Evidence of Bank Lending Channel for Argentina and Colombia*

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Abst ract

In this paper we find empirical evidence of bank lending channel for Colombia.and Argentina. As for Argentina, we do not find evidence that changes in the interbank interest rate affect the growth rate of total loans directly. However, it does indirectly through interactions: the interbank interest rate affects the loan supply through its interactions with capitalization and liquidity.As for Colombia, there is direct bank lending channel, which is reinforced through interactions with capitalization and liquidity. Also, using a panel data of more than 3300 firms, we provide additional support to the existence of a bank lending channel for Colombia.

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1 Introduction

While economists agree that monetary policy can affect real output in the short run, there is still a lot of controversy on how does monetary policy exactly operate.

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The most commonly discussed channel, the traditional "interest rate" channel, suggests that when the Fed decreases money supply (exchanging bonds for bank reserves), nominal and real interest rates will increase -the effect of monetary policy on the real interest rates works through an assumption of sticky prices in the short run. Consequently, investment and present consumption decrease, and therefore aggregate demand (AD) decreases. However, as Bernanke and Gertler (1995) point out, empirical studies of the interest rate channel have not been entirely successfull in explaining large changes in GDP and AD components due to moderate changes in the interest rates induced by monetary policy. This empirical findings have led to a vast literature that tries to identify and quantify other monetary transmission mechanisms, which complement and amplify the interest rate channel.

A longstanding question is whether financial institutions in general, and banks in particular, play an important role in the transmission of monetary policy to the real economy. The literature identifies two channels in which financial institutions might play a significant role, namely, the balance sheet channel (or broad credit channel) and the bank lending channel (or narrow credit channel).

The balance sheet channel was first introduced by Bernanke and Gertler (1989). The main idea of this mechanism is that in the presence of imperfect capital markets, informational asymmetries between borrowers and lenders cause a gap in the cost of internal and external sources of funding to borrowers. In general, this gap has a negative relation with the collateral of the borrower. A contractionary monetary policy has the effect of increasing real interest rates, therefore reducing the value of assets that act as collateral, that has the effect of deteriorating credit worthiness of borrowers. Therefore, consumption and investment plans that would be profitable if financed entirely with internal sources of funding, are no longer profitable when financed partially with external sources. This effect leads to a lower level of AD in the economy, magnifying the effects of the interest rate channel. Note that there is no specific role played by banks in the broad credit channel.

On the other hand, the bank lending channel gives a specific role to banks. The basic idea is that a contractionary monetary policy that reduces bank deposits creates a need for alternative funds in order to maintain the level of loans. If such alternative funds are scarce or not available, then banks will necessarily reduce their loan supply, affecting negatively consumption and investment plans. Therefore, the bank lending channel amplifies the effect on AD of a contractionary monetary policy.

In order to have a bank lending channel two conditions are required: first, some firms must be dependent on bank loans; second, the central bank must be able to shift bank loan supply schedules. Regarding the first condition, there is evidence that suggests that small firms are bank dependent[1]. This occurs because banks have comparative advantage in the sense of having lower costs of obtaining information about (and monitoring) their customers than other investors. Also, small firms generally lack access to securities markets and this effect will be more important for countries

[1]For US, see for example Fazzari et al (1988).

with less developed capital markets.

With respect to the second condition, a contractionary monetary policy has the effect of reducing the aggregate level of deposits [2]. Since these are one of the least expensive sources of financing for banks, it will be costly (for some banks) and even impossible (for others)[3] to offset the shortage in deposits with other sources of funding. In particular, if the Modigliani-Miller financial irrelevance theorem (Modigliani and Miller (1958) does not hold for the banking firm, some banks will not be able to obtain loanable funds required to maintain their level of lending, and therefore their loan supply will drop[4]. Then, financial variables that measure banks' financial health can play an important role, in the sense that banks with weak balance sheets are more affected by informational asymmetries than banks with stronger balance sheets.

In this paper, we present evidence that supports the existence of a lending channel of monetary policy for Argentina and Colombia.

Since capital markets are underdeveloped in these two countries, banks are a key source of financing for firms and households. Consequently, one would expect that the bank lending is stronger in these two economies (vis-a-vis countries with well developed capital markets).

The rest of the paper is organized as follows. Section 2 presents a theoretical model developed by Kishan and Opiela (2000), that has testable implications for the empirical analysis. Section 3 discusses the data and summary statistics. Section 4 presents the empirical analysis and results, and Section 5 concludes.

2 A Motivating Model

Kishan and Opiela (2000) provide evidence of the existence of a bank lending channel of monetary policy in the US from 1980 to 1995. Following Kashyap and Stein (1995), they try to identify the bank lending channel by studying cross sectional differences

[2] Bernanke and Blinder (1992) show that aggregate deposit fall immediately when the Fed tightens. Using bank dissagregated data, Kashyap and Stein (1995) also provide evidence that supports this.

