Bank Lending Channel in Brazil: Evidence from the Composition of External Finance of Public and Private Firms

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ABSTRACT

This paper analyses the existence of an active bank-lending channel in the transmission of monetary policy in Brazil. We built an original database of 291 public firms and 4,797 private firms. We look at the reactions of bank loans of public and private firms to monetary contractions. Our results indicate that firms with more financial restrictions decrease their demand of bank loans after monetary contractions, just like the bank-lending channel would predict.

Key Words: Bank Lending Channel, Credit Channel, Monetary Transmission. Mechanisms

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1 INTRODUCTION

Mishkin (1996) asserts that traditional transmission mechanisms of Monetary Policy are not fully capable of explaining how economic agents respond to monetary policy. Other channels are necessary to complement the explanations given by the more traditional channels. One of these other mechanisms is the bank-lending channel. This theory focus on frictions in the credit market, caused by problems of asymmetric information related to the behavior of financial institutions and firms that have direct impact over the transmission of monetary policy.

The bank lending theory is a part of a much more extensive theory known as the credit channel theory. This theory points to other forms of transmission mechanisms that enhance the more traditional ones. It asserts therefore that the traditional Keynesian view does not completely explain the mechanism of Monetary Policy transmission. The timing and magnitude of the effects of the Monetary Policy are not satisfactorily explained by the conventional theory. The other component of the credit channel is balance sheet theory.

The balance-sheet channel emphasizes the impact of Monetary Policy shocks on the balance sheet of the firms. This view affirms that imperfections in the credit market, as asymmetric information and moral hazard problems, may deteriorate the balance sheet of firms, reducing their ability to obtain external financing. The reduction in the credit for the firms diminishes their investment level and, consequently their output that can lead to a decrease in aggregate demand.

The bank-lending channel suggests the existence of a transmission mechanism of the Monetary Policy through which shifts in the bank loans supply impact the real economy. By this channel, contracionist monetary shocks are able to reduce demand deposits of banks making them decrease their supply of loans to the private sector. The reduction in bank loans limits the investment of corporations that are mostly dependent of this form of financing. This situation is particularly more intense with firms that experience more financial restrictions.

Brazil is known for relevant imperfections in the credit market. Some of these imperfections are related to a high cost capital and to an underdeveloped capital market. Therefore, it seems reasonable to believe that problems of adverse selection and moral hazard between financial institutions and firms may be important to understand how the monetary transmission mechanism works in Brazil.

The objective of this paper is to evaluate the existence and relevance of the bank-lending channel in Brazil. With this purpose, we look at the reaction of the mix of bank and nonbank debt after a monetary contraction. The results of the paper indicate that firms that have more financial restrictions react in accordance with the bank-lending theory. That is, they decrease their financing through bank loans after a monetary contraction.

We use an original database composed of balance sheet information of 291 public firms and 4,797 private firms. Of the private firms, 102 disclose quarterly information while all the others disclose only end of the year information.[1] The information of the public firms come from "Comissão de Valores Imobiliários" (CVM), Economática and Gazeta Mercantil and the information of the private firms come from SERASA and Gazeta Mercantil.[2]

Our classification scheme is based on differentiating firms depending on their access to the financial markets. We choose size defined as total assets as our criteria to classify firms in more or less financial constrained. We verify that size is highly correlated to other financial characteristics of firms that indicate the degree in which firms access the financial markets. Some of these characteristics are total short-term debt, long-term debt, fixed assets and long-term commercial paper.

We start to study the reactions of firms in Brazil to monetary policy beginning in the fourth quarter of 1994, just after the implementation of the Real Plan. The final quarter of the sample period is the fourth quarter of 2007. This choice of the initial quarter of our sample period is important because the high inflation period prevalent in Brazil before the third quarter of 1994 could very much distort our results. The decisions of investment and finance in periods of high inflation can be very different from those of low inflation. In high inflation periods, the

[1] All public firms disclose quarterly balance sheet information.
[2] The information of SERASA and Gazeta Mercantil about private firms is confidential.

information asymmetries get so magnified and monetary policy much less effective that it is not reasonable to discuss credit channels theories of monetary transmission mechanism.

