Macroprudential and Monetary Policy: Loan-Level Evidence from Reserve Requirements

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Abstract

We analyze the impact of reserve requirements on the supply of credit to the real sector. For identification, we exploit a tightening of reserve requirements in Uruguay during a global capital inflows boom, where the change affected more foreign liabilities, in conjunction with its credit register that follows all bank loans granted to non-financial firms. Following a difference-in-differences approach, we compare lending to the same firm before and after the policy change among banks differently affected by the policy. The results show that the tightening of the reserve requirements for banks lead to a reduction of the supply of credit to firms. Importantly, the stronger quantitative results are for the tightening of reserve requirements to bank liabilities stemming from non-residents. Moreover, more affected banks increase their exposure into riskier firms, and larger banks mitigate the tightening effects. Finally, the firm-level analysis reveals that the cut in credit supply in the loan-level analysis is binding for firms. The results have implications for global monetary and financial stability policies.

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1 Introduction

Financial crises are typically preceded by bank credit booms in conjunction with strong foreign capital inflows (Reinhart and Rogoff (2009), Schularick and Taylor (2012), Jordà et al. (2013), Gourinchas and Obstfeld (2012)). The adverse consequences of strong credit booms fueled by fragile foreign liquidity, which may end up in a financial crisis, imply a role for macroprudential policy related to monetary policy (IMF (2015)). Local domestic monetary policies through setting interest rates may be ineffective, as higher monetary policy rates may attract more capital inflows, thereby increasing local credit booms and exhacerbating inflationary pressures as a result (Rey (2015), Rajan (2014)). Not surprisingly, many emerging countries currently use reserve requirements, often on non-insured non-deposit liabilities, which are very related to the new macroprudential policies that are discussed (Hanson et al. (2011), Freixas et al. (2015), IMF (2015)) and also on liquidity requirements of Basel III. Importantly, by targeting foreign bank liabilities, policy makers can target both credit booms and capital inflows. Past banking crises and also the recent global financial crisis have shown the importance of credit and monetary policy on both the aggregate economy and financial stability (Bernanke (1983), Reinhart and Rogoff (2009), Schularick and Taylor (2012)).

In this paper we analyze the impact of bank reserve requirements on the supply of credit to the real sector. Uruguay offers an excellent setup to empirically identify this effect for two main reasons: the tightening of reserve requirements introduced in May 2008, especially on foreign bank funding, and the exhaustive credit register of all granted bank credit in the system. Both the policy change and the credit register data are crucial for the analysis of the macroprudential role of reserve requirements for emerging markets, but also for monetary policy. The identification of the bank lending channel through reserve requirements (Bernanke and Blinder (1988), Bernanke and Blinder (1992)), Stein (1998) and Kashyap and Stein (2000)) has been elusive, as it has been analyzed with macro or bank level data which cannot control for borrowers' fundamentals (credit demand).

The monetary authority of Uruguay introduced changes on May 2008 (binding on June) in the regulation associated to the percentage of funds that banks must keep as reserves at the Central Bank. There was a tightening in the reserve requirements for banks, notably on foreign bank funding (deposits from non-resident financial institutions). These changes were implemented under a context of economic growth and persistent inflationary pressures derived from the high prices of the most relevant commodities for the Uruguayan economy. The main motive behind the tightening was inflation and the inability of stabilizing it by using the policy rate alone. Importantly, for macroprudential policy and capital controls, the reserve requirements in Uruguay affected more foreign bank liabilities which are denominated in foreign currency. Moreover, we have access to the Credit Register of the Central Bank of Uruguay, which is an exhaustive dataset of all the loans granted by each bank. This dataset is complemented with bank balance-sheet information from all the institutions that report to the Central Bank of Uruguay in

its role as regulator and supervisor of the banking system.

To study the effects on credit availability, we first aggregate all the different loans for each bank-firm pair in each month in order to construct a measure of total committed lending at the firm-bank-time level from January 2008 to December 2008. We then match each loan with the relevant bank balance-sheet variables (bank liabilities, size, capital and liquidity). We focus on firms that borrow from multiple banks as we can control for unobserved borrower fundamentals with firm fixed effects (proxing by credit demand as in Khwaja and Mian (2008)). We follow a difference-in-differences approach which compares lending to the same firm before (April, 2008) and after (July, 2008) the policy change among banks with different degrees of exposition to the sources of funds targeted by the reserve requirements. This allows us to identify the overall effects of the new reserve requirements on the supply of credit, both on the intensive and the extensive margins, and also the heterogeneous effects of these changes among different firm and bank characteristics. In particular, on firms' heterogeneity, we analyze whether the policy impact is different for firms with different ex-ante risk, number of banking relationships, and currency of the loan (Jimenez et al. (2014)). On banks' heterogeneity, we analyze bank size, solvency and liquidity (Kashyap and Stein (2000); Jimenez et al. (2012)). Finally, we also analyze the period before (January to April 2008) and after (July to October 2008) to run placebo tests.

The results on the intensive margin of lending suggest that the tightening of reserve requirements reduces the supply of credit to non-financial firms. Controlling for unobserved borrower fundamentals by focusing on lending to the same firm, we find that banks more affected by the policy cut more on credit volume. These effects are statistically and economically significant: a 10 percentage points increase on total reserve requirements translates into a cut in committed lending of 6 percentage points. Importantly, the stronger quantitative results are for the tightening to bank liabilities stemming from borrowing from non-residents, which relates to capital inflow controls.

Moreover, when we analyze the impact of the introduced policies across different firm and bank characteristics, we find that the credit supply reduction in committed lending is *lower* for ex-ante riskier firms. That is, more affected banks—for which the cost of financing increases more—cut the supply of credit in general, but concentrate more their portfolio in ex-ante riskier firms. We also find that the policy effects on cutting credit supply are stronger for borrowers with more banking relations, suggesting that banks cut credit less in these relations where they are able to extract higher rents—those with fewer bank relationships. In addition, larger banks are more capable of mitigating the effects of the policy. Finally, we find that the tightening of reserve requirements has a positive effect on the likelihood of ending a lending relationship with a firm (extensive margin of credit), although this effect is smaller for ex-ante riskier firms.

The loan-level results suggest that the increase in reserve requirements tightened the supply of bank credit. However, some firms could have mitigated the negative effects of the bank lending channel by resorting to loans from banks less affected by the policy change. In order to assess whether this is the case, we analyze the change in committed lending *by all banks* to a given firm between July and April, 2008. The results from the firm-level analysis suggest that the loan-level results are binding at the firm-level: firms with higher ex-ante credit from banks more affected by the policy obtain less overall bank credit ex-post. Finally, it is important to note that we do not find significant effects for the period before the policy (a placebo test run on January to April 2008), and for the period after (July to September 2008).

We mainly contribute to three strands of the literature. First, the bank lending channel of monetary policy through reserve requirements has been shown theoretically among others by Bernanke and Blinder (1988) and Stein (1998), however the empirical evidence has been analyzed with macro data (Bernanke and Blinder (1992)) and with bank level data (Kashyap and Stein (2000), Mora (2014)). As Khwaja and Mian (2008) among others show, loan-level data is needed to identify the supply of bank credit stemming from a bank shock. In this paper we identify the bank lending channel of monetary policy through reserve requirements with an exhaustive credit register and the change in regulation.

Second, equally or more important, we contribute to the literature on macroprudential policy and capital controls. As argued by Rey (2015), domestic monetary policy through interest rates may be ineffective in emerging markets with strong global capital flows. Reserve requirements can therefore be useful for changing the stance of monetary policy, and, moreover, as they can target differently distinctive bank liabilities, they can tighten even more short-term wholesale uninsured foreign liabilities that may be more fragile in crisis times. This links monetary policy with macroprudential policies and policies on capital controls.[1] Importantly, we find the strongest quantitative effects for the introduction of a reserve requirement for funds from non-residents. Interestingly, the tightening of requirements cut credit supply for firms, but more affected banks reacted by concentrating more their credit supply to ex-ante riskier borrowers, probably to compensate for the reduction in bank profits stemming from the liquidity funds in the central bank at 0% rates. This result suggests some unintended consequences of the policy change—a risk-taking channel of reserve requirements.

Finally, we also contribute to the recent literature on the impact of reserve requirements on financial stability. There has been a renewed interest on this policy, mainly due to the search for new macroprudential tools (Tovar et al. (2012), Montoro and Moreno (2011), Federico et al. (2014)). While the previous papers study country-level evidence on the effectiveness of reserve requirements, our paper is, to our knowledge, the first one to identify the effect on credit by using disaggregated data on individual loans and hence to be able to control for borrower fundamentals (and thus credit demand).

[1] There is not an explicit capital control, but these reserve requirement policies may make foreign funding more expensive.

The rest of the paper proceeds as follows. Section 2 discusses the data that we use and the policy change that we study. Section 3 introduces the empirical strategy and presents the results. Section 4 concludes.

2 Data and policy change

Data We have access to two datasets from the Central Bank of Uruguay in its role as banking regulator and supervisor. Both datasets cover the period from January 2008 to December 2008 and are available on a monthly frequency. The first dataset is the Credit Registry of the Central Bank of Uruguay (*"Central de Riesgos"*), which is an exhaustive record of all loans granted in the system with detailed information at the loan level. In particular, it contains information about the identity of the borrower, whether the borrower is a firm or a household, the country of residence, the economic sector to which it belongs, all the financial institutions with which it has a loan, the amount of the loan, the currency of the loan, its maturity, and the credit rating given by the bank to the firm. The rating given by the bank takes into account the current situation of the loan, and it can go from 1 to 5, being 5 the riskiest rating. [2] On the other hand, we also have access to a dataset with balance sheet information for all the banks operating in the system during the period 2008.

We focus on loans granted to non-financial private firms, making a total of 46.595 firms and 19 financial institutions for the total sample (January to December 2008). Given that we focus only on loans granted to firms, this dataset is comprehensive, since the monthly reporting threshold is of approximately USD 1.500. The sample includes one public bank, 12 private commercial banks and 6 non-bank financial institutions,[3] all of which were subject to reserve requirements. During this period there were changes in the structure of the market. In particular, there was a merger between two banks present in the Uruguayan banking system, and an acquisition of one bank by a foreign bank (not present in the country until that moment). Both cases were treated as if they were present from the beginning of the period (in order to avoid losing the observations associated to the banks that disappeared), which means that the final number of banks under analysis is 18.

The Uruguayan Economy in 2008

Monetary policy

After the financial and sovereign crisis that Uruguay suffered following the default of Argentina, in 2002, the Central Bank of Uruguay adopted a monetary regime with an inflation target operationalized by using

[2] Appendix Table A1 provides a more detailed description of all variables.

[3] There is another public bank in the Uruguayan banking system, but it has been excluded from the sample since its main line of business are mortgages to households (while our focus is on loans granted to private firms) and it has experienced several restructures and recapitalizations.

a monetary aggregate, the average monetary base. In July 2007, the Central Bank of Uruguay started to gradually implement the management of the interest rate as the main monetary policy instrument. As a result, monetary policy guidelines changed in response to the behavior observed in the inflation rate in 2007, which registered levels above the upper limit of the target range (see Figure 1). The factors behind this evolution were related to costs rather than demand, in particular, increases in the international prices of agricultural commodities and oil. However, inflationary pressures of domestic origin, such as increases in wage costs and the greater dynamism of private demand, were also playing a role. Under these circumstances, the Central Bank of Uruguay started to use the interest rate (call rate on overnight interbank loans) as the main monetary policy instrument. Initially, the call rate range was defined between 4% and 6%, but due to the persistence of inflationary pressures in the economy successive upward adjustments were decided.