[3] Because demand deposits are insured, they are less subject to informational asymmetries relative to other sources of funding (i.e. large time deposits). Meanwhile, other sources of funding for banks are uninsured, what makes them more likely to suffer information problems. Therefore, bank characteristics that are not so important for the obtention of deposits become very relevant for the acquisition of other sources of funds, such as large CDs.

[4] Another way in which a contractionary monetary policy can affect bank lending is through its impact on the capitalization ratio. Banks face interest rate risk given their role in maturity transformation: they hold long term assets (many of them with a fixed interest rate), which they finance issuing short term liabilities. Therefore, a contractionary monetary policy, that increses short-term interest rates, increases the debt of the banks and decreases the net present value of its assets, thus reducing bank profits. If banks cannot reduce dividend payments substantially, then equity is reduced. Given the minimum capitalization requirements , some banks that initially had a low capitalization ratio, will have to cut lending to meet the capitalization requirement as a short term response.

on the response of bank lending to monetary policy. To do so, they develop a model of a representative bank that has three assets, namely required reserves (RR), loans (LN) and securities (SEC); and three liabilities, namely, demand deposits (DD), large time deposits (TD) and capital (K). For simplicity, the bank does not hold excess reserves, so $RR = \alpha DD$, where $\alpha \in [0, 1]$ is determined by the central bank.

DD are assumed to be inversely related to the Fed funds rate: $DD = a_0 - a_1 r_{ff}$.

A bank is assumed to have market power in the TD market as well as in the LN market. Thus, it can raise TD by increasing its rate (r_{TD}) over the mean rate in the market ($\overline{r_{TD}}$), and can change loans by moving its loan rate (r_{LN}) with respect to the mean rate in the loan market ($\overline{r_{LN}}$):

$$\begin{aligned} TD &= b_0 + b_1(r_{TD} - \overline{r_{TD}}) \\ LN &= d_0 - d_1(r_{LN} - \overline{r_{LN}}) \end{aligned}$$

Capital markets are assumed to be imperfect. This is introduced by assuming that the interest rate sensitivities of TD and LN respectively($(b_1,\ d_1) >> 0$), depend on bank size and capitalization. Specifically, it is assumed that b_1 depends positively on both bank size and capitalization, following the idea that larger and better capitalized banks will find it easier to raise funds by issuing time deposits. Meanwhile, d_1 depends positively on bank size only, reflecting the idea that larger banks tend to give credit to larger firms which have better access to alternative sources of funding. Thus, larger banks have a demand for LN which is more sensible to changes in the interest rate than that of small banks.

$$\begin{aligned} b_1 &= b_1(\overset{+}{A}, \overset{+}{K}) \\ d_1 &= d_1(\overset{+}{A}) \end{aligned}$$

Securities are held as a buffer stock against liquidity shocks, and the mean market rates of TD, SEC and LN are assumed to be directly related to the Fed funds rate with fixed spreads:

$$\begin{aligned} SEC &= c_0 + c_1 DD - RR \\ \overline{r_{TD}} &= e_0 + \phi r_{ff} \\ \overline{r_{SEC}} &= f_0 + \phi r_{ff} \\ \overline{r_{LN}} &= g_0 + \phi r_{ff} \end{aligned}$$

Banks are assumed to choose LN, TD and SEC to maximize profits,

$$Profit = (\overline{r_{LN}} - \Phi)LN + \overline{r_{SEC}} SEC - \overline{r_{TD}} DD - \overline{r_{LN}} TD$$

subject to the balance sheet constraint ($LN + SEC + RR = \ DD + TD + K$) and the equations given above. ΦLN represents loan losses.

The first order conditions of this maximization problem yield the optimal portfolio for the bank (ie, LN, SEC, TD). Taking derivatives of LN, SEC and TD with respect to the Fed funds rate generates some testable implications. In particular, assuming $c_1 < 1$, the model predicts that an increase in this rate should increase TD, decrease LN, and have an ambiguous effect on SEC (the sign of the partial derivative will depend on the values of the parameters, this becoming an empirical issue).

$$\begin{aligned}
\frac{\partial LN}{\partial r_{ff}} &= -\frac{a_1 d_1 (1 - c_1)}{b_1 + d_1} < 0 \\
\frac{\partial TD}{\partial r_{ff}} &= \frac{a_1 b_1 (1 - c_1)}{b_1 + d_1} > 0 \\
\frac{\partial SEC}{\partial r_{ff}} &= -a_1 (c_1 - \alpha) \lessgtr 0
\end{aligned}$$