We show in this paper that small firms – those that we consider to have more financial restrictions - react like the bank-lending channel suggests. Their financing through bank loans is negatively related with monetary contractions. This is probably due to their greater dependency on this type of financing in contrast with large firms that they have more access to the external credit market and also more access to both short and long term financing from Banco Nacional de Desenvolvimento Econômico e Social –BNDES - an official development bank.

Other papers, such as Graminho and Bonomo (2002) and Takeda and Nakane (2005) study the bank-lending channel in Brazil. However, they look mostly to the behavior of banks after a shift in monetary policy. Our paper contributes to the literature by concentrating, instead, on the reaction of firms after a shift in monetary policy using micro data.

The structure of the rest of this paper is as follow. In section 2, we survey the literature. In section 3, we describe the data we use in our empirical analysis. In section 4, we perform the empirical analysis related to the reaction to monetary contractions of public and private firms with quarterly balance sheet information. In section 5, we present the empirical analysis related to the reaction of private firms with yearly balance sheet information to monetary contractions. In section 6, we present the main conclusions.

2. SURVEY OF THE BANK LENDING CHANNEL

The bank-lending channel asserts the existence of a Monetary Policy transmission mechanism by which changes in the bank lending level affect the economy. Several authors question the asymmetric treatment given by the traditional view of monetary transmission to currency and credit[3]. While the currency receives a special status, the bank loans, bonds and other financing forms are concentrated at a "bonds market", ruled just by an interest rate (Bernanke and Blinder, 1988).

[3] See Alfaro *et al* (2004), Bernanke and Blinder (1988), Bernanke and Gertler (1995), Kashyap and Stein (1994, 1995).

Nowadays, the literature on the Monetary Policy transmission has been emphasizing the financial intermediary's importance in the provision of the credit. This view asserts that banks and other credit institutions present a special role in the economy. This occurs because these institutions specialize in collecting information and monitoring the performance of the borrowers. Besides, they have the capacity to establish a long run relationship with their customers. These characteristics guarantee to banks comparative advantages when working with asymmetric information problems. Consequently, the bank's ability to finance activities that would not be financed at the capital market gives the banks loans a special status in the credit market (Kashyap and Stein, 1994). In this context, the bank-lending channel arose as a new channel of Monetary Policy transmission.

By the bank-lending channel, the economy can be modeled as being composed of three assets - currency, bonds and bank loans - which differ considerably amongst them and should be analyzed individually when observing the impact of Monetary Policy shocks. In this context, banks can be special in the monetary transmission in two ways: in addition to the creation of fiduciary currency as indicated by the traditional view, the banks lend. Thus, in contrast with the interest rate channel, the Monetary Policy cannot only be transmitted by the impact in the real interest rate, but also through an independent impact in the bank lending level. For instance, even if a monetary contraction has reduced effect on the real interest rate, it can affect the spread between loans and bonds significantly. This affects the investment decisions of the firms that depend on bank loans, which impact the output of the economy (Kashyap and Stein, 1995).

The bank-lending channel indicates that the Monetary Policy transmission works through the following mechanism. In the case of a contracionist monetary shock ($M \downarrow$), the reduction in the economy's reserves level diminishes the supply of deposits (insured financing form) to banks. These suffer a cut in their financing sources and have to reduce the supply of loans. The reduction in the supply of bank credit increases the external finance premium of firms dependent to that financing form. Consequently, the investment level of those companies is reduced ($I \downarrow$), what affects negatively the growth of the economy ($Y \downarrow$) (Kashyap and Stein, 1994).

$$M \downarrow \Rightarrow deposits \downarrow \Rightarrow bank\ lending \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$$

Bernanke and Blinder (1988) identify two necessary conditions to the existence of the bank lending channel[4]. First, there must be firms dependent to bank loans, which are unable to substitute them by other financing forms without costs. Besides, the Central Bank has to be capable to modify the supply of bank loans through the Monetary Policy.