Financial system

As metioned before, the Uruguayan financial system was composed of 2 public banks, 12 private commercial banks and 6 non-bank financial institutions. Some of the main characteristics of the system are given by a significant degree of dollarization, a high proportion of short term deposits over total deposits and sound levels of solvency and liquidity indicators. The 2008 dollarization rate was around 80% for deposits and 56% for loans, lower than the levels displayed before the 2002 crisis which were above 90% and 60% respectively.

Reserve requirements

The Uruguayan prudential banking regulation dates back at least to 1865, when a type of capital requirement was introduced. In the following decades, some other forms of regulation, including reserve requirements, were introduced as well. The big piece of banking legislation, called the "General Banking Law", was passed in 1938 to pursue the financial stability and safety of the banking system through three pillars: the requirement of a minimum level of capital, a minimum requirement for the relationship between capital and reserves, and a liquidity requirement.

The later regulation on reserve requirements continued adapting the instrument to the reality of the financial system in each period. As a result, the current reserve requirements vary according to both maturity and currency of the liabilities in order to contemplate the dollarization of the Uruguayan financial system and the diverse stability that deposits of different maturities display.

Policy change

Although the negative impact of the financial crisis in 2008 led to a downwards revision of the projections about the performance of the developed economies, the growth figures for the emerging economies remained solid (see Figure 2). Instead, the main concerns for these economies were the inflationary

pressures originated mainly by the higher prices of the commodities, context to which Uruguay was no stranger: the accumulated inflation rate for the year 2007 reached 8.50%. An important driver of this situation were capital inflows, as Figure 3 shows: the capital account was around four times higher in 2008 when compared to 2006. Under these conditions, the Uruguayan monetary authority introduced changes in the regulation of reserve requirements in order to reduce the amount of money in circulation.

We focus on the effects of the increase in the reserve requirements introduced in Uruguay in June 2008 but announced one month earlier, the 6th of May 2008. It can be summarized in three main changes: an increase in the reserve requirements for short-term liabilities from residents, an increase in the reserve requirements for liabilities from non-residents, and the *introduction* of a reserve requirement for liabilities from foreign banks. In particular, reserve requirements for (short-term) liabilities from residents increased from 17% to 25% if denominated in local currency (Uruguayan pesos), while they increased from 25% to 35% for liabilities denominated in foreign currency (mainly US dollars and Argentinean pesos). Liabilities from non-residents suffered an increase of reserve requirements from 30% to 35%. More importantly, before the reform, liabilities from other financial institutions (domestic or foreign) were *not* subject to a reserve requirement. After the reform, liabilities from foreign financial institutions were subject to a reserve requirement of 35%.[4] Liabilities from domestic financial institutions, however, continued to be exempt from reserve requirements. Hence, the different degrees of exposition of banks to these three sources of funding determines the *intensity* of the impact of the policy changes.

Reserve requirements in Uruguay have to be constituted of cash and deposits at the central bank. For the requirements for liabilities coming from non-residents—both financial and non-financial companies—the targeted funds were net of exposures to foreign sovereigns. Until June 2008, term deposits at the central bank that were kept to satisfy the reserve requirements were remunerated[5]. However, this remuneration dropped to zero at the same time that reserve requirements were increased.

This change in reserve requirements was the first one since the beginning of 2004, as Uruguay did not actively used this policy tool until that moment (Federico et al., 2014).[6] Moreover, as the requirements vary by maturity and currency, and are applied to all types of liabilities,[7] this policy is very related to the new liquidity standards proposed in Basel III, especially the "Liquidity Coverage Ratio":[8] this Basel III liquidity requirement is intended to ensure that a bank can withstand a situation of funding distress during 30 days, and hence requires banks to hold liquid assets for those liabilities that are more

[4]The changes were introduced through the following acts of the Central Bank of Uruguay: "Circular 1991", "Circular 1992".

[5]The rate offered to term deposits at the central bank denominated in pesos was 4%, which is half of the inflation rate at that time; if the deposit was denominated in a foreign currency, the rate depended on the policy rate of the currency's country.

[6]We report all reserve requirement changes in Appendix Table A2.

[7]Except borrowings from other domestic financial institutions.

[8]The two standards have also some important differences: for instance, retail demand deposits are considered to be more stable than wholesale deposits in the LCR, while borrowings from other domestic banks are not subject to reserve requirements in Uruguay.

prone to run (i.e., short-term).

Banks significantly increased reserves as a result, as Figure 4 shows. The average reserves at the BCU increased by around 60% after the policy.[9] Figure 4 also shows the split between demand and term deposits at the BCU: there is a sharp increase in demand deposits, as the central bank stopped paying interest on term deposits. This reinforces the importance of understanding the credit supply effects of such policy, as banks clearly rebalanced their portfolio as a result.

3 Empirical strategy and results

Policy variable

We build our policy variable of interest by taking into account the change in the reserve requirements for local and foreign currency liabilities, liabilities from foreign non-financial sector and liabilities from foreign financial sector. We multiply the increase in reserve requirements by each source of funding (as of April 2008, before the announcement of the reform): 8% for short-term liabilities in local currency from residents, 10% for short-term liabilities in foreign currency from residents, 5% for liabilities from non-financial non-residents, and 35% for liabilities from non-resident banks. We sum up the four increases and divide them by total liabilities to construct our independent variable of interest.

$$RR_b = \frac{\Delta ReserveRequirements_b}{TotalLiabilities_b}$$

We use the change in reserve requirement—instead of a measure taking into account the actual level of reserves of the banks—because the amount of reserves above the minimum (i.e., the reserve buffer) is an endogenous decision that takes into account the requirement as well as the ability of the bank to easily raise reserves.[10] Since the cost of breaching the minimum is substantial—from a reputational and potential supervisory intervention perspective—banks target buffers rather than actual reserves. Moreover, if banks do not adjust their asset composition after the reform and instead use their buffers, it is unlikely that we find any significant results on credit supply.

Until June 2008, term deposits at the central bank that were kept to satisfy the reserve requirements were remunerated[11]. However, this remuneration dropped to zero after the policy change. Therefore, there was another policy shock at the same time. Although both shocks need not be related—one refers to the increase in reserve requirements and the other to the mix of demand and term deposits at the central bank to satisfy those requirements—we control for this change as well. Since only term deposits

[9] The same evolution is present if the reserves are normalized by total assets

[10] As in Martinez-Miera and Suarez (2012) with capital requirements

[11] The rate offered to term deposits at the central bank denominated in pesos was 4%, which is half of the inflation rate at that time; if the deposit was denominated in a foreign currency, the rate depended on the policy rate of the currency's country.

at the central bank were remunerated, banks with a higher proportion of term deposits (with respect to the reserve requirements) suffered a stronger drop in interest income. Therefore, we construct the following variable for each bank to control for this effect: $Remuneration_b \equiv \frac{Termdepositsat CB_b}{TotalReserveRequirements_b}$.

Summary statistics

The dependent variable of interest is the change in credit to firms during the reform. In particular, we use the change in (the log of) credit committed by bank b to firm f between April and July 2008. In other words:

$$\Delta logL_{bf} = logL_{bf,June} - logL_{bf,April}$$

where

$$logL_{bf} = log(Loan_{bf})$$

We remove the 1st and 99th percentiles to reduce the noise of extreme observations. Summary statistics for this variable, as well as for the policy variables, the bank controls that we use (Size, Solvency Ratio, Liquidity Ratio), and loan controls can be seen in Table 1.

On average, credit decreased during this period around 1.8%. However, the median value in terms of change in credit is at around -0.05%, which is negligible. Therefore, the distribution is skewed to the left, with several loans suffering a significant decrease. One way to see this is to compare the 25th percentile (a drop of 11%) and the 75th percentile (an increase of 2%). As mentioned before, we remove the extremes to make sure that the results are not driven by outliers.

We can also see the size of a typical loan, which is of $922,000 (median). There are very large loans in our sample, as one can see that the mean loan is above the 75th percentile. These loans, however, can only bias the results to the extend that they suffer sharp changes in volume, which is taken care of by removing the extremes of the dependent variable. Nevertheless, the results are robust to removing the top (99th percentile) loans.

The average impact of the increase in reserve requirements is 7.5% of total liabilities, which indicates the importance of this policy change. There is some heterogeneity in the impact, ranging from 4.7% to 14.8%. All banks are hence significantly affected, although the impact for some is three times larger than for others.

Figure 5 plots the evolution of aggregate bank credit to non-financial corporations during the year of study, 2008. After a period of strong credit growth, the trend flattens in June, when the reserve

requirements reform came into effect. This provides some suggesting evidence that the change in reserve requirements had an impact on credit supply, but one needs disaggregated data to properly identify such effect. This is what we do in the next section.

We test different empirical models throughout this section, but we highlight here the basis of the estimations. We estimate the following model:

$$\Delta logL_{bf} = \beta RR_b + \alpha_f + \theta Y_b + \delta Z_{bf} + \epsilon_{bf} \tag{1}$$

As explained before, the change in (the log of) committed credit from bank b to borrower f from April to July 2008 is the dependent variable. We choose April—instead of May, since it was not until June when the reform was introduced—to alleviate any endogeneity issues coming from the banks' reaction to the announcement of the reform.

Following a difference-in-differences approach, we compare lending for the same firm before (April, 2008) and after (July, 2008) the policy change among banks that are differently affected by the changes in the reserve requirements. One key aspect of the identification strategy is the focus on firms with more than one bank relationship; by analyzing the change in committed lending for the same firm, we proxy for credit demand by using firm fixed effects (Khwaja and Mian (2008)) and hence focus on credit supply. In addition, we analyze whether the effects of the policy changes were different across different firm and bank characteristics.

3.1 Intensive margin

Before introducing borrower fixed effects, however, we start the empirical analysis by estimating the following model, controlling for credit demand by using observable firm characteristics:

$$\Delta logL_{bf} = \beta RR_b + \eta X_f + \theta Y_b + \delta Z_{bf} + \epsilon_{bf} \tag{2}$$

Where $logL_{bf}$ is the change in committed credit from bank b to borrower f between April and July 2008. The coefficient of interest is β, which corresponds to the policy variable, the change in reserve requirements (as % of total liabilities), RR_b. X_f are firm characteristics (in April 2008), which include industry dummies; Z_{bf} are loan-level variables, which include the credit rating set by the bank, information about the level of indebtedness of the firm, the collateral ratio, and the currency of the loan (local or foreign). Y_b includes bank-level characteristics, such as size, solvency, liquidity, and the amount of deposits affected by the change in reserves remuneration.

The results can be seen in Table 2. Column 1 includes only firm- and loan-level controls and the policy shock variable. The coefficient on the policy variable is negative and significant, meaning that a

higher impact of the reserve requirement reform is associated to a higher drop in credit. The coefficient remains similar in Column 2, where we include the mentioned bank-level variables. Bigger banks tend to increase lending as compared to smaller banks. Interestingly, banks more affected by the change in the remuneration of central bank deposits decrease lending, hence reinforcing the effect of our main policy variable, the change in reserve requirements.

Since there were moments of important financial global turmoil during this period—the rescue of Bear Stearns occurred in March, two months before announcing the change in reserve requirements—we include in Column 3 the variable $ForeignAssets$ to control for the amount of foreign investment made by banks. The coefficient of interest remains negative and significant. Regarding the loan-level variables, the coefficients for Ratings 3 and 4 are negative and significant in all regressions. This suggests that when the rating set up by one bank to a particular borrower is 3 or 4—which are riskier ratings than Rating 1, the 'reference' (i.e. omitted dummy) rating—the credit to this firm is more likely to decrease.

A concern from these results is that the coefficient on our policy variable is driven by some unobserved bank characteristics that are correlated with the impact of the change in reserve requirements. A way to alleviate this concern is to run "placebo tests", thus regressing the same specification for the period before (from January to April 2008) and after the policy was introduced (from July to October 2008). This is what we do in columns 4 and 5. We do not observe any significant effect of the change in reserve requirements on lending for these periods.