More interesting testable implications, however, derive from the introduction of the assumption mentioned before, of the dependence of interest rate sensitivities of LN and TD on bank size and capitalization:

$$\begin{aligned}
\frac{\partial(\frac{\partial LN}{\partial r_{ff}})}{\partial A} &= \frac{\partial(\frac{\partial TD}{\partial r_{ff}})}{\partial A} = \frac{a_1(1 - c_1)(b_1 \frac{\partial d_1}{\partial A} - d_1 \frac{\partial b_1}{\partial A})}{(b_1 + d_1)^2} \lessgtr 0 \\
\frac{\partial(\frac{\partial LN}{\partial r_{ff}})}{\partial K} &= \frac{\partial(\frac{\partial TD}{\partial r_{ff}})}{\partial K} = \frac{a_1 d_1 (1 - c_1) \frac{\partial b_1}{\partial K}}{(b_1 + d_1)^2} > 0
\end{aligned}$$

1)The net effect of asset size on the sensitivity of LN to r_{ff} is undetermined and depends on parameter values. This reflects the idea that two factors play an important role for big banks: maybe they are less subject to asymmetries of information than smaller banks, and therefore they can obtain easier alternative sources of funds (TD) when a contractionary monetary policy reduces DD; but, their clients are also bigger firms which tend to be more sensitive to interest rates, so if big banks increase r_{LN} due to higher costs of funding, they will loose more demand for loans than smaller banks. Similarly, it is unclear the effect of bank size on the sensitivity of TD to the Fed funds rate.

2)The sensitivity of LN to r_{ff} is lower for better capitalized banks; that is, better capitalized banks experience a lower reduction in loans that less well capitalized banks do. Similarly, better capitalized banks will increase more TD in times of monetary policy tightening.

Thus, capitalization and bank size appear to matter for lending. In Section 4 we test the predictions for bank lending that derive from this model for Argentina and Colombia.

3 Data

3.1 Data sources

The data for banks of Argentina are taken from the *Información de Entidades Financieras* releases of the Central Bank of Argentina, which consists of the monthly balance sheets that each bank is required to report to the Superintendencia de Entidades Financieras y Cambiarias (the financial institutions' regulator). The period used is November 1995 to November 2005. Unfortunately, such releases only include those banks that existed as of November 2005; therefore, banks that dissapeared throughout the period are not included in the dataset.

The data for banks of Colombia comes from financial statements that banks report monthly to the Superintendencia Financiera de Colombia, which regulates the financial system. The sample used covers the period 1995:1 to 2005:9, and consists of all the commercial banks that were operating at every moment of time. The panel of banks is unbalanced, with a maximum number of 40 banks in 1997:12, and a minimum of 21 banks at the final period. The number of banks at the beginning of the sample period was 38. The reduction in the number of banks during the last ten years reflects the consequences of the period of stress experienced by financial institutions in Colombia between 1997 and 1999, that led to bank failures, acquisitions and merges among financial institutions[5].

The macroeconomic variables used were taken from several sources: International Financial Statistics data was used for CPI and bilateral exchange rate peso-US dollar for both countries. As a proxy of GDP, which is not available on a monthly basis, the Estimador Mensual de Actividad Económica index (EMAE) without seasonality was used for Argentina, and the Indice de Producción Real Manufacturera (IPM) for Colombia. The first one is available online in a monthly frequency from Instituto Nacional de Estadísticas y Censos of Argentina (INDEC), while the second one is available online at the Central Bank of Colombia's (BANREP) web page.

The interbank interest rate is used as the monetary policy instrument. This variable was chosen, because it is the most commonly used in monetary transmission mechanism and inflation targeting studies (see, for example, Gomez and Julio (2001)). The interbank interest rate of Argentina is available online at the webpage of the Central Bank of Argentina (BCRA), and that of Colombia is available online at the webpage of BANREP.

[5] The way in which the Superintendencia Financiera handles acquisitions and merges is the following: first, when a big bank acquires a small bank (definition), the small bank disappears while the big bank's figures become those of the group; second, when a merge takes place, both banks disappear at the time of the merge, and a new one starts operating the period after.

3.2 Construction of variables

As a proxy of bank-specific characteristics, capitalization ratio, liquidity and size were used. The ratio of equity over assets was used as the measure of capitalization. Liquidity was measured as the ratio between liquid assets minus short-term liabilities *and* deposits (checking, savings and time deposits). Size of bank i is defined as the ratio of its total asset to the total asset of the banking system at a particular point in time.

These variables are included to test whether bank specific variables affect lending, and whether banks with different characteristics respond differently to monetary policy shocks. According to the bank lending channel, capital market imperfections affect the relationship between banks and their investors. Therefore, it is expected that variables that proxy for the financial health of a bank, such as capitalization and liquidity, matter in these relationships. It is not so clear if size should matter, at least there is not a precise economic reason of why it should matter[6], but given that it is a variable widely used in this literature, it is included here as well.