In agreement with Kashyap and Stein (1994), the validity of the first condition requests that firms do not face bank loans and other financing forms as perfect substitutes. In other words, the Modigliani-Miller Theorem (1958) has to fail at least for some firms, so that those are unable to compensate a reduction in the bank loans supply for other financing form (issuing promissory notes, debentures etc). Thus, a reduction in the bank lending level leads some firms to incur in costs associated to the establishment of a new credit relationship. In other words, there is lock-in in the credit market.

To test the first condition, we can analyze the external financing of firms related to bank loans. Bonomo and Graminho (2002) analyze this for Brazil in the year of 2000. They used data of 224 companies extracted from Economatica. The authors found that, on average, the total financial debt of the companies was, in 2000, 41% of outside financing and 22% of the total financing. Besides, 20% of the analyzed companies presented more than 63% of outside financing in bank loans. These results suggest that, in Brazil, a considerable number of companies are dependent of bank lending.

The condition that the Central Bank has to be able to modify the bank credit supply through the Monetary Policy is more controversial. This is because when promoting a contracionist monetary shock, the Central Bank compromises the bank ability to generate insured financing forms (as demand deposits). However, it does not restrict the use of uninsured financing forms, as the issue of Certificates of Deposit (CD's). Thus, for the second condition to be valid, the banks cannot consider insured deposits and other financing forms as perfect substitutes, since that would allow them to compensate the deposits reduction completely.

[4] A third condition is, like in every non-neutrality of money model, that there must be some type of price rigidity (Kashyap and Stein, 1994).

Several authors argue that the proposition above is theoretically dubious. Romer and Romer (1990), for instance, believe that the banks can always be financed, without additional costs, through uninsured financing forms. Indeed, even if a contracionist Monetary Policy shock diminishes the amount of available deposits to the banks, they are able to compensate that reduction through the emission of CD's, promissory notes or other securities. That argument is an application of the Modigliani-Miller Theorem (1958) for the banks.

For the bank-lending channel to be active, one must prove that market frictions, related asymmetric information and agency problems, do not allow that a reduction in the banks deposits to be completely compensated by other financing forms. In other words, the theorem of Modigliani-Miller (1958) cannot be valid for the bank firm. Concluding, the bank-lending channel depends on the flexibility degree of the financial market. The more flexible (guaranteeing financing forms similar to insured deposits), less relevant the bank-lending channel is in an economy.

Kashyap and Stein (1994) test the validity of Modigliani-Miller Theorem (1958) for banks. In other words, they test if there are frictions in the market of uninsured external financing. If we take as example the issue of CD's, which are not insured by the government, we noticed that the quality of the issuing bank is important in the investor's decisions. This occurs because there is some degree of asymmetric information between the issuing bank and the investor so that problems of adverse selection are relevant. These considerations allow cross-sectional differences in the cost of uninsured external financing between banks of different characteristics. Kashyap and Stein (1994) conclude that, as in the case of the no-bank firms, small banks incur in larger costs when substituting between different financing forms than the big ones. This result suggests that the Modigliani-Miller Theorem (1958) is not valid for the bank firm.

The banks can relax the impact the reduction in the insured deposits stock on its loan supply also by selling liquid assets (Kashyap and Stein, 1995). This occurs because the banks can compensate the decrease in their liability side through the reduction of the share of their asset that is more liquid, protecting their loan portfolio. This strategy is justified by the trade-off between liquidity and expected return of the bank. While loans are less liquid and have larger return, bonds and securities are more liquid and have less return. Though, that strategy is only

possible for banks that are more liquid (great proportion of $(Bonds + Securities)/Total\ \ Asset$), since a very low stock of liquid assets can represent risks to the bank.

Empirical studies that try to test the bank lending channel use, in general, two methodologies: the study of aggregate data or micro data. An example that uses aggregate data is Bernanke and Blinder (1992). These authors find evidences that a contracionist monetary shock, represented by an increase in Federal Funds Rate[5], is followed by the reduction in the aggregate level of bank loans. Such a result is consistent with the existence of the bank lending channel, but it also admits another interpretation. The reduction in bank lending level can be caused by a diminution in the demand[6] for loans, and not in the supply of bank credit.