Even when controlling for firm characteristics, the concern remains that firms borrowing from banks more affected by the policy shock are fundamentally different than firms borrowing from less affected ones, and hence the coefficient could be driven, in the previous specification, by credit demand rather than credit supply. This is especially important when the change in reserve requirements disproportionately affects some type of liabilities (for instance, liabilities from foreign financial institutions). Failure to properly control for credit demand, hence, can bias the results. As discussed before, we make use of firm fixed effects to compare the evolution of committed credit to the same firm between April and July 2008, in order to remove the potential demand bias. In particular, we estimate the model (1) specified earlier in Table 3.

Note that this specification restricts the sample to those firms borrowing from two or more banks. This happens because the fixed effect fully explains the dependent variable if there is only one observation for a particular borrower. Hence, the number of observations drops significantly; still, this credit represents 75% of the total credit in our dataset.

Column 1 show the results controlling only by the change in reserve requirements. In column 2, we

add loan-level variables, and in column 3 we add the rest of the bank controls. Our coefficient of interest is more than twice the one found in Table 2, reinforcing the importance of controlling for credit demand. In terms of economic significance, the result in column 3 (-0.596) indicates that a one standard deviation increase in reserve requirements (i.e., 2 percentage points) translates into a 1.2 percentage point decrease in committed credit. To compare it with the actual change in credit, the mean change in credit in this period was a 1.77% decrease.

Interestingly, the introduction of firm fixed effects makes the rest of the bank controls lose their significance, except for the impact of the end of remuneration, which is still negative and significant. This shows the importance of controlling for credit demand, and remarks the importance of the policy change for credit supply.

As previously discussed, the variables regarding borrower credit ratings are set by each bank individually at loan level. This implies that two banks can set different credit ratings for the same borrower at the same time, since these variables reflect their own exposure to it.[12] Therefore, the interpretation of the coefficients of Ratings is slightly different with firm FE: it shows the different lending to the same firm if two banks are setting different ratings to the borrower. The coefficients in the rating 4 and 5 variables suggest that banks on average reduce lending to riskier firms.

As before, we replicate the specification, this case the one in column 3, for the periods before (January to April, column (4)) and after (July to October, column (5)). We do not find any significant result for our policy variable.

We subject the results to a number of robustness checks. The results are robust to dropping the public bank from the sample, since it could have a different behavior and has an important share of the market; we also control for whether the bank is a branch or not; we also drop from the sample the biggest loans; the main results do not change: banks more affected by the change in reserve requirements reduce credit supply as compared to other (less-affected) banks.

Summing up, we have shown that banks that suffer a higher reserve requirements increase lend less to firms. The economic significance of this decrease is important: a 10 percentage points increase in reserve requirements imply a 6 percentage points lower credit change.

Funding from non-residents

The most important—and possibly unexpected—part of the reform is the introduction of reserve requirements of 35% to all foreign bank funding. In fact, the first announcement made the 6th of May

[12]This situation—two banks assigning a different rating to the same firm—happens for almost half of the sample.

2008 ('Circular 1991') continued to exclude foreign bank funding from the requirements, and it was not until ten days later when the Central Bank of Uruguay amended this part by including also foreign bank funding ('Circular 1992').[13] Moreover, it is precisely this part of the requirement, as part of the requirements on foreign funding, that is of most interest to combat the potential adverse effects of using the short-term rate to conduct monetary policy in emerging economies. For these reasons we replicate some of the previous regressions splitting the change in reserve requirements by the part due to funding from residents and the part due to funding from non-residents. The results can be seen in Table 4.

In column 1, we show the results without using firm FE; in a similar fashion as in Table 2, column 2. Columns 2 to 4 replicate columns 1 to 3 in Table 3. The results show that the effect is negative for the two parts of the change, but only the change in reserve requirements due to non-resident funding appears to be significant. Therefore, the negative effect from the increase in reserve requirements is mainly driven precisely by this part. We also run a Placebo test for the specification in column 3—important given the turmoil in the international financial markets at that time—and find no significant effects before or after the period of the policy (columns 5 and 6). This has important implications from a macro-prudential perspective, which we discuss in the final section.

Heterogenous Effects

The results obtained so far show that banks that suffered a higher change in reserve requirements reduce on average lending (to the same firm) by more. We look now at whether these results differ across different firm / loan and bank characteristics. In order to do so, we start by estimating the following model to capture potential firm and loan heterogeneity in the effects of reserve requirements on credit supply:

$$\Delta logL_{bf} = \beta RR_b + \gamma RR_b Z_{bf} + \alpha_f + \theta Y_b + \delta Z_{bf} + \epsilon_{bf} \tag{3}$$

Where now we have two coefficient of interest: β—as before—and γ, the coefficient of the interaction between the policy change and firm / loan characteristics; in particular, we want to know whether the reduction in credit supply driven by the increase in reserve requirements depends also on the riskiness and the number of banking relations of the borrower. Several banking models (Cordella et al. (2014)) suggest that increases in funding costs by banks may cause a risk-shifting behavior in order to compensate for the decrease in income. If that is the case, then the effect of the policy change would be less important—or even positive—for riskier borrowers.

We present the results from estimating model 3—using heterogeneity in ratings—in Table 5, columns 1 to 3. Column 1 presents the results with the policy variable interacted with each rating dummy. The level effect of the policy variable, now corresponding to the "base" rating, rating 1 (the safest), is even

[13]The other amendment in 'Circular 1992' referred to the maturity of the liabilities from non-residents subject to the requirement, which went from below 181 days to include all of them.

more negative and significant than before. The interactions with the dummies for ratings 2, 3, and 4 do not reveal any differentiated behavior; nevertheless, the interaction with the dummy for the rating 5 is positive and significant. This suggests that banks more affected by the change in reserve requirements reduce lending by less to the riskiest firms, as compared to safer borrowers. In column 2 we show the results only focusing in this interaction, and we find the same effects. In column 3 we introduce the interaction of the rating 5 dummy with the rest of the bank-level variables, but the results suggest the same. More affected banks seem to shift their lending portfolio towards riskier firms.

Given that we are capturing an effect that is firm-bank varying, we can further saturate the specification by using bank fixed effects. This way we capture any observed and unobserved heterogeneity at bank level. The results are shown in columns 4 and 5. We still find a positive coefficient for the interaction between our policy variable and the rating 5 dummy.

Another interpretation of this result could exist if banks had substantial discretion when setting ratings to borrowers; this is because the heterogeneity in ratings also reflect different ratings given by different banks to the same borrower. In order to rule out that differences when setting ratings are driving the results, we restrict the sample to firms that obtain the same rating from all banks whom they are borrowing from. We find the exact same result, which can be seen in column 6. Even when restricting the attention to firms for which there is no disagreement in terms of credit quality, we still find that more affected banks shift towards riskier firms as a response to the increase in reserve requirements.

Firms also differ in the number of banking relations that they have. Banks lending to firms with few banking relations might be able to extract rents from the lending relation due to the reduced competition (Montoriol-Garriga (2007)). We analyze whether the credit supply reaction differs along this dimension in Table 6. In column 1, we include an interaction of our policy variable with a dummy variable that equals 1 if the borrower has only two lending relations, and zero otherwise. The coefficient is positive but not significant. Things change when, in column 2, we use a dummy that captures firms with two or three banking relations. The coefficient for our policy variable more than doubles, suggesting that, for firms with more than three bank relations, the reduction in credit supply is substantial. Interestingly, the interaction with the new dummy is positive and significant. Hence, this suggests that more affected banks shift their lending towards firms with fewer banking relations.

We explore this result further in columns 3 to 6 by changing the sample based on the number of bank relations. In column 3, we focus on firms with only one banking relation. We cannot control for firm FE in this case, as we only have one observation per firm, by definition. Nevertheless, it is interesting to observe that the negative coefficient of the policy variable is not significant. Column 4 focus on firms with more than one relation, which is the same specification as in table 3, column 3. Columns 5

and 6 restrict the sample to firms with more than two and three banking relations, respectively. The coefficient on the policy variable monotonically increases, suggesting that the credit supply reduction by more affected banks is more acute for firms with several banking relations.

We also estimate whether the credit supply reaction depends on the currency of the loan (not reported). Note that the change in reserve requirements had different intensities depending on the currency—and origin—of the liabilities, but it was indifferent on the currency of the assets, in this case credit. Nevertheless, since reserve requirements have to be met with the currency that matches the targeted liabilities, there could be a more pronounced credit supply reduction for loans denominated in foreign currency. However, we do not find any significant differential effect.

Our next step is to understand how bank characteristics can influence the effect of reserve requirements on credit. Some bank characteristics may alleviate the negative impact of reserve requirements on credit shown in previous tables. In particular, bigger banks might be able to accommodate the increase in reserve requirements by shifting more easily to cheaper sources of financing. In order to test our hypotheses, we construct dummies to identify the top banks in the previous variables (similar to the approach to test loan and firm heterogeneity). We create a dummy to identify those banks above the 75th percentile in terms of size in April 2008.[14] For solvency and liquidity, we choose the median in April 2008 as our threshold: the dummies equal 1 for banks above the median in terms of the solvency ratio and the liquid assets ratio, respectively. Each of the dummies roughly splits the sample of loans in half.

Therefore, the model that we estimate is the following:

$$\Delta logL_{bf} = \beta RR_b + \gamma RR_b Y_b + \theta Y_b + \alpha_f + \delta Z_{bf} + \epsilon_{bf} \tag{4}$$

where Z_b is the corresponding dummy for bigger, more solvent, or more liquid banks.

The results can be seen in Table 7.[15] Column 1 shows that bigger banks are able to compensate the impact of reserve requirements on credit: for a given level of reserve requirements increase, bigger banks increase credit supply by more (or decrease it by less) than smaller banks do. In Column 3 we repeat the same exercise with the solvency ratio, obtaining the opposite result: more solvent banks reduce lending by more relative to less solvent banks. This result could reflect differences in risk appetite captured by bank solvency; however, we repeat the regression using $Capital/Assets$ as the solvency variable and obtain no significant results for the interaction (not reported). We also observe, in column 3, that more

[14] We choose the 75th percentile because the distribution of banks' loans is very skewed to the right, and choosing a different threshold (the median, for instance) would imply that almost all observations in the credit register belong to banks labeled as 'big'.

[15] All regressions include the variable Remuneration_b as well as its corresponding interaction, to make sure that we are properly capturing the impact of reserve requirements.

liquid banks seem to compensate for the impact of the change in reserve requirements, but the result disappears once we include all the interactions in column 4.[16]

The results hence suggest that the impact of reserve requirements on credit supply is negative on average but presents big differences depending on loan (rating), firm and bank characteristics. In particular, more affected banks seem to shift lending towards (ex ante) riskier exposures and borrowers with fewer banking relations, while bigger and less solvent banks appear to be less affected by the increase in reserve requirements. This suggests that the effectiveness of reserve requirements as a macro-prudential tool to curb the credit cycle can have unintended consequences in terms of risk-shifting, and at the same time it can be diminished by the biggest financial institutions.

3.2 Extensive Margin

So far we have focused on lending relations between banks and borrowers that have continued from April to July 2008. However, a potential effect of a credit supply reduction is the end of some loan relations. Therefore, we extend our analysis to understand whether higher reserve requirements can make a lending relationship less likely to continue. In order to do so, we estimate a regression very similar to model 1:

$$DEnd_{bf} = \beta RR_b + \alpha_f + \theta Y_b + \epsilon_{bf} \tag{5}$$

where $DEnd_{bf}$ is a dummy variable that equals 1 if an existing loan relationship in April 2008 has disappeared in July 2008, and 0 otherwise.

