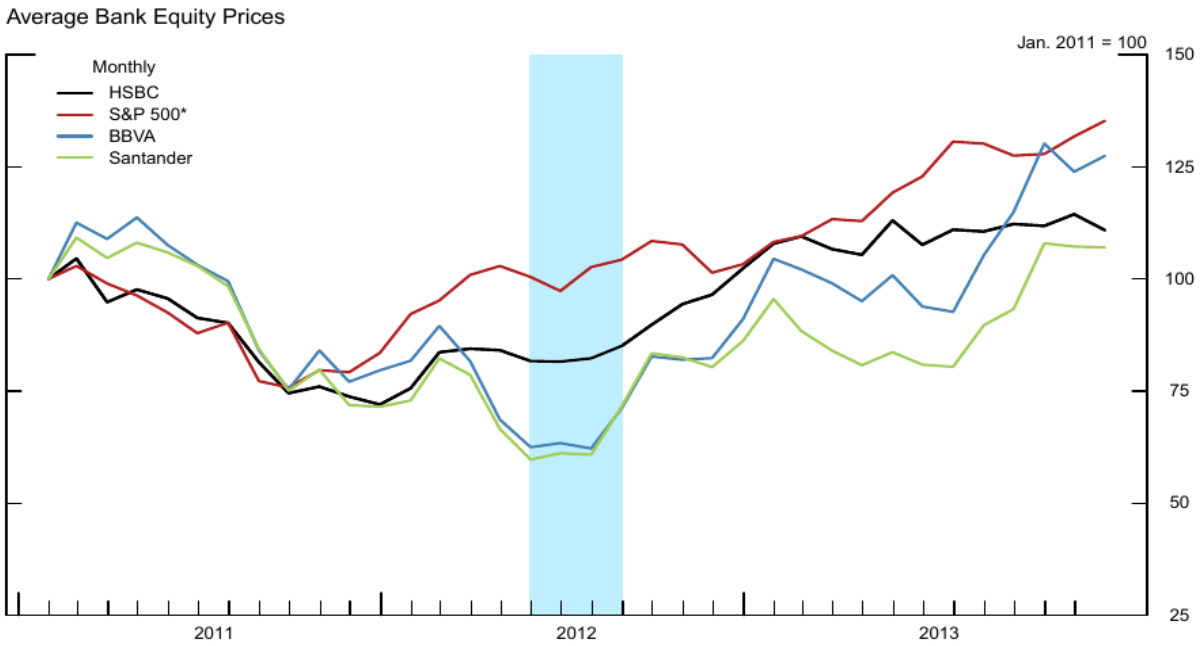
[10] Stock prices are deflated.

Figure 3: Loan Portfolio



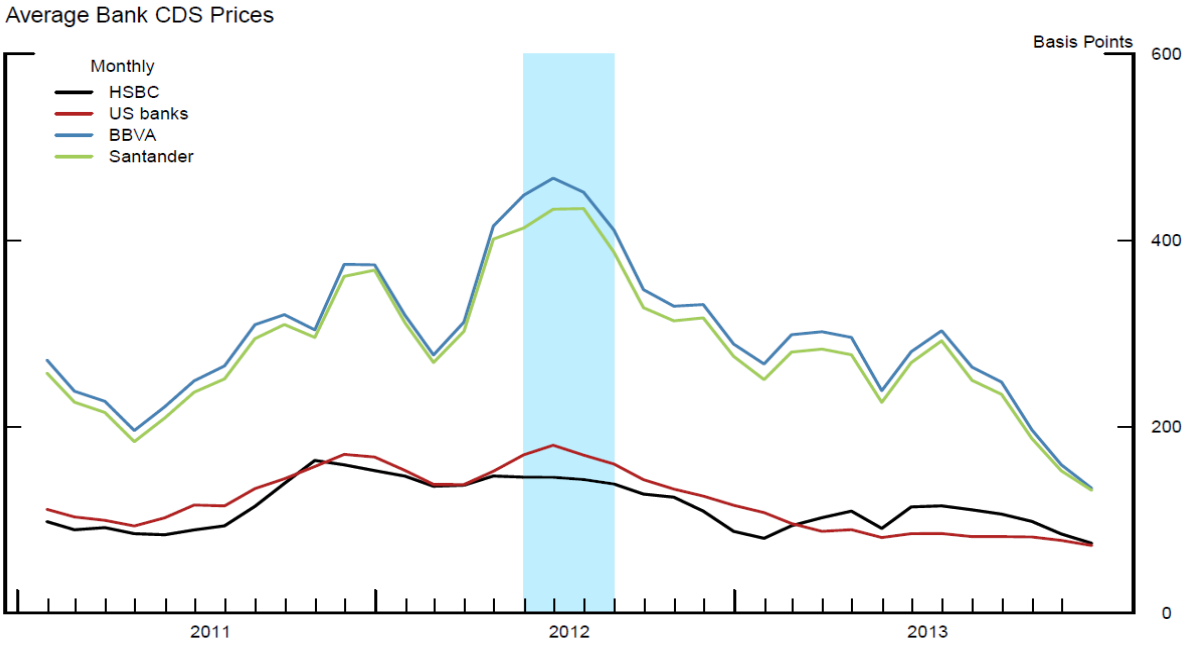
Source: Comisión Nacional Bancaria y de Valores