Trying to solve the identification problem found by Bernanke and Blinder (1992), Kashyap et al. (1993) observe how an important substitute to the bank loans, the promissory notes, behave during a monetary contraction. The authors justify that analysis by the following intuition. Suppose that the Monetary Policy operates only through the interest rate channel and that the reduction in the bank lending observed during a monetary contraction is consequence just of the reduction in the demand for credit. If that is true, the demand for no-bank financing forms should also decrease, what would cause a reduction in the level of promissory notes issued. However, if the credit channel is active, a monetary contraction should reduce the supply of bank loans. In that case, promissory notes issue should increase. This indicates that the companies have some ability in substituting their financing sources and that the demand for credit does not explain the decrease in loans level.

Using aggregate data, Kashyap et al. (1993) find that a monetary contraction changes the composition of the external financing of the firms. There is an increase in the promissory notes issuance and a reduction in the amount of bank loans. This result implies that there was a reduction in the supply of bank loans, not in the demand for those, what is consistent with the existence of the bank-lending channel. Besides, the authors observed that the changes in

[5] For a detailed discussion about Monetary Policy instruments, see Bernanke and Mihov (1998).
[6] The demand effect on the bank loans represents the natural reduction in the demand for those resulting from an increase in the interest rate after a monetary contraction. The traditional Monetary Policy transmission channel foresees that effect. The effect that the bank lending channel authors are interested is an independent shock of Monetary Policy over the supply of bank loans.

the external financing composition of the firms affected the investment level. That result implicates that the bank loans and other forms of external financing are not perfect substitutes.

Other authors, in contrast, argue that the results found by Kashyap et al. (1993) can be explained by the fact that, in a recession, big companies present better performance than the small ones, what would make the biggest to demand more credit. Besides, those companies are the ones that issue more promissory notes, what explains the increase in that finance form without proving that there was a reduction in the supply of loans. That identification problem occurs in studies with aggregate data because they do not consider individual characteristics of the agents, what made that practice broadly criticized[7].

The use of micro data allows the analysis of the distributive effects of the Monetary Policy. In other words, during a monetary shock, it is possible to observe differences of behavior among banks with distinct characteristics. This analysis allows us to solve the identification problem between supply and demand for bank loans found by studies with aggregate data. Indeed, several researches have been using that methodology to test the bank-lending channel in distinct countries.

The main conclusion of Kashyap and Stein (2000) is that, for the small banks, Monetary Policy shocks affect more the loan level of the less liquid banks. This occurs because a monetary contraction increases the liquidity constraints of the smaller banks, which, for hypothesis, are not indifferent to insured and uninsured financing sources. Therefore, the banks with more liquid balance sheets are able to protect their loan portfolio, by selling their liquid assets stock. This result confirms the main hypothesis of Kashyap and Stein and the existence of the bank lending channel in the United States during the studied period.

For the Brazilian economy there are some empirical papers in the literature that also use micro data. Graminho and Bonomo (2002) and Takeda and Nakane (2005) analyze the existence and relevance of the bank lending channel in Brazil. Takeda and Nakane (2005) use monthly micro data of Brazilian commercial banks balance sheet from December 1994 to December 2001. These authors consider as Monetary Policy instruments the short run interest rate and

[7] See Bernanke and Gertler (1995), Hubbard (1995), Kashyap and Stein (2000).

the reserve requirements on bank deposits. The results found by Takeda and Nakane (2005) suggest that the impact of the reserve requirements is relevant and stronger on big banks' loans. That can be explained by the progressive nature of the reserve requirements, which affects more strongly banks with larger levels of deposits. Shocks in the interest rate, in contrast, seem not to affect the bank loans level. Concluding, Takeda and Nakane (2005) find evidences that the bank lending channel was active in Brazil during the studied period.