The results can be seen in Table 8. Columns 1 does not include fixed effects and studies the whole sample (i.e., not restricting the analysis to firms with two or more loans in April 2008). The coefficient on the main policy variable is positive and significant: more affected banks are more likely to terminate a loan relationship between April and July 2008. In column 2 we introduce firm fixed effects show that, without controlling for other bank characteristics, more effected banks are more likely to terminate a lending relationship. We introduce bank controls in column 3, and in column 4 we further control for loan characteristics: the coefficient in column 4, for instance, shows that a bank that has an increase of reserve requirements of 10 percentage points (with respect to its liabilities) has a 2 percentage points higher likelihood of terminating a lending relationship. This compares to the average probability of lending relation termination of 8.3% during this same period.

In column 5 we introduce a variable to control for the importance of the particular loan in the asset portfolio of the bank: $Credit_{bf}/TA_b$. Banks may be less willing to terminate a loan relationship if the loan represents a big part of their portfolio. This issue is partially controlled with the high debt

[16] Given the turmoil in the international financial markets at that time, we also study whether the reserve requirements have a different impact on credit if the bank is a subsidiary, but we do not observe any significant difference.

dummy, but only for the biggest loans. The coefficient on this variable is negative, as expected, but not significant (the p-value is 15%). Nevertheless, the coefficient on our main policy variable does not change.

Given the results found in Table 5, we analyze whether the likelihood of terminating a loan relationship due to the increase in reserve requirements depends on the rating of the loan. We hence introduce the interactions between the main policy variable and the ratings dummies as before. The results are shown in column 6. As before, the negative effect of reserve requirements on credit supply (now on the extensive margin) is mitigated for loans with a worse credit rating. We also observe that more affected banks are more likely to terminate loan relationships with Rating 3 loans. We can confirm these results by saturating the specification with bank fixed effects to control for bank heterogeneity. This is what we do in column 7. The heterogeneous results for loan characteristics remain the same.

Columns 8 and 9 present the results from running the same specification as in column 4 for the period before (January to April) and after (July to October) the policy reform. Again, we do not find any significant result.

We have shown that banks more affected by the increase in reserve requirements not only reduce the amount of credit to borrowers, but also increase the probability of finishing a lending relationship. This result is robust to controlling for credit demand, introducing other bank controls, and even controlling for the importance of the loan in the asset portfolio of the bank. Moreover, the likelihood of terminating the lending relationship due to the policy change varies with the credit rating of the loan: riskiest (rating 5) loans are less likely to be terminated by more affected banks.

We subject the results of the intensive and extensive margin to a number of robustness checks. As shown in tables 2, 3, 4, and 8, we run placebo tests for the periods outside the policy change for the main results. Moreover, Appendix Table A3 shows the main regressions in tables 2, 3, and 8 for a number of variations. Columns 1 to 3 show the results using different clustering of the standard errors: instead of clustering at bank-industry level, these are clustered at bank level. Columns 4 to 6 show the results constructing the policy variable based on the liability structure of January 2008, instead of April. This is shown to alleviate any concerns about anticipation of the reform. Columns 7 to 9 show the results normalizing the policy variable by total assets instead of total liabilities. In all these cases, the results are shown to be robust.

3.3 Firm-Level Analysis

Even if credit supply decreases, however, firms may be able to substitute it by going to another bank. This point is key in order to understand how reserve requirements can dampen the credit cycle. Firms could also use other forms of financing (bonds, for instance), but in the case of Uruguay, with less devel-

oped capital markets, this possibility is less likely. We then study whether firms borrowing from banks more affected by the reform are able to compensate the reduction in credit supply by obtaining bank credit from another institution. In order to do so, we study how lending from all banks has evolved at firm level; i.e., we study the following variable: $\Delta logL_f = logL_f - logL_f$.

We transform the original bank-level variables, including the policy change, into firm-level variables. We do so by computing a weighted average of those variables for each firm, where the weights is determined by the proportion of credit obtained from each bank in April 2008. Therefore, the variable of interest is:

$$RR_f = \sum_b \frac{L_{bf}}{L_f} RR_b$$

We estimate a very similar model that we have used so far, but with all variables at firm-level, although we cannot introduce firm fixed effects. The results are shown in Table 9. Column 1 shows the regression of the change in (log of) credit experienced by each firm with the bank-level controls as firm-level weighted averages. Firms borrowing more from banks more affected by the change in reserve requirements suffer a larger drop in total credit. The coefficient is not only statistically significant but also economically relevant: a 10 percentage points increase in reserve requirements (as % of total liabilities) is associated to a 2.7 percentage points decrease in lending for the firm. We also see that firms borrowing from banks more affected by the change in central bank deposit remuneration also experience a decrease in credit, consistent with the results found in the intensive margin. However, firms borrowing from bigger, less solvent, and more liquid banks experience an increase in total bank credit.

We saw in Table 5 that the negative effect of reserve requirements on credit supply was less important for riskier firms; in other words, more affected banks reduce credit supply less to loans that have a rating 5. In column 2 we introduce a dummy variable, Rating5_f, that equals 1 if the weighted average rating of the firm in April 2008 if greater or equal to 4.5, and 0 otherwise. A weighted average rating above 4.5 implies that most of the credit of the firm is rated as the riskiest type. Similar to Table 5, we introduce an interaction between the main policy variable and the Rating 5 dummy. The coefficient on the change in reserve requirements is now almost doubled, indicating that non-rating-5 firms suffer a larger drop in credit when borrowing from banks more affected by the policy change. The coefficient on the interaction, however, is positive and significant: the previous effect is less important for Rating 5 firms. The risk-shifting behavior, hence, has real effects. This result is particularly important because one could think that since better-rated firms suffer a stronger credit crunch, they could manage to shift to other banks. Yet this is not the case, as our results show.

Results in column 2 show the differentiated effect for Rating 5 firms with respect to other firms. Nev-

ertheless, from a macro-prudential point of view, it is also important to know whether Rating 5 firms borrowing from more affected banks increase total bank credit, and not only in relation to less risky firms. In columns 3 and 4 we repeat the same regression from column 1 but splitting the sample: column 3 shows the results for non-Rating 5 firms, while column 4 shows the results for Rating 5 firms.

The coefficient of the main policy variable in column 3 suggests an even higher negative impact of reserve requirements on credit. In particular, a non-Rating 5 firm borrowing from banks that have a 10 percentage points increase in reserve requirements (as % of total liabilities) suffers a contraction in total credit of 6.1 percentage points. This result is consistent with what we see in column 2 (the two coefficients are not statistically different). The result in column 4, however, suggests that this effect is much smaller for a Rating 5 firm: in the same situation, a Rating 5 firm suffers a decrease in total credit of only 0.7 percentage points, one order of magnitude smaller in absolute value. Nevertheless, the coefficient is still negative, which suggests that Rating 5 firms also suffer a total credit contraction as result of the increase in reserve requirements, albeit a much smaller one.

Since we cannot control for firm fixed effects in these specifications, we estimate the same specification as in column 1 for the period of January to April (column 5) and the period of July to October 2008 (column 6) as placebo tests. These placebo tests show that firms borrowing from more affected banks do not have a differential total bank credit evolution during the period before the policy change and the period after.

We have shown that the increase in reserve requirements caused firms borrowing from more affected banks to suffer a bigger reduction in total bank credit. Therefore, the reduction in credit supply was binding at firm-level, with potential consequences for hiring and investment decisions.

3.4 Pricing analysis - loan rates

We further analyze whether the increase in reserve requirements is associated to increases in loan rates. As noted above, we do not have data on actual rates from the credit register. We obtain aggregated data on the average loan rates that individual banks apply to three different sectors (agriculture, industry, and services). We estimate the following model:

$$\Delta RL_{bi} = \beta RR_b + \gamma_i + \theta Y_b + \epsilon_{bi} \tag{6}$$

Where ΔRL_{bi} is the three-month change of loan rates applied by bank b to industry i in local currency. Our coefficient of interest is, as before, β. We introduce industry dummies. Note that we only have 34 observations, since loan rates for some banks are missing. Results are displayed in Table 10. The coefficient of the policy variable, β_1, is positive throughout the specifications, but it is never statistically

significant. Nevertheless, we would not conclude that more affected banks do not adjust their loan pricing given the lack of granular data on loan rates.

3.5 Funding

So far we have focused on how banks adjusted their asset side—i.e., credit supply. However, the regulatory change also altered the relative prices of different sources of funding. The most affected source was the funding from foreign banks, since the reserve requirement increased from 0% to 35%. Therefore, banks may have changed their funding structure as a result of the policy shock. While we have mentioned that the increase in reserve requirements was done due to inflationary pressures, from a macro-prudential perspective one should also monitor whether banks become very dependent of some (not subject to reserve requirements) sources of funding. In the case of Uruguay, these are long-term funding from residents and the domestic interbank market.

Nevertheless, to the extend that the Modigliani-Miller theorem does not (perfectly) hold, one should not expect a big change in funding sources. If banks could immediately adjust, then there would be no effect on credit supply. More importantly, banks that are particularly biased towards a particular (affected) source of funding may find it very costly to change it.

In order to study this issue, we compare the evolution of the different funding categories from January to April and from April to July (the policy shock). We compare the percentage change in these funding categories for the median bank, so that our results are not driven by extremes. The different changes can be seen in Figure 6.

The figure shows that, for the median bank, the only category of liabilities that decreases is the funding from foreign banks, precisely the most targeted source of funding by reserve requirements. This decrease is not seen in the first part of the year—from January to April. On the opposite side we find short-term funding from residents (STLC and STFC), which barely change from their pre-policy trend, and funding not subject to reserve requirements (NonRR), which increases almost 5%. Moreover, funding sources not subject to reserve requirements (fifth category) increase by 5%. As a result, banks become more exposed to the domestic interbank market, increasing interlinkages and the possibility of spillovers (Allen and Gale (2000)).

4 Conclusions

Although the use of reserve requirements as macroprudential tools has been very popular in Latin American economies, there is little evidence about the impact of these policies. In this paper, we study the role of reserve requirements as macroprudential tools. In particular, we analyze the effects of the increase

in the reserve requirements for different sources of funding on the average supply of credit and on the risk-taking behavior of banks.

Uruguay offers an excellent setting to study these effects given the changes introduced in the regulation regarding reserve requirements in June 2008 and the comprehensive datasets we have access to. We use a difference-in-differences approach comparing lending before and after the introduction of the policy changes among banks with different degrees of exposition to the funds targeted by the policies.

The results on the intensive margin suggest that the main assumptions of the bank lending channel of monetary policy hold: Modigliani and Miller propositions are not satisfied for banks. In particular, increases in reserve requirements for different sources of funding (short-term funding from residents, funds from the foreign non-financial sector and funds from foreign banks) have an impact on non-financial firms through changes in banks' lending behavior. That is, restrictions to short-term funding imply a reduction on the supply of loans. In addition, we find that more affected banks increase their exposure to riskier firms and firms with fewer banking relations, while larger and less solvent banks are more capable of mitigating the effects of the lending channel.

These policies may also have real costs for corporate firms. When we analyze the effects of the higher reserve requirements at the firm level, we find that, on average, firms were not able to insulate from the negative impact of the policy changes. This is a relevant conclusion for an economy like Uruguay, where the development of the capital market is in a very early stage and, as a consequence, bank financing plays a key role in the investment decisions of firms.

The results of this study entail policy implications for macroprudential regulation. Although restrictions to short-term funding by banks may contribute to prevent threats that can later translate into risk propagation among the banking system, the strong reliance of banks on these type of funds plays an important role on the lending behavior of these institutions. As a consequence, the new liquidity standards proposed by Basel III, which are not far from the reserve requirements in Uruguay, may have a cost in terms of credit availability, as suggested by Diamond and Rajan (2001) and Calomiris and Kahn (1991).