3.3 Characteristics of the banking sectors in Argentina and Colombia

Tables 1 to 4 show summary statistics of characteristics of the banking systems (commercial banks) in Argentina and Colombia at two different points in time. These characteristics are presented in two ways: the first four columns in each table group banks according to asset size, while the last four group them according to the capitalization ratio. For instance, the fourth column, ">75", stands for the group composed by the 25 percent of banks with the highest size in terms of assets. Similarly, the eighth column, also labeled ">75", stands for the group composed by the 25 percent banks with highest capitalization ratio.

According to Table 1, that shows the characteristics of the banking system in Argentina in November 2005, the relationship between size and capitalization is negative, while that of size and liquidity is positive; bigger banks in terms of asset size have lower capitalization ratios and are more liquid. This can also be observed when banks are grouped according to their capitalization ratio: banks that are more capitalized have significantly lower liquidity ratios. This can be explained by the fact that holding liquid assets has an opportunity cost which better capitalized banks need not incur.

It is also important to note that there are big differences in the ratios of capitalization among groups of banks in Argentina. For instance, for November 2005, while the 25 percent less capitalized banks had a capital ratio of 5.6%, the top 25 percent

[6]If financial indicators of banks were not publicly available, it could be the case that bank investors used size as a proxy of financial health. Nevertheless, in most countries this information is publicly available. And, in particular, that is the case of Colombia, and Argentina.

had a capital ratio of almost 55%. This differences are much stronger than those of banks in the US and other countries as Colombia.

It can also be observed that the group of more capitalized banks has a significantly lower ratio of deposits to liabilities. This can be explained by the fact that more capitalized banks have better access to alternative sources of funding, and therefore they depend less on deposits to finance their positions in assets. This same pattern holds for December 1996, as shown in Table 2.

From Table 2 one can observe that in December 1996 bank characteristics were slightly different for Argentinean banks. First, although the smallest banks in terms of assets were the most capitalized ones, the relationship between size and capitalization is not as systematic as in Table 1 for the other three asset size groups. Second, the relationship between asset size and liquidity is not at all clear. Third, although the relationship between liquidity and capitalization is not as clear as appears to be in Table 1, still the group of the most capitalized banks is, at the same time, the group with a lowest liquidity ratio.

It is important to mention that, since the sample of banks in 1996 consists only of surviving banks as of November 2005, there might be a selection bias towards higher capitalization ratios for December 1996, specially for small banks in terms of assets, given the characteristics of the data set for Argentina.

As for Colombia, some important facts can be observed from Table 3. When looking at the differences according to size, it can be noticed that smaller banks tend to have a bigger participation of loans in their assets, vis-a-vis larger banks. Similarly, they have a smaller participation of securities. That trend explains the fact that smaller banks appear to have lower liquidity ratios than larger banks do. Similarly, the biggest banks have a high capitalization ratio, relative to the mean of the system. Also important, the banks in the smallest percentile are the less capitalized among commercial banks. Note also that banks of any size obtain their financing basically from deposits[7].

Meanwhile, when looking at the characteristics of banks according to their capitalization ratio, trends seem to be less clear. The most capitalized banks (those above the 75th percentile) are also the biggest ones, according to market shares. But, for lower percentiles, there is no clear relationship between size, as proxied by market shares, and the degree of capitalization. More importantly, when dividing banks according to the capitalization ratio, there does not appear to be a pattern in asset composition; the percentage of loans in the total assets are very similar among groups, as well as the percentage of securities. But, what can be observed, is that the most capitalized banks have a larger proportion of commercial loans and a smaller participation of consumption loans.

Nevertheless, banks' characteristics in Colombia appear to have changed over time. Table 4 replicates the information shown in Table 3 for December 1997. One interesting feature is that asset composition has varied quite importantly. By the

[7]Deposits include demand deposits as well as time deposits.

end of 1997, there was a negative relation between capitalization and the ratio of loans to assets; while banks in the first quartile according to capitalization had a ratio of loans to assets above 75%, the quartile of the most capitalized banks had a ratio below 60%. Correspondingly, the ratio of securities to assets had a positive relationship with the degree of capitalization. When comparing asset composition between 1997 and 2005, it is noticeable that, in general, banks turned to have more securities and less loans in their portfolios after the crisis. Note that the ratio of loans to assets reduced importantly for all groups of banks, while the ratio of securities to assets rose significantly. This can probably be explained by the systematic default of banks that took higher risks in the period of credit boom before the crisis, and by more conservative lending policies taken by surviving banks that tend to account better for risks derivating from the lending business.