Graminho and Bonomo (2002) test the existence of the bank-lending channel in Brazil based in the methodology of Kashyap and Stein (2000), explained above. These authors conclude that, unlike the expected, positive shocks in the interest rate relax the banks liquidity constraint. By Graminho and Bonomo (2002), this result suggests that increases in the interest rate can be beneficial to the Brazilian banks. This occurs because an increase in the banks profits, caused by the increase of the interest rate, raises the internal financing capacity of those banks, reducing their dependence of deposits as source of financing. That result does not corroborate the existence of a bank lending channel in Brazil.

3. Data

We divide our description of the data in two parts. In the first part, we show how we classify firms in respect to their access to the financial markets. We take size, measured by total assets, as our classification criteria following Gertler and Gilchrist (1994). We observe that size is highly correlated with other financial variables that indicate the capacity firms have to access the financial markets. We classify firms in small and large. We will show that our small firms have relatively less access to the financial markets than large corporations. After sorting out firms, we proceed to explain how we identify the monetary contraction shocks. For this we use the SELIC rate, both nominal and ex-post real, as our main measure of monetary contractions and the Boshen-Mills (1995) index as our second alternative measure.

3.1 Classifying Firms in Large or Small

We have two distinct databases of firms. In both we exclude financial firms. Our main empirical analyses are done with a database composed of 291 public firms and 102 private firms with quarterly financial statements. Our sample period for this database goes from the

fourth quarter of 1994 to the fourth quarter of 2007. The information come from CVM, Economatica and from confidential information of SERASA and Gazeta Mercantil. We also use a database of private firms with end of year financial statements. In this database there are 4,797 private firms. The information related to private firms is confidential and come from Gazeta Mercantil and SERASA. In this case, our sample period goes from 1997 to 2007.

Our interest in separating firms in large and small ones is that, as Gertler and Gilchrist (1994) point out, is that by doing this we can infer the level of access to the financial markets of the corporations. In theory, small firms will depend much more on bank loans than large firms. The latter will also issue much more short and long term commercial paper or debt and have much more access to capital markets, issuing more ordinary and preferred stocks.

In the case of firms with quarterly information, we consider a possible candidate for being small, a firm whose logarithm of total assets is less or equal to the percentile 30 of the distribution of total assets in at least one quarter or year of our sample periods. In a similar fashion, we consider a possible candidate for being a large firm, one whose logarithm of total assets is greater or equal to the percentile 30 in at least one year of our sample periods. By doing this, we obtain 112 small firms and 68 large firms. Of the 68 large firms, 3 are private ones. Of the 112 small firms, 36 are private.

In the case of firms with yearly information, we consider a firm small if its logarithm of total assets is less or equal to the 30 th percentile in at least one year. A firm is large if its logarithm is greater or equal to the 70 th percentile in at least one year. By doing this, we obtain 77 large firms and 102 small firms.

We look at every quarter or year at the skewness of the distribution of small and large. We could have problems in our sample selection if the distribution of small firms were skewed to the right or if the distribution of large firms were skewed to the left. This could indicate that our cut-off for small and large is not a good one. The average of quarterly skewness (considering all periods) we observe for small firms was 0.88 and for large firms was 1.5. In the case of end of the year information, the skewness (considering all periods) was 0.80 for

small firms and 1.25 for large firms. These results indicate that our classification scheme is not a bad one as far as the cut-off is size concerned.[8]

Panel A of Table 1 shows the small and large public and private firms with quarterly information separated by the sector of the economy they belong to. As one would imagine, large firms (23%) come from the concessionaries followed by the food and beverages sector (17%) while small firms come mostly from services sector (14%) followed by the service textile sector (13,0%).

Panel B of Table 1 lists mean values of some financial characteristics of small and large firms for the whole sample relative to its assets. As we can easily verify, large firms have greater long and short-term debt in average than small firms. Large firms also have more fixed assets and net operational revenues as a percentage of total assets. Finally, 53% of large firms (36 firms) have much more outstanding loans at BNDES compared to only 18,0% of small firms (22 firms).