Nevertheless, we have shown the effectiveness of reserve requirements as a macro-prudential tool to dampen the credit cycle, especially for the part coming from the global credit cycle. While our results show that reserve requirements are effective on average, they also raise two main issues. First, banks shift credit towards riskier firms: this raises concerns regarding the potential thread to financial stability that this shift represents. From the point of view of a macro-prudential regulator, a careful calibration would be necessary to make sure that the benefits of a decrease in credit growth are higher than the costs

in terms higher risk-taking. The second concern is the fact that big banks are able to compensate the impact of reserve requirements: since those are typically the banks that provide more credit to the real sector, the effectiveness of reserve requirements to control the credit cycle could be lower than suggested by our results.

5 Tables and Figures

Table 1:
Summary statistics

Panel A: Dependent variable						
	Mean	St. Dev.	P25	Median	P75	Obs.
$\Delta logL_{bf}$	-0.0177	0.3493	-0.1087	-0.0005	0.0215	32,004
Credit_{bf} April 08	12,100	90,393	401	922	2,740	35,596
Credit_{bf} July 08	12,339	91,044	416	953	2805	36,143
Panel B: Bank variables in April 2008						
	Mean	St. Dev.	P25	Median	P75	Obs.
RR_b	0.075	0.023	0.059	0.07	0.08	18
Size_b	3.597	1.339	2.665	3.503	4.034	18
Solvency ratio_b	0.298	0.249	0.118	0.191	0.405	18
Liquidity ratio_b (%)	18.13	12.17	10.45	13.58	24.43	18
Remuneration_b	0.075	0.023	0.059	0.070	0.080	18
Panel C: Loan variables in April 2008						
	Mean	St. Dev.	P25	Median	P75	Obs.
Collateral ratio_{bf}	0.23	0.24	0.00	0.20	0.50	32,652
Dummy foreign currency_{bf}	0.68	0.47	0	1	1	32,652
Dummy high debt_{bf}	0.02	0.12	0	0	0	32,652
Panel D: Ratings in April 2008 (frequencies)						
	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5	Obs.
Rating_{bf}	43.64%	15.45%	6.10%	6.07%	28.73%	32,652

This table reports the summary statistics of the variables used in the paper. $\Delta logL_{bf}$ is the difference in the logarithm of credit received by borrower f from bank b between April and July 2008. Credit_{bf} is the total credit received by borrower b from bank b, expressed in $ thousands. RR_b is the increase in reserve requirements for bank b over total liabilities. $\text{Size}_b$is the logarithm of total assets of bank b. Solvency ratio_b is the regulatory capital over risk-weighted assets held by bank b. Liquidity ratio_b is the ratio of liquid assets over total assets of bank b. Remuneration_b is the share of term deposits at the central bank over reserve requirements for bank b. All variables are computed in their April 2008 value. Detailed variable definitions are provided in Appendix Table A1.

Table 2:
Impact of Reserve Requirements on Credit

	(1)	(2)	(3)	(4)	(5)
RR_b	-0.304***	-0.266***	-0.227*	0.071	-0.210
	(0.084)	(0.099)	(0.115)	(0.189)	(0.201)
$Rating2_{bf}$	0.001	-0.003	-0.003	-0.013**	0.001
	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)
$Rating3_{bf}$	-0.032***	-0.031***	-0.034***	-0.023**	-0.019**
	(0.007)	(0.007)	(0.006)	(0.008)	(0.008)
$Rating4_{bf}$	-0.024***	-0.032***	-0.040***	-0.038***	-0.024***
	(0.009)	(0.009)	(0.010)	(0.012)	(0.008)
$Rating5_{bf}$	-0.000	-0.005	0.005	0.025***	0.017**
	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
$Size_b$		0.021***	0.021***	0.020***	0.005
		(0.003)	(0.003)	(0.006)	(0.006)
$Solvency_b$		-0.065	-0.045	0.054	0.067
		(0.049)	(0.043)	(0.060)	(0.076)
$Liquidity_b$		0.001	0.002	0.001	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)
$Remuneration_b$		-0.001***	-0.001***	-0.001**	0.002**
		(0.000)	(0.000)	(0.000)	(0.001)
Foreign $Assets_b$			-0.001		
			(0.001)		
Observations	30,039	30,039	30,039	29,990	31,162
R-squared	0.014	0.016	0.007	0.005	0.008
Period	Apr - Jul	Apr - Jul	Apr - Jul	Jan - Apr	Jul - Oct
Industry FE	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y

The dependent variable is $\Delta Log(Credit)_{bf}$, which is the change in (the log of) credit granted by bank b to firm f from April to July 2008 for columns 1 - 3. In column 4, it is the change from January to July 2008, while for column 5 it is the change from July to October 2008. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. '$RatingX_{bf}$' are dummy variables that equal 1 if bank b assigns rating X to firm f in April 2008. $Size_b$is the logarithm of total assets of bank b. Solvency $ratio_b$ is the regulatory capital over risk-weighted assets held by bank b. Liquidity $ratio_b$ is the ratio of liquid assets over total assets of bank b. $Remuneration_b$ is the share of term deposits at the central bank over reserve requirements for bank b. Foreign $assets_b$ is the ratio of assets held outside Uruguay over total assets for bank b. Loan controls (High $debt_{bf}$, Collateral $ratio_{bf}$, and Foreign $currency_{bf}$) and industry fixed effects are included in all regressions.See Appendix Table A1 for the definition of all the variables. All regressions are estimated using ordinary least squares. Robust standard errors clustered at bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 3:
Impact of Reserve Requirements on Credit: Firm FE

	(1)	(2)	(3)	(4)	(5)
RR_b	-0.465***	-0.502***	-0.596**	-0.078	-0.040
	(0.132)	(0.170)	(0.274)	(0.211)	(0.283)
$Rating2_{bf}$		0.005	-0.007	-0.014	-0.018
		(0.018)	(0.020)	(0.020)	(0.015)
$Rating3_{bf}$		-0.019	-0.027	-0.026	-0.000
		(0.025)	(0.024)	(0.025)	(0.023)
$Rating4_{bf}$		-0.042**	-0.057***	-0.018	-0.039*
		(0.021)	(0.021)	(0.023)	(0.021)
$Rating5_{bf}$		-0.039	-0.062**	0.034	-0.011
		(0.029)	(0.028)	(0.022)	(0.026)
$Size_b$			0.004	0.011	0.001
			(0.010)	(0.011)	(0.013)
$Solvency_b$			-0.081	0.132	0.005
			(0.087)	(0.106)	(0.117)
$Liquidity_b$			0.000	-0.001	0.001
			(0.001)	(0.001)	(0.001)
$Remuneration_b$			-0.001*	-0.000	0.001
			(0.000)	(0.001)	(0.001)
Observations	9,700	9,700	9,700	9,656	10,205
R-squared	0.489	0.493	0.494	0.526	0.531
Period	Apr - Jul	Apr - Jul	Apr - Jul	Jan - Apr	Jul - Oct
Borrower FE	Y	Y	Y	Y	Y
Loan controls	N	Y	Y	Y	Y

The dependent variable is $\Delta\ Log(Credit)_{bf}$, which is the change in (the log of) credit granted by bank b to firm f from April to July 2008 for columns 1 - 3. In column 4, it is the change from January to July 2008, while for column 5 it is the change from July to October 2008. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. '$RatingX_{bf}$' are dummy variables that equal 1 if bank b assigns rating X to firm f in April 2008. $Size_b$is the logarithm of total assets of bank b. Solvency $ratio_b$ is the regulatory capital over risk-weighted assets held by bank b. Liquidity $ratio_b$ is the ratio of liquid assets over total assets of bank b. $Remuneration_b$ is the share of term deposits at the central bank over reserve requirements for bank b. Loan controls (High $debt_{bf}$, Collateral $ratio_{bf}$, and Foreign $currency_{bf}$) and fixed effects are either included ('Y') or not included ('N'). See Appendix Table A1 for the definition of all the variables. All regressions are estimated using ordinary least squares. Robust standard errors clustered at bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 4:
Impact of Reserve Requirements on Credit: Resident and Non-resident Funding

	(1)	(2)	(3)	(4)	(5)	(6)
RR resident$_b$	-0.654	-0.502	-0.427	-0.649	0.664	1.089
	(0.424)	(0.567)	(0.594)	(0.728)	(0.962)	(1.279)
RR non-resident$_b$	-0.408**	-0.472***	-0.486**	-0.604**	0.045	0.092
	(0.160)	(0.174)	(0.201)	(0.267)	(0.275)	(0.241)
Industry dummies	Y	-	-	-	-	-
Loan controls	Y	N	Y	Y	Y	Y
Bank controls	Y	N	N	Y	Y	Y
Firm FE	N	Y	Y	Y	Y	Y
Observations	30,039	9,700	9,700	9,700	9,656	10,205
R-squared	0.016	0.489	0.493	0.494	0.526	0.531
Period	Apr - Jul	Apr - Jul	Apr - Jul	Apr - Jul	Jan - Apr	Jul - Oct

The dependent variable is $\Delta\ Log(Credit)_{bf}$, which is the change in (the log of) credit granted by bank b to firm j from April to July 2008. 'RR resident$_b$' is the part of the increase in reserve requirements for bank b due to the policy change of funding from residents over total liabilities. 'RR non-resident$_b$' is the part of the increase in reserve requirements for bank b due to the policy change of funding from non-residents over total liabilities. Industry dummies, bank controls (Size$_b$, Solvency$_b$, Liquidity$_b$, Remuneration$_b$), loan controls (RatingX$_{bf}$, High debt$_{bf}$, Collateral ratio$_{bf}$, and Foreign currency$_{bf}$), and fixed effects are either included ('Y'), not included ('N'), or spanned by other fixed effects ('-'). See Appendix Table A1 for the definition of all the variables. All regressions are estimated using ordinary least squares. Robust standard errors clustered at bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 5:
Impact of Reserve Requirements on Credit: Firm Heterogeneity
Risk-taking

	(1)	(2)	(3)	(4)	(5)	(6)
RR_b	-0.963**	-1.031***	-1.218***			
	(0.233)	(0.276)	(0.382)			
$Rating5_{bf}$	-0.131***	-0.101***	-0.196	-0.125***	-0.053	
	(0.045)	(0.037)	(0.152)	(0.044)	(0.149)	
RR_b * $Rating2_{bf}$	0.276					
	(0.814)					
RR_b * $Rating3_{bf}$	-0.168					
	(0.867)					
RR_b * $Rating4_{bf}$	-0.025					
	(0.829)					
RR_b * $Rating5_{bf}$	0.875*	0.896**	1.261**	1.105**	1.023*	1.088*
	(0.513)	(0.354)	(0.509)	(0.419)	(0.539)	(0.578)
Firm FE	Y	Y	Y	Y	Y	Y
Bank controls (levels)	Y	Y	Y	-	-	-
Bank controls (interactions)	N	N	Y	N	Y	Y
Bank FE	N	N	N	Y	Y	Y
Observations	9,700	9,700	9,700	9,700	9,700	6,562
R-squared	0.490	0.490	0.490	0.491	0.491	0.623

The dependent variable is $\Delta Log(Credit)_{bf}$, which is the change in (the log of) credit granted by bank b to firm f from April to July 2008. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. '$RatingX_{bf}$' are dummy variables that equal 1 if bank b assigns rating X to firm f in April 2008. The sample in column 6 only includes firms for which the rating does not differ across banks. Bank controls ($Size_b$, $Solvency_b$, $Liquidity_b$, $Remuneration_b$) and fixed effects are either included ('Y'), not included ('N'), or spanned by other fixed effects ('-'). See Appendix Table A1 for the definition of all the variables. All regressions are estimated using ordinary least squares. Robust standard errors clustered at bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 6:
Impact of Reserve Requirements on Credit: Firm Heterogeneity
Banking relations