Figure 4: Bank equity prices



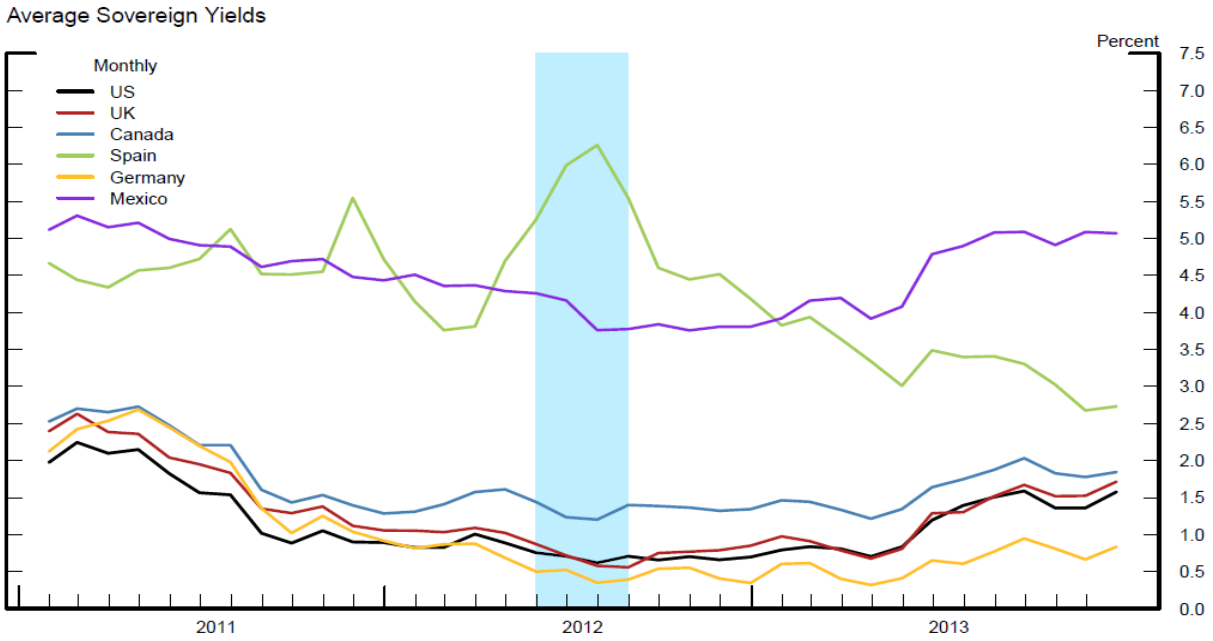
*S&P 500 is the bank sub-index.

Figure 5: Bank CDS



Source: Markit; JPMorgan

Figure 6: Sovereign yields



Note: Data are monthly average yields on 5−Year Sovereign Bonds.