Panel C of Table 1 shows some mean tests for these characteristics considering the financial statements of the last quarters of the years 1999, 2002 and 2005. As one can see all p-values of the differences of characteristics means between large and small are close to 0. Therefore, it seems that small firms in our sample differ from large firms as far as access to the financial market is concerned. They have less access to the financial markets.

Panel D of Table 1 shows the small and large private firms with end of the year information separated by the sector of the economy they belong to. We have 4,797 non-financial firms in our database with balance sheet information for all years from 1997 to 2007. There are 108 large firms and 181 small firms. Of the large firms, 18% come from the food and beverages sector. In the case of small private firms, 26% come from the service sector.

Finally, Panels E and F of Table 4 lists financial characteristics of small and large private firms with end of the year balance sheet information as well mean tests. Large private firms

[8] We also used other classification schemes for robustness analyses, such as a) increasing to 80% the cutoff percentile for large firms and decreasing to 20% the cutoff percentile for small firms; b) considering large and small firms only those that were large and small in every period with the 70% and 30% percentiles. Our empirical results did not change much with these new classifications.

have greater long and short-term debt in average than small private firms and issue more commercial paper. Therefore, it seems that small private firms in our sample differ from large firms as far as access to the financial market is concerned. They seem to have less access to the financial markets.

Table 1. Small and Large Firms with Quarterly and Yearly Data: Financial Characteristics

Our sample is composed of 291 non-financial public corporations and 4.797 private firms. Of the private firms, 102 disclose quarterly information as well as yearly information while all the others disclose yearly information only. The information of the public corporations comes from "Comissão de Valores Mobiliários", CVM, and the information of the private firms comes from confidential information from SERASA and Gazeta Mercantil. We collect financial statements from these corporations starting in the fourth quarter of 1994 and ending in the fourth quarter of 2007. We classify a firm as being large when its logarithm of its total assets is above the percentile 70 in at least one quarter of our sample period. We classify a firm as small when the logarithm of its total assets is below percentile 30 at least in one quarter. Panel A shows small and large firms with quarterly information separated by sectors of the economy. Panel B shows some financial characteristics of small and large firms with quarterly financial statements. Panel C shows the results of mean tests of financial characteristics of small and large firms with quarterly financial statements. Panel D shows small and large private firms with end of the year information separated by sectors of the economy. Panel E shows some financial characteristics of small and large private firms with end of the year financial statements. Panel F shows the results of mean tests of financial characteristics of small and large private firms with end of the year financial statements.

Panel A Small and Large Firms with Quarterly information by Sectors of the Economy

Industries	Large			Small		
	N	Log(Assets)	Net Operational Revenues/Assets	N	Log(Assets)	Net Operational Revenues/Assets
Chemical Petroleum	4	19.01	0.67	1	18.32	0.42
Food and Beverages	11	18.22	0.47	10	17.52	0.44
Mining Metallurgy	4	18.11	0.34	8	17.41	0.61
Electro/Electronic Equiptment	3	18.01	0.52	8	17.31	0.35
Transportation	5	18.46	0.34	6	17.56	0.49
Public Services	16	18.09	0.61	6	17.48	0.63

Textiles	4	18.13	0.33	13	17.43	0.512
Services	3	11.43	0.46	14	8.34	0.44
Others		10.22	0.52		9.23	0.21
Private Firms	9			39		
Total	68			120		

Panel B Financial Characteristics of Firms with Quarterly information

Financial Characteristics	**Large Firms (A)**				**Small Firms (B)**			
	N	**Mean**	**Median**	**Standard Deviation**	**N**	**Average**	**Median**	**Standard Deviation**
Log(Assets)	68	18.21	18.03	4.15	120	17.12	17.01	3.21
Operational revenues/Assets	68	0.63	0.58	0.83	120	0.31	0.15	0.48
Financial Expenses/Assets	68	0.15	0.13	0.32	120	0.09	0.18	0.31
Fixed Assets/ Assets	68	0.43	0.48	0.41	120	0.32	0.31	0.78
ShortTerm Debt/Assets)	68	0.67	0.60	0.96	120	0.44	0.12	0.05
LongTerm Debt/Assets	68	0.21	0.14	0.22	120	0.04	0.02	0.03
BNDES Loans	36				21			