	> 1 relation		1 relation	> 1 relation	> 2 relations	> 3 relations
	(1)	(2)	(3)	(4)	(6)	(6)
RR_b	-0.790*	-1.857**	-0.156	-0.596**	-1.061**	-2.066***
	(0.408)	(0.762)	(0.179)	(0.274)	(0.401)	(0.656)
RR_b * Dummy 2 relations$_f$	0.298					
	(0.343)					
RR_b * Dummy 2-3 relations$_f$		1.430**				
		(0.691)				
Firm FE	Y	Y	N	Y	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y
Industry FE	-	-	Y	-	-	-
Observations	9,700	9,700	20,339	9,700	3,402	1,439
R-squared	0.494	0.494	0.020	0.494	0.353	0.294

The dependent variable is $\Delta Log(Credit)_{bf}$, which is the change in (the log of) credit granted by bank b to firm f from April to July 2008. 'Dummy 2 relations$_f$' is a dummy variable equal to 1 if the firm has two bank relations in April 2008, 0 otherwise. 'Dummy 2-3 relations$_f$' is a dummy variable equal to 1 if the firm has two or three bank relations in April 2008, 0 otherwise. We choose these thresholds as they are the 75th and 90th percentiles in terms of banking relations. The samples in columns 3 to 6 is composed of the following firms: column 3 contains firms with only one banking relation; column 4 contains firms with at least two banking relations; column 5 contains firms with at least two banking relations.; column 6 contains firms with at least four banking relations. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. Bank controls (Size$_b$, Solvency$_b$, Liquidity$_b$, Remuneration$_b$), loan controls (RatingX$_{bf}$, High debt$_{bf}$, Collateral ratio$_{bf}$, and Foreign currency$_{bf}$), and fixed effects are either included ('Y'), not included ('N'), or spanned by another set of fixed effects ('-'). See Appendix Table A1 for the definition of all the variables. All regressions are estimated using ordinary least squares. Robust standard errors clustered at bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 7:
Impact of Reserve Requirements on Credit: Bank Heterogeneity

	(1)	(2)	(3)	(4)
RR_b	-0.836***	-0.438*	-0.367	-1.449***
	(0.308)	(0.226)	(0.226)	(0.525)
RR_b * Dummy $size_b$	0.475*			0.912***
	(0.261)			(0.337)
RR_b * Dummy $solvency_b$		-0.586*		-1.119***
		(0.324)		(0.395)
RR_b * Dummy $liquidity_b$			0.605**	-0.646
			(0.265)	(0.724)
Firm FE	Y	Y	Y	Y
Bank controls	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y
Observations	9,700	9,700	9,700	9,700
R-squared	0.494	0.494	0.494	0.495

The dependent variable is $\Delta Log(Credit)_{b,j,}$, which is the change in (the log of) credit granted by bank b to firm f from April to July 2008. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. 'Dummy $size_b$' is a dummy that equals 1 if bank b is above the 75th percentile in Size, 0 otherwise. 'Dummy $solvency_b$' is a dummy that equals 1 if bank b is above the median in Solvency, 0 otherwise. 'Dummy $liquidity_b$' is a dummy that equals 1 if bank b is above the median in Liquidity, 0 otherwise. All regressions are estimated using ordinary least squares. Bank controls ($Size_b$, $Solvency_b$, $Liquidity_b$, $Remuneration_b$), loan controls ($RatingX_{bf}$, High $debt_{bf}$, Collateral $ratio_{bf}$, and Foreign $currency_{bf}$), and firm fixed effects are included in all regressions. See Appendix Table A1 for the definition of all the variables. All regressions are estimated using ordinary least squares. Robust standard errors clustered at bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 8:
Impact of Reserve Requirements on Credit: Extensive Margin

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RR_b	0.192***	0.283***	0.186**	0.199**	0.195**	0.231*		-0.043	0.155
	(0.064)	(0.074)	(0.086)	(0.084)	(0.085)	(0.131)		(0.106)	(0.095)
$Remuneration_b$	0.001**		0.000	0.000	0.000	0.000		-0.000	0.000
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)
$Size_b$	-0.009*		-0.007*	-0.006*	-0.007	-0.006*		0.003	-0.000
	(0.004)		(0.004)	(0.004)	(0.004)	(0.003)		(0.005)	(0.004)
$Solvency_b$	-0.050		0.003	0.018	0.029	0.033		-0.004	-0.018
	(0.039)		(0.030)	(0.030)	(0.031)	(0.032)		(0.035)	(0.034)
$Liquidity_b$	0.002***		-0.000	-0.000	-0.000	-0.000		-0.001	0.000
	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)		(0.001)	(0.000)
$Credit_{bf}/TA_b$					-0.017				
					(0.011)				
RR_b * $Rating2_{bf}$						0.465	0.471		
						(0.329)	(0.329)		
RR_b * $Rating3_{bf}$						0.574**	0.581**		
						(0.213)	(0.222)		
RR_b * $Rating4_{bf}$						-0.106	-0.105		
						(0.211)	(0.232)		
RR_b * $Rating5_{bf}$						-0.248**	-0.297**		
						(0.106)	(0.116)		
Firm FE	N	Y	Y	Y	Y	Y	Y	Y	Y
Bank controls	Y	N	Y	Y	Y	Y	-	Y	Y
Bank FE	N	N	N	N	N	N	Y	N	N
Observations	35,589	10,067	10,067	10,067	10,067	10,067	10,067	10,076	10,529
R-squared	0.028	0.494	0.495	0.498	0.498	0.499	0.500	0.531	0.489
Period	Apr - Jul	Apr - Jul	Apr - Jul	Apr - Jul	Apr - Jul	Apr - Jul	Apr - Jul	Jan - Apr	Jul - Oct

In columns 1 - 7, the dependent variable is $DEnd_{bf}$, which is a dummy variable that equals 1 if bank b is lending to borrower f in April 2008 but not in July 2008, and 0 otherwise. In column 8, the dependent variable is $DEnd_{bf}$, which is a dummy variable that equals 1 if bank b is lending to borrower f in January 2008 but not in April 2008, and 0 otherwise. In column 9, the dependent variable is $DEnd_{bf}$, which is a dummy variable that equals 1 if bank b is lending to borrower f in July 2008 but not in October 2008, and 0 otherwise. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. $Size_b$is the logarithm of total assets of bank b. Solvency $ratio_b$ is the regulatory capital over risk-weighted assets held by bank b. Liquidity $ratio_b$ is the ratio of liquid assets over total assets of bank b. $Remuneration_b$ is the share of term deposits at the central bank over reserve requirements for bank b. $Credit/TA_{bf}$ is the (de-meaned) ratio of total credit of bank b to firm f over total assets of bank b. '$RatingX_{bf}$' are dummy variables that equal 1 if bank b assigns rating X to firm f in April 2008. All regressions are estimated using ordinary least squares. Bank controls interacted and fixed effects are either included ('Y') or not included ('N'). Robust standard errors clustered at the bank-industry level are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Table 9:
Impact of Reserve Requirements on Credit: Firm-level

	All firms		Non-rating-5	Rating 5	All firms	
	(1)	(2)	(3)	(4)	(5)	(6)
RR_f	-0.274***	-0.501***	-0.607***	-0.069*	0.102	0.058
	(0.097)	(0.140)	(0.198)	(0.041)	(0.073)	(0.084)
$Rating5_f$		-0.002				
		(0.011)				
RR_f*$Rating5_f$		0.317***				
		(0.113)				
$Remuneration_f$	-0.002***	-0.002***	-0.002***	-0.001***	-0.001***	0.002***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
$Size_f$	0.025***	0.025***	0.032***	0.014***	0.023***	0.015***
	(0.005)	(0.005)	(0.007)	(0.002)	(0.005)	(0.003)
$Solvency_f$	-0.268***	-0.270***	-0.417***	-0.051**	-0.104**	0.063
	(0.043)	(0.044)	(0.074)	(0.023)	(0.043)	(0.041)
$Liquidity_f$	0.003***	0.003***	0.004***	0.000	0.002***	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Observations	26,586	26,586	18,711	7,875	26,574	27,664
R-squared	0.002	0.003	0.002	0.004	0.001	0.002
Period	Apr - Jul	Apr - Jul	Apr - Jul	Apr - Jul	Jan - Apr	Jul - Oct

The dependent variable is $\Delta Log(Credit)_f$, which is the change in (the log of) credit granted by all banks to firm f from April to July 2008. 'RR_f' is the weighted average (where the weights are the size of the loan) increase in reserve requirements for all banks lending to firm f. $Rating5_f$ is a dummy variable equal to 1 if the weighted average of the ratings received by firm f is above 4.5, 0 otherwise. The other bank controls are transformed into firm-level weighted averages in the same fashion. Column 3 restricts the sample to firms with $Rating5_f$ equals 0; column 4 restricts the sample to firms with $Rating5_f$ equal to 1. Columns 1 to 5 show the results for the April-July period; column 6 refers to the January-April period; column 7 shows the results for the July-October period. Robust standard errors are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

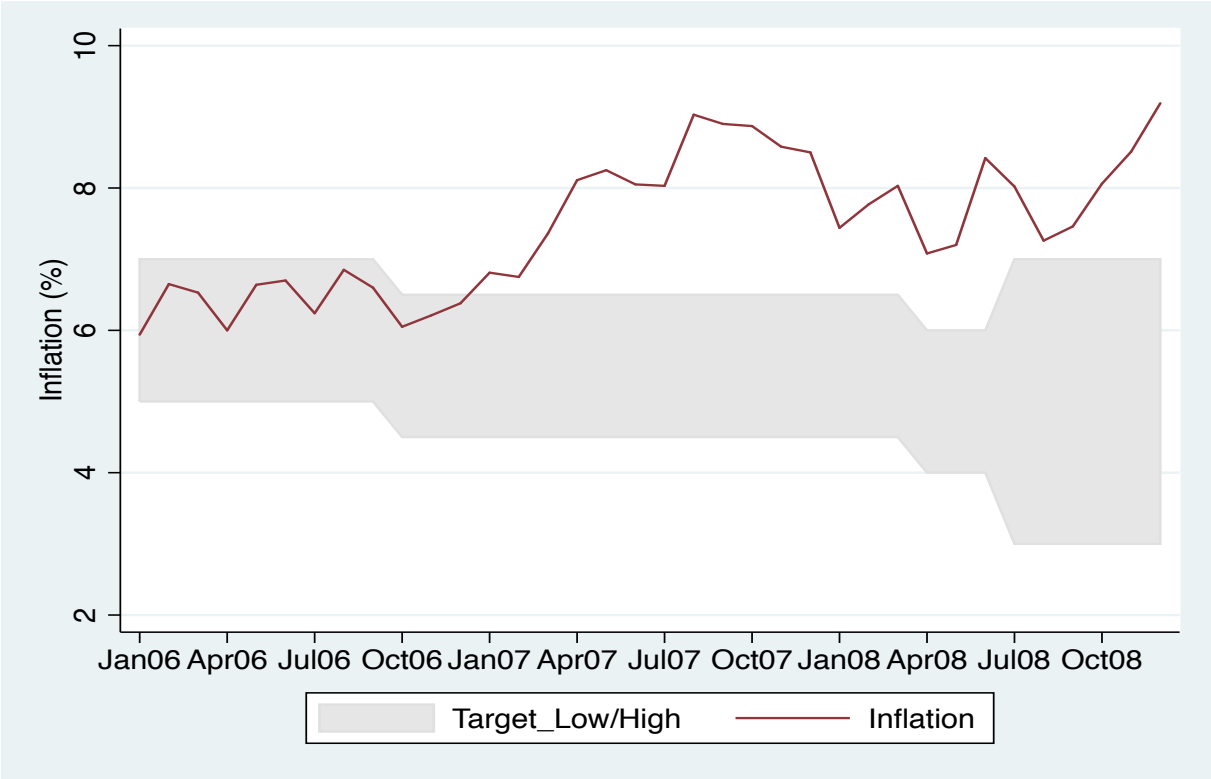
Table 10:
Impact of Reserve Requirements on Credit: Loan Rates