Another important feature, now regarding liability composition, is that more capitalized banks in 1997 tended to have a lower ratio of deposits to total liabilities than less capitalized banks. This seems to provide some indirect evidence of the presence of capital market imperfections for banks, as predicted by the bank lending channel theory, and also of the importance of the capitalization ratio as an indicator of the degree of informational asymmetries faced by banks. Basically, the fact that there is a negative relation between the degree of capitalization and the ratio of deposits to liabilities supports the idea that better capitalized banks are less deposit-dependent, in the sense that they can find easier substitutes for these than less capitalized banks do. Nevertheless, this relationship tended to disappear in time, becoming less clear in recent years. Probably this happened because the differences in capitalization between different groups of banks has reduced, due to failure of poorly capitalized banks and also to financial decisions taken by surviving banks.

As a final point concerning the evolution of the banking sector characteristics in time for Colombia, it is important to mention that more capitalized banks appear to have a larger proportion of commercial loans in their portfolios. This could suggest that banks that lend to large firms are healthier and better capitalized banks.

One can observe several differences for Argentina and Colombia from Tables 1 to 4. One is that the banking system of Argentina is much more concentrated than that of Colombia. For example, while the largest banks in Argentina hold 86% of the assets of the system, that figure is 51% for Colombia, even though the number of commercial banks in Argentina is more than three times that of Colombia. Next, the capitalization ratios for Argentina are much higher than those for Colombia, especially in recent years. Also, banks in Argentina with the highest capitalization ratios are small banks in terms of asset size, whereas in Colombia, those with the highest capitalization ratios are big banks in terms of asset size. When looking at the changes over time of banking sector characteristics, bank characteristics in Argentina seemed to remain stable between 1996 and 2005, while important changes took place for Coloimbia, probably as a consequence of differences in the way in which both data sets are constructed; namely, that the data set for Argentina contains only

those banks existing in November 2005, whereas for Colombia there is also data for banks that dissappeared.

4 Empirical results:

The empirical especification in this panel approach is the following:

$$y_{it} = \sum_{j=1}^{6} \mathbf{X}_{it-j}\boldsymbol{\beta}_j + \sum_{j=1}^{6} x_{3it-j} 1_2' \odot \mathbf{Z}_{it-1}\boldsymbol{\phi}_j + \alpha Dummycrisis_t + u_{it} \qquad ((1))$$

where y_{it} represents the growth rate of total loans for bank i at time t; $\mathbf{X}$ is a matrix of macroeconomic variables including a proxy for the growth rate of GDP, growth rate of real exchange rate and the policy instrument, which is the real interbank interest rate (denoted by x_{3it} and calculated as the nominal interbank interest rate minus observed monthly inflation rate). $\mathbf{Z}$ is a matrix of bank specific variables, namely, capitalization and liquidity. Monthly dummies to control for seasonality in the data were also included ; $Dummycrisis$ is a dummy variable included for Colombia to control for the financial crisis period between July 1998 and December 2000; and, the error term was assumed i.i.d. as well as to account for bank specific AR(1) structure. For Colombia, another two regressions are considered, namely, one for commercial loans and one for consumer loans.

The estimated empirical specification for both countries is

$$\begin{pmatrix} \mathbf{y}_1 \\ \mathbf{y}_2 \\ \cdot \\ \cdot \\ \cdot \\ \mathbf{y}_m \end{pmatrix} = \begin{pmatrix} \mathbf{X}_1^* \\ \mathbf{X}_2^* \\ \cdot \\ \cdot \\ \cdot \\ \mathbf{X}_m^* \end{pmatrix} \delta + \begin{pmatrix} \mathbf{u}_1 \\ \mathbf{u}_2 \\ \cdot \\ \cdot \\ \cdot \\ \mathbf{u}_m \end{pmatrix}$$

where 1,...,m are the banks and and the $\mathbf{X}^*$ matrix contains all the variables in the RHS of (1)

$$E(\mathbf{u}\,\mathbf{u}') = \begin{pmatrix} \sigma_{1,1}\Omega_{1,1} & \sigma_{1,2}\Omega_{1,2} & \cdot & \cdot & \cdot & \sigma_{1,m}\Omega_{1,m} \\ \sigma_{2,1}\Omega_{2,1} & \sigma_{2,2}\Omega_{2,2} & \cdot & \cdot & \cdot & \sigma_{2,m}\Omega_{2,m} \\ \cdot & \cdot & \cdot & & & \cdot \\ \cdot & \cdot & & \cdot & & \cdot \\ \cdot & \cdot & & & \cdot & \cdot \\ \sigma_{m,1}\Omega_{m,1} & \sigma_{m,2}\Omega_{m,2} & \cdot & \cdot & \cdot & \sigma_{m,m}\Omega_{m,m} \end{pmatrix}$$

The variance structure of the errors was specified to account for autocorrelation of order 1 specific to each panel [8].

[8] Some studies have used dynamic panel data models to look for evidence of a bank lending channel. However, since the endogenous variable is the growth rate of loans, it is not clear why the

The results for Argentina suggest that there is no direct bank lending channel triggered by changes in the interbank intererest rate. But there is indirect eefect on bank lending through the interactions of the interbank interest rate and capitalization and, to a less extent, liquidity.