	(1)	(2)	(3)	(4)
RR_b	4.937	5.085	2.933	9.314
	(8.877)	(9.788)	(10.165)	(10.404)
$Remuneration_b$			-0.007	-0.011
			(0.006)	(0.016)
$Size_b$				0.032
				(0.362)
$Solvency_b$				2.229
				(3.315)
$Liquidity_b$				-0.075***
				(0.018)
Industry FE	N	Y	Y	Y
Observations	34	34	34	34
R-squared	0.010	0.020	0.038	0.291

The dependent variable is $\Delta RL_{b,i,t+1}$, which is the change in average loan rate of bank b for industry i from April to July 2008. 'RR_b' is the increase in reserve requirements for bank b due to the policy change over total liabilities. $Remuneration_b$ is the share of term deposits at the central bank over reserve requirements for bank b. $Size_b$is the logarithm of total assets of bank b. Solvency $ratio_b$ is the regulatory capital over risk-weighted assets held by bank b. Liquidity $ratio_b$ is the ratio of liquid assets over total assets of bank b. Fixed effects are either included ('Y'), not included ('N'). Robust standard errors are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

Figure 1:

Target and actual inflation in Uruguay, 2006 - 2008



This figure presents the evolution of inflation (CPI growth) and the target inflation range in Uruguay for the period 2006 to 2008. Source: Central Bank of Uruguay.

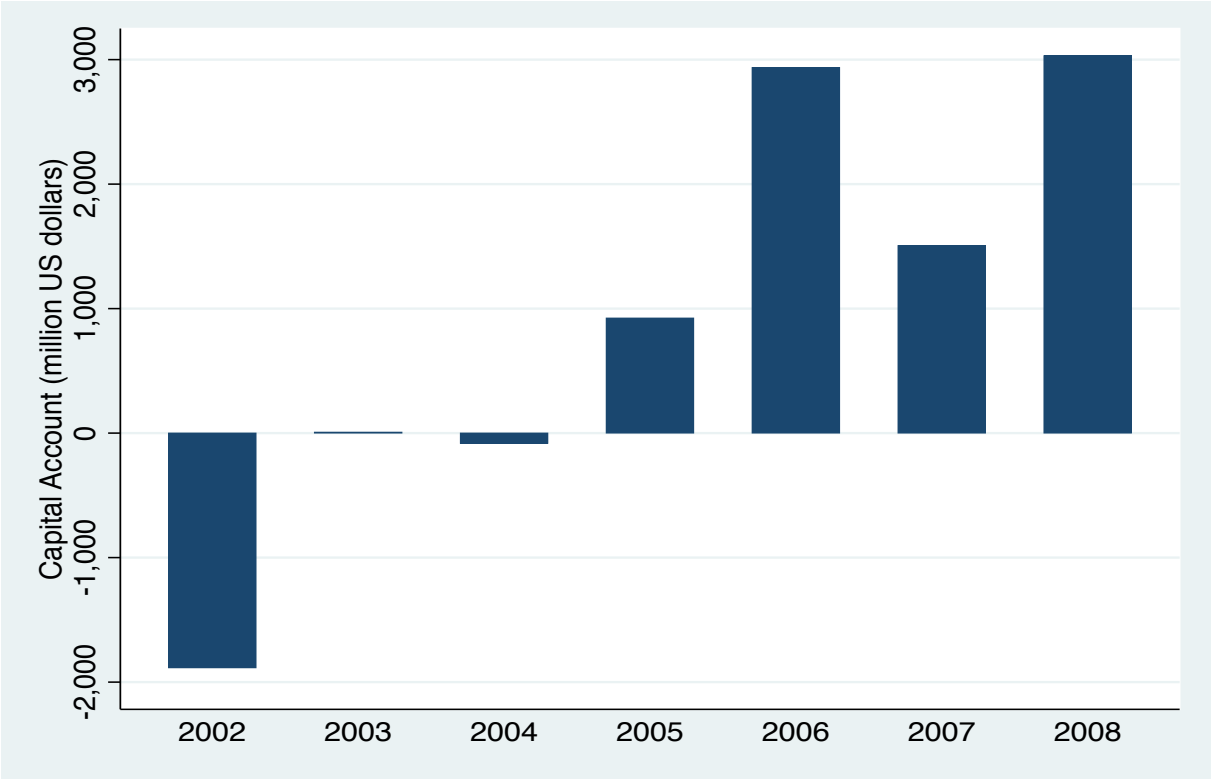
Figure 2:

GDP growth in Uruguay, 2005 - 2008

This figure presents the GDP growth (constant prices) in Uruguay for the period 2005 to 2008. Source: Central Bank of Uruguay.

Figure 3:

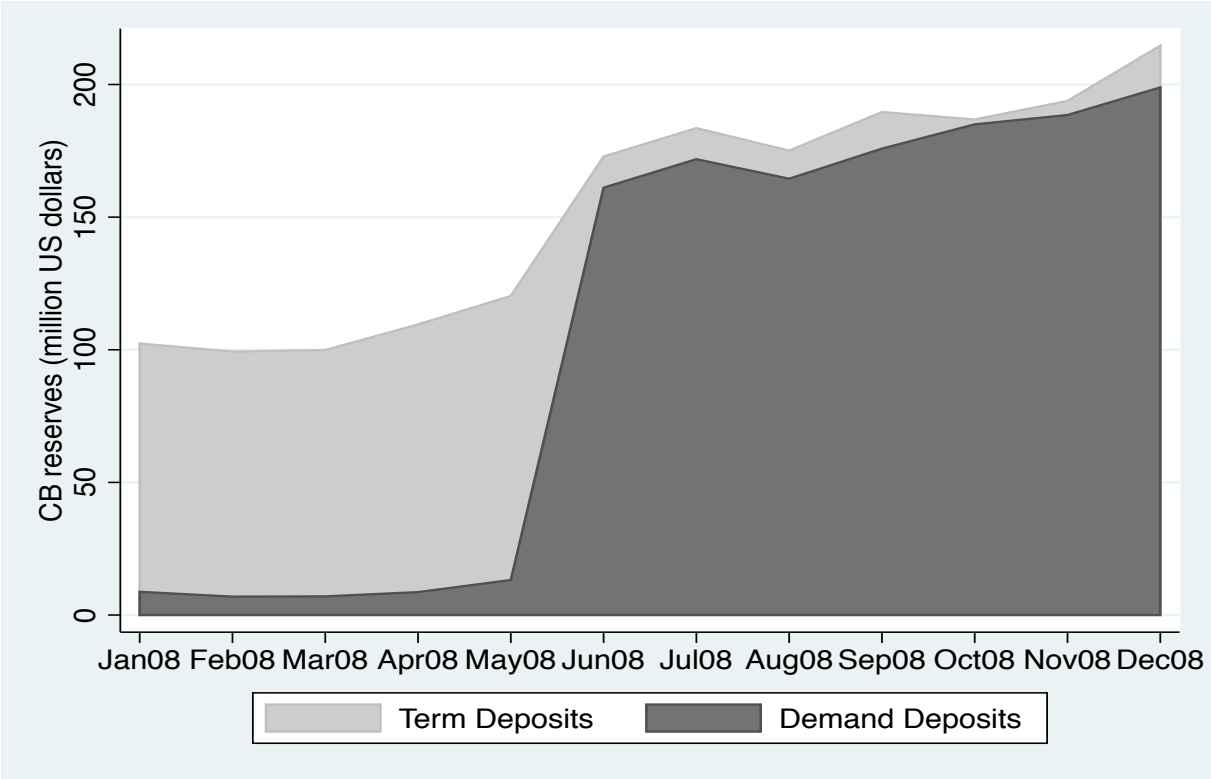
Capital account, 2002 - 2008



This figure presents the evolution of the annual capital account for Uruguay for the period 2002 to 2008. The values shown are in millions of US dollars. Source: Central Bank of Uruguay.

Figure 4:

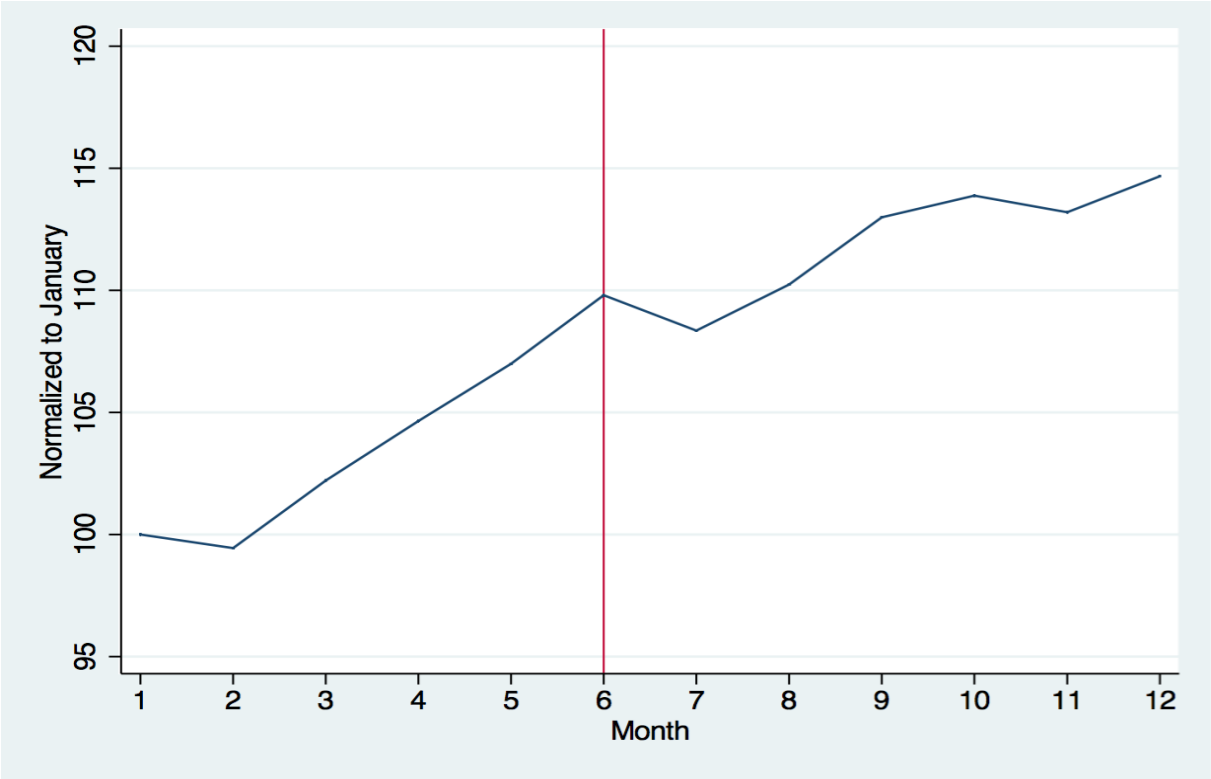
Average reserves at the central bank, 2008



This figure presents the evolution of reserves at the central bank, split between demand deposits and term deposits. The values are an average across banks, in million US dollars.