Table 5: Total Effect Coefficients for Argentina
Dependent variable: Growth rate of Total Loans

Variable	*Coefficient*	*Std.Err.*
Interbank rate	-0.032	0.022
Interactions:		
Interbank rate x Liquidity	0.048**	0.015
Interbank rate x Capitalization	0.143*	0.025

* Significant at the 1 percent level **Significant at the 10 percent level

These results suggest that when the interbank interest rate changes, the growth rate of loans will be affected less the better capitalized (and the higher its liquidity ratio) the bank is.

The results for Colombia agree with the basic ideas of the bank lending channel. See Tables 6 and 7, which show the results of the regressions corresponding to total loans and commercial loans. Note that the impact of monetary policy on the growth rate of loans is negative; increments in the interbank interest rate lead to reductions in the growth rate of loans. However, the impact is not the same accross banks; those institutions that have lower capitalization and liquidity ratios are affected more.

This suggests that these bank specific variables, capitalization and liquidity, affect lending decisions done by banks, and also the ability that they have to obtain alternative sources of funding when a monetary policy shock affects the amount of core deposits in the economy.

The results are quite different when the growth rate of consumption loans in used in the regressions. The interest rate is not significant in explaining changes in the growth rate of these loans, and bank specific variables do not appear to matter either. This result suggests that consumer loans have a different dynamics than commercial loans. However, as it was seen before, commercial loans represent the great majority of total loans, and that can explain that even when there is no evidence of a bank lending channel for consumer loans, there is evidence for total loans.

growth rate of loans of today depending on its previous realizations. The current period growth rate of loans might depend on past periods realizations through demand side influences, but these should be captured by the macroeconomic and bank specific variables.

Table 6: Total Effect Coefficients for Colombia
Dependent variable: Growth rate of Total Loans

Variable	*Coefficient*	*Std.Err.*
Interbank rate	-.6824*	.0551
Interactions:		
Interbank rate x Liquidity	1.6949*	.1379
Interbank rate x Capitalization	4.5424*	.3608

* Sifiigncant at the 1 percent level

Table 7: Total Effect Coefficients for Colombia
Dependent variable: Growth rate of Commercial Loans

Variable	*Coefficient*	*Std.Err.*
Interbank rate	-.6710*	.0757
Interactions:		
Interbank rate x Liquidity	1.5629*	.1892
Interbank rate x Capitalization	4.7544*	.4947

* Significant at the 1 percent level

5 Bank Lending Channel for Colombia using Firms' data

As a robustness test for the evidence of bank lending channel for Colombia, we analyze balance sheet data for Colombian firms. In order to identify the bank lending channel with these data, we separate firms into two groups according to the degree of leverage[9]. Group 1 is composed by firms in the lowest quartile of leverage and Group 2 is composed by firms in the highest quartile. The intuition behind this way of grouping firms is that in moments of tight monetary policy, firms with higher indebtness will find it harder to obtain liquidity. Therefore, the impact of a change in interest rates on these firms should be stronger than on those with lower leverage ratios.

Kashyap et al (1993) develops a simple theoretical model to model changes in optimal debt structure of the firm over time. In times of contractionary monetary policy, bank loans experience a supply shock due to the fall in deposits. As the spread between the interest rates on bank loans and non-bank debt rises, the lending channel would anticipate a decrease in bank lending.in the firms' optimal debt structure. Furthermore, as risk increases in periods of contractionary monetary policy, banks will be more reluctant to lend to firms with poor information availability.

[9]Leverage is defined as the ratio of total liabilities to total assets of the firm, following the conventional definition.

5.1 Data Source

The data for firms was collected by the Supeintendencia de Sociedades, the organism that regulates non-financial firms in Colombia. The sample consists of a panel of annual observations on firms from 1995 to 2004. For each year, more than six thousand firms submit information about their balance sheets. The panel is unbalanced, due to the entry and exit of firms, and also to the fact that some firms report their balances for some years but not for others (not necessarily for consecutive years).

After depurating the data base for firms that have an early exit or a late entry, or that do not report for the whole span of time, we are left with a balanced panel of around four thousand non-financial firms belonging to various economic sectors.

5.2 Empirical Especification and Results

The empirical especification in this panel approach is the following:

$$BD_{it} = \sum_{j=1}^{2} BD_{it-j}\boldsymbol{\gamma}_j + \sum_{j=1}^{2} \Delta \log(R_{t-j})\theta_j + \sum_{j=1}^{2} inv_{it-1}\eta_j + cap_{it-1}\mu_j + \alpha Dummycrisis_t + u_{it} \quad ((2))$$

where BD_{it} represents the ratio of bank debt to total debt for firm i at time t; R_t is the real interbank interest rate, which instruments for monetary policy; inv controls for inventories and cap for capitalization. The parameters of interest are $\boldsymbol{\gamma}$, $\boldsymbol{\theta}, \boldsymbol{\eta}$ and μ_j; in particular, the vector $\boldsymbol{\theta}$, which multiplies the instrument for monetary policy. $Dummycrisis$ is a dummy variable included for Colombia to control for the financial crisis period of 1999 and 2000. The error term is assumed i.i.d.

Because lag values of the dependent variable are included as regressors, we use Arellano-Bond (1991) methodology, which corrects the inconsistency of the within estimator and provides a consistent and efficient estimator. The intuition of including lags of the ratio of bank debt as covariates is that the ratio presents some inertia over time, in the sense that the debt structure of firms does not change significantly in short periods of time.

The main results are summarized in Table 8, which presents the long run coefficients of the real interest rate for both groups of firms.

Table 8: Evidence of Bank Lending Channel for Firms
Dependent variable: Ratio of Bank Debt to Total Debt
Group 1: Low Leveraged Firms

Variable	*Coefficient*	*Std.Err.*
Interbank rate	-0.0068**	0.0037

**Significant at the 10 percent level

Group 2: High Leveraged Firms

Variable	*Coefficient*	*Std.Err.*
Interbank rate	-0.0191*	0.0068

* Significant at the 1 percent level

As shown in Table 8, the ratio of bank debt to total debt of both groups of firms goes down when the real interest rate increases. This is due to both supply and demand factors and debt substitution. However, the impact is clearly bigger and more significant for high leveraged firms than for low leveraged firms. This provides some additional support for the existence of a bank lending channel of monetary policy in Colombia.

6 Conclusion

In this paper we find empirical evidence of bank lending channel for Colombia. As for Argentina, we do not find evidence that changes in the interbank interest rate affect the growth rate of total loans directly. However, it does indirectly through interactions: the interbank interest rate affects the loan supply through its interactions with capitalization and liquidity.As for Colombia, there is direct bank lending channel, which is reinforced through interactions with capitalization and liquidity.

Bank specific variables are key in analyzing how changes in the interbank rate affect the growth rate of loans for Argentina and Colombia. It is particularly important the way in which capitalization affects the lending ability of banks; better capitalized banks should be able to lend more in moments of constrained liquidity. This might be the result of a combination of minimum capital regulations and informational frictions in markets for banks' funds, which affect both the decisions taken by banks and their ability to raise funds in markets alternative to the deposits one.

Finally, using a panel data of more than 3300 firms, we provide additional support to the existence of a bank lending channel for Colombia.

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Table 1. Characteristics of the Banking System in Argentina (November 2005)

		By Asset Size (percentile)			By Capitalization (percentile)			
Characteristic	**< 25**	**25-50**	**50-75**	**> 75**	**< 25**	**25-50**	**50-75**	**> 75**
Market Share (percent)								
Total Assets	0.65	3.44	9.60	86.31	28.15	54.33	15.74	1.78
Total Loans	0.74	3.14	8.44	87.68	24.34	58.91	14.60	2.15
Securities	0.51	2.80	10.15	86.53	33.69	51.71	12.98	1.62
Deposits	0.21	3.16	9.20	87.44	24.08	64.03	11.36	0.52
Ratios as group aggregate (percent)								
Loans to Asset	41.16	33.15	31.88	36.86	31.36	39.34	33.66	43.89
Securities to Assets	23.29	24.06	31.18	29.58	35.30	28.08	24.33	26.91
Deposits to Liabilities	38.38	70.44	72.37	69.34	55.52	80.61	57.33	42.89
Capitalization	49.25	16.17	14.36	10.79	5.59	11.26	18.45	54.88
Liquidity	11.80	17.70	26.60	28.47	32.99	24.72	30.57	11.53
In millions of pesos of Nov 2005								
Total Assets of the system	208159							
Total Loans of the system	75522							
Total Securities of the system	61406							
Total Deposits of the system	133317							
In millions of US dollar of Nov 2005								
Total Assets of the system	70658							
Total Loans of the system	25636							
Total Securities of the system	20844							
Total Deposits of the system	45254							
Number of Banks	72							

Table 2. Characteristics of the Banking System in Argentina (December 1996)