Figure 5:

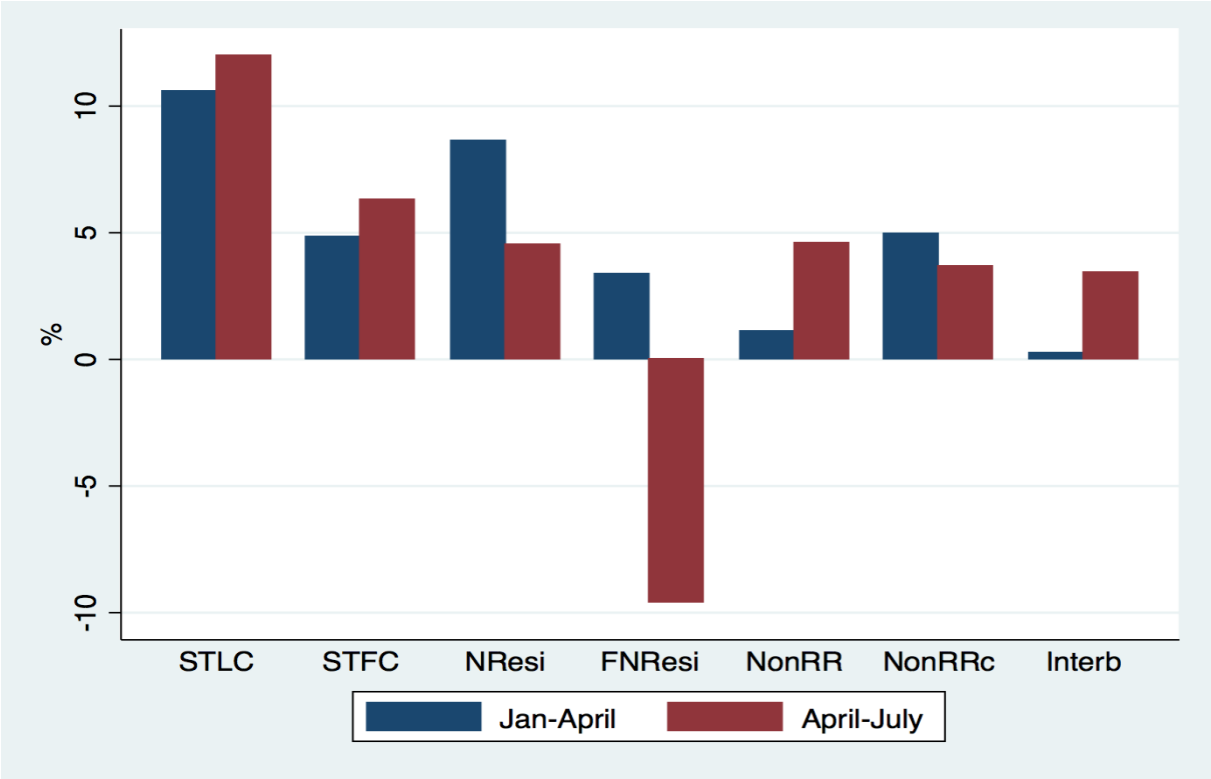
Aggregate bank credit evolution in Uruguay, 2008



This figure presents the evolution of aggregate bank credit to non-financial corporations in Uruguay for the year 2008, with the values normalized to the January level. The vertical red line reflects the introduction of the change in reserve requirements.

Figure 6:

Change in funding structure



This figure presents the median % change of different sources of funding for Uruguayan banks, from January to April 2008 (blue) and from April to July 2008 (red), the period of the policy change. 'STLC' refers to short-term (below 30 days) liabilities from residents denominated in local currency. 'STFC' refers to short-term (below 180 days) liabilities from residents denominated in foreign currency. 'NResi' refers to liabilities from non-resident non-financial institutions. 'FResi' refers to liabilities from non-resident financial institutions. 'NonRR' refers to liabilities not subject to reserve requirements, which are mainly liabilities from residents in local currency with maturities above 1 year and borrowing form the domestic interbank market. 'NonRRc' refers to liabilities not subject to the change in reserve requirements, which include the categories in 'NonRR' as well as liabilities from residents in local currency of over 30 days and in foreign currency of over 180 days. 'Interb' refers to liabilities from domestic banks.

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Appendix

Appendix Table A1:
Definition of main variables

Variable name	Definition
Dependent Variables	
$\Delta logL_{bf}$	Change in the logarithm of (strictly positive) committed credit granted by bank b to firm f between April and July 2008.
$LEnd_{bf}$	dummy variable that equals 1 if the bank-firm relationship ends between April and July 2008, 0 otherwise.
Policy Variables	
RR_b	Ratio of bank's total additional reserve requirements over total liabilities. Banks' additional reserve requirements is the sum of the change in reserve requirements for: short-term local currency deposits, short-term foreign currency deposits, deposits from foreign non-financial sector, and deposits from foreign financial sector.
RR residents$_b$	Ratio of bank's total additional reserve requirements for liabilities from residents over total liabilities.
RR non-residents$_b$	Ratio of bank's total additional reserve requirements for liabilities from non-residents over total liabilities.
Remuneration$_b$	Ratio of bank b's term deposits at the central bank over total reserve requirements.
Bank-Level Variables	
Size$_b$	Logarithm of total assets of bank b.
Liquidity$_b$	Ratio of Available Liquidity over Total Assets of bank b. The Available Liquidity includes liquid assets in excess to the liquidity in the Central Bank of Uruguay plus assets portfolio (excluding the portfolio of securities that cannot be sold but held until investment).
Solvency$_b$	$=(Eligible\ Capital/RWA$ of bank b.
Branch$_b$	=1 if bank b is organized as a branch of a foreign bank, =0 otherwise.
Public$_b$	=1 if bank b is owned by the government, =0 otherwise.
Loan-Level Variables	
Rating 1_{bf}	dummy variable equal to 1 if the loan has a rating of 1A ("borrower with loan fully covered by warranty") and 1C ("borrower with strong capacity to pay"), 0 otherwise. Safest rating.
Rating 2_{bf}	dummy variable equal to 1 if the loan has a rating of 2A ("borrower with adequate capacity to pay", delay in payment<30 days) and 2B ("borrower with potential problems to pay", delay in payment<60 days), 0 otherwise.
Rating 3_{bf}	dummy variable equal to 1 if the loan has a rating of 3 ("borrower with compromised capacity to pay", delay in payment<120 days), 0 otherwise.
Rating 4_{bf}	dummy variable equal to 1 if the loan has a rating of 4 ("borrower with very compromised capacity to pay", delay in payment<180 days), 0 otherwise.
Rating 5_{bf}	dummy variable equal to 1 if the loan has a rating of 5 ("irrecoverable debt", delay in payment$\geq$ 180 days), 0 otherwise. Riskiest rating.
Highdebt$_{bf}$	dummy variable equal to 1 if the loan is classified as a "highdebt", i.e., the credit is a substantial amount of bank's own resources, 0 otherwise.
Collateral ratio$_{bf}$	ratio of the collateral value over the total credit granted by bank b to firm f.
Dummy foreign currency$_{bf}$	dummy variable equal to 1 if the loan granted by bank b to firm f is in foreign currency, 0 otherwise.

Appendix Table A2:
Reserve Requirements in Uruguay

Source / maturity	**Reserve Requirements levels**									
	10/1983	12/1983	04/1984	08/1984	10/1984	07/1985	08/1985	12/1988	10/1991	01/1992
RR residents - Local currency (Pesos)										
< 30 days	13%	14%	15%	15%	15%	15%	24%	25%	23%	10%
30 - 90 days	13%	14%	5%	5%	5%	4%	11%	12%	10%	4%
91 - 180 days	13%	14%	5%	5%	5%	4%	11%	12%	10%	4%
181 - 366 days	13%	14%	0%	0%	0%	0%	5%	6%	6%	2%
> 366 days	13%	14%	0%	0%	0%	0%	5%	6%	6%	2%
RR residents - Foreign currency										
< 180 days	-	-	5%	5%	3%	3%	10%	10%	10%	10%
> 180 days	-	-	0%	0%	0%	0%	4%	4%	4%	4%
RR non-residents - non-financial corporations										
Treatment	As residents	As residents	As residents	As residents	As residents	As residents	As residents	As residents	As residents	As residents
	04/2000	08/2002	09/2002	11/2002	04/2003	06/2003	07/2003	09/2003	10/2003	06/2008
RR residents - Local currency (Pesos)										
< 30 days	10%	10%	30%	30%	28%	23%	20%	18%	17%	25%
30 - 90 days	4%	4%	24%	24%	22%	17%	14%	12%	9%	9%
91 - 180 days	2%	2%	22%	5%	5%	5%	5%	5%	4%	4%
181 - 366 days	4%	4%	24%	24%	22%	17%	14%	12%	6%	6%
> 366 days	2%	2%	22%	0%	0%	0%	0%	0%	0%	0%
RR residents - Foreign currency										
< 180 days	10%	10%	10%	10%	10%	10%	10%	10%	25%	35%
> 180 days	4%	4%	4%	4%	4%	4%	4%	4%	19%	19%
RR non-residents - non-financial corporations										
Treatment	As residents	As residents	As residents	As residents	As residents	30%	30%	30%	30%	35%

This table shows the reserve requirements for the Uruguayan banking sector since 1983 until the date of the policy change that we study, 2008. In each date there is at least a change in the requirement for one or more types of liabilities. Most of the changes occur between 2002 and 2003, the period after the default of the Argentinean government and the subsequent default by the Uruguayan government. The first change in the policy since that episode is precisely the one we study. Until 2003, liabilities from non-residents were treated the same way as liabilities from residents. Until 1984, there were no reserve requirements for foreign currency-denominated liabilitiess.

Appendix Table A3:
Impact of Reserve Requirements on Credit: Robustness

	Errors clustered at bank level			RR defined with January 2008 values			RR defined over total assets		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RR_b	-0.266***	-0.314**	0.186*	-0.230***	-0.312*	0.158**	-0.372***	-0.821**	0.295**
	(0.067)	(0.127)	(0.095)	(0.081)	(0.171)	(0.067)	(0.138)	(0.376)	(0.128)
Firm FE	N	Y	Y	N	Y	Y	N	Y	Y
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	30,039	9,700	10,067	30,039	9,700	10,067	30,039	9,700	10,067
R-squared	0.016	0.494	0.498	0.016	0.494	0.498	0.016	0.494	0.498
Margin	Intensive	Intensive	Extensive	Intensive	Intensive	Extensive	Intensive	Intensive	Extensive
Replication	T.2 C.2	T.3 C.3	T.8 C.3	T.2 C.2	T.3 C.3	T.8 C.3	T.2 C.2	T.3 C.3	T.8 C.3

This table replicates some of the key results in the paper with the following differences: in columns 1 - 3, the clustering of errors is at bank-level (as opposed to bank-industry); in columns 4 - 6, the reserve requirements variable is defined using the funding structure in January 2008 (as opposed to April 2008); and in columns 7 - 9, the increase in reserve requirements is normalized by total assets (as opposed to total liabilities). In columns 1 - 2, 4 - 5, and 7 - 8, the dependent variable is $\Delta Log(Credit)_{bf}$, which is the change in (the log of) credit granted by bank b to firm f from April to July 2008. In columns 3, 6, and 9, the dependent variable is $DEnd_{bf}$, which is a dummy variable that equals 1 if bank b is lending to borrower f in April 2008 but not in July 2008, and 0 otherwise. The last row shows the concrete specification by referring to the actual table and column in the paper. All regressions are estimated using ordinary least squares. Bank controls and fixed effects are either included ('Y') or not included ('N'). Robust standard errors clustered are reported in parentheses. ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.