	By Asset Size (percentile)				By Capitalization (percentile)			
Characteristic	**< 25**	**25-50**	**50-75**	**> 75**	**< 25**	**25-50**	**50-75**	**> 75**
Market Share (percent)								
Total Assets	1.17	3.72	9.83	85.27	17.91	33.69	39.49	8.92
Total Loans	0.80	3.19	7.83	88.18	15.57	33.86	39.47	11.11
Securities	1.53	5.41	14.45	78.61	25.92	24.28	42.40	7.40
Deposits	1.04	3.47	6.49	88.99	17.37	35.12	45.65	1.86
Ratios as group aggregate (percent)								
Loans to Asset	40.26	50.21	46.73	60.66	50.99	58.95	58.63	73.11
Securities to Assets	14.42	16.06	16.23	10.18	15.98	7.96	11.85	9.16
Deposits to Liabilities	60.94	56.61	40.42	61.91	53.63	59.72	66.51	23.83
Capitalization	25.68	14.06	16.47	14.66	6.51	10.04	14.72	51.43
Liquidity	9.97	15.14	7.10	8.45	32.99	24.73	30.57	11.53
In millions of pesos of Nov 2005 (constrained)								
Total Assets of the system	125631							
Total Loans of the system	73697							
Total Securities of the system	13872							
Total Deposits of the system	64729							
In millions of US dollar of Nov 2005 (constrained)								
Total Assets of the system	93829							
Total Loans of the system	55041							
Total Securities of the system	10360							
Total Deposits of the system	48343							
Number of Banks (constrained)	58							

Table 3. Characteristics of the Banking System in Colombia (September 2005)

	By Size (percentile)				By Capitalization (percentile)			
Characteristic	**<25**	**25-50**	**50-75**	**>75**	**<25**	**25-50**	**50-75**	**>75**
Market Share (percent)								
Total Assets	7.9	15.4	25.8	50.9	23.1	19.8	10.7	46.4
Total Loans	9.5	17.6	24.3	48.7	22.4	19.9	12.3	45.4
Securities	5.9	11.7	29.5	52.9	24.2	19.9	8.0	47.9
Deposits	7.5	15.9	26.7	49.9	23.1	20.4	11.0	45.5
Ratios (percent)								
Loans to Assets	62.6	59.2	49.0	49.8	50.4	52.3	59.9	50.9
Securities to Assets	25.3	25.6	38.7	35.2	35.5	34.0	25.3	34.9
Deposits to Liabilities	75.8	85.9	84.6	81.4	79.0	84.2	84.5	83.1
Liquidity	15.9	24.8	41.4	37.8	36.2	36.1	24.1	36.8
Capitalization	8.8	12.7	10.8	12.1	7.9	10.7	11.9	13.8
Participation of Total Loans (percent)								
Commercial	52.4	51.1	60.5	70.7	56.5	57.8	52.4	71.5
Consumer	46.8	25.6	30.6	17.5	27.6	33.8	26.6	19.1
Mortgage	0.4	24.3	8.7	10.0	9.6	9.4	22.1	10.0

In millions of Colombian pesos of Nov 2005	
Total Assets of the system	110,231,651
Total Loans of the system	57,357,481
Total Securities of the system	37,273,492
Total Deposits of the system	80,323,813

In millions of US dollars of Nov 2005	
Total Assets of the system	47,690
Total Loans of the system	24,815
Total Securities of the system	16,126
Total Deposits of the system	34,721

Total Number of Commercial Banks 21

Table 4. Characteristics of the Banking System in Colombia (December 1996)

	By Size (percentile)				By Capitalization (percentile)			
Characteristic	**<25**	**25-50**	**50-75**	**>75**	**<25**	**25-50**	**50-75**	**>75**
Market Share (percent)								
Total Assets	4.6	11.8	28.8	54.8	31.8	15.5	25.2	27.4
Total Loans	4.7	11.2	29.6	54.5	36.8	16.5	22.7	24.0
Securities	4.2	12.1	25.7	58.0	15.3	11.1	29.6	44.0
Deposits	4.0	11.6	31.1	53.3	38.7	16.8	22.8	21.8
Ratios (percent)								
Loans to Assets	66.4	62.2	67.4	65.2	75.7	69.8	59.1	57.2
Securities to Assets	10.4	11.9	10.3	12.1	5.5	8.3	13.5	18.5
Deposits to Liabilities	69.4	78.9	81.9	82.8	93.1	86.3	73.6	70.5
Liquidity	8.8	9.4	9.7	10.7	4.0	7.1	11.7	19.5
Capitalization	14.8	13.6	12.2	13.6	5.9	10.5	15.0	21.9
Participation of Total Loans (percent)								
Commercial	82.5	70.5	40.9	49.7	26.5	44.8	71.6	73.0
Consumer	17.5	28.9	19.7	14.6	5.7	22.4	28.1	23.7
Mortgage	0.0	0.6	39.4	35.7	67.8	32.8	0.3	3.3

In millions of Colombian pesos of Nov 2005	
Total Assets of the system	94,962,893
Total Loans of the system	62,216,689
Total Securities of the system	10,956,440
Total Deposits of the system	65,782,971

In millions of US dollars of Nov 2005	
Total Assets of the system	53,207
Total Loans of the system	34,859
Total Securities of the system	6,139
Total Deposits of the system	36,858

Total Number of Commercial Banks 40