Panel C Mean Tests of Financial Characteristics of Large and Small Firms with Quarterly Information

	Mean Tests		
	4T1994	**1T2000**	**3T2007**
Ln(Assets)	4.312 (0.03)	4.86 (0.03)	5.525 (0.03)
Ln(inventories)	2.510 (0.01)	3.36 (0.03)	2.855 (0.03)
Ln(net operational revenues)	3.430 (0.02)	3.764 (0.02)	4.543 (0.01)
Ln(short term debt)	3.260 (0.00)	3.872 (0.02)	4.754 (0.02)
Ln(longTerm Commercial Paper)	1.620 (0.05)	1.96 (0.03)	1.68 (0.02)

Panel D Small and Large Private Firms with End of the Year Information and Sectors of the Economy

Industries	Large			Small		
	N	Log(Assets)	Net Operational Revenues/Assets	N	Log(Assets)	Net Operational Revenues/Assets
Chemical Petroleum	10	12.16	0.62	8	9.23	0.57
Food and Beverages	20	9.22	0.42	10	10.43	0.35
Mining Metallurgy	10	11.23	0.21	16	10.21	0.26
Electro/Electronic Equiptment	7	10.15	0.52	12	11.12	0.15
Transportation	9	9.22	0.59	21	8.73	0.21
Public Services	14	8.33	0.48	5	7.25	0.46
Textiles	13	8.24	0.13	14	9.24	0.75
Services	6	19.51	0.21	49	11.34	0.61
Others		13.20	0.37		7.02	0.355
Total	108			181		

Panel E Financial Characteristics of Private Firms with End of the Year Information

Financial Characteristics	Large Firms (A)				Small Firms (B)			
	N	Mean	Median	Standard Deviation	N	Average	Median	Standard Deviation
Log(Assets)	108	11.87	11.0	3.51	181	8.32	8.70	4.76
Operational revenues/Assets	108	0.61	0.42	2.65	181	0.31	0.47	0.49
Financial Expenses/Assets	108	0.15	0.05	1.28	181	0.19	0.16	0.29
Fixed Assets/ Assets	108	0.63	0.35	0.43	181	0.47	0.31	0.61
ShortTerm Debt/Assets)	108	0.41	0.41	0.61	181	0.39	0.14	0.51
Short Term Dollar Debt/(Assets)	108	0.25	0.19	0.21	181	0.31	0.37	0.59
LongTerm Commercial Paper/Assets	108	0.32	0.05	0.31	181	0.28	0.23	0.29

Panel F Mean Tests of Financial Characteristics of Large and Small Private Firms with End of the Year Financial Statements

	Mean Tests		
	1997	**2002**	**2004**
Ln(Assets)	3.161 (0.01)	6.23 (0.02)	2.34 (0.02)
Ln(inventories)	1.42 (0.02)	1.76 (0.02)	2.378 (0.01)
Ln(net operational revenues)	2.43 (0.01)	3.62 (0.02)	4.45 (0.03)
Ln(short term debt)	3.03 (0.02)	4.43 (0.01)	4.32 (0.10)
Ln(longTerm Commercial Paper)	2.32 (0.04)	1.25 (0.06)	1.45 (0.08)

3.2 Measures of Monetary Contractions

After having classified firms in small and large, we now move to explain how we define a monetary contraction. A prerequisite for all our tests is a good indicator of monetary policy. However as Bernanke and Mihov (1998) point out there is no consensus in the literature as to the best indicator of monetary stance. We decide to use three measures to indicate monetary contractions: the SELIC rate, both nominal and real ex-post, and the Boshen-Mills (1995). [9]

Bernanke and Blinder (1993) advocate that the interest rate set by the Central Bank in its open market operations is a good indicator of monetary policy except in periods where the interest is very volatile, which was not the case in Brazil in our sample period (that goes from the fourth quarter of 1999 to the fourth quarter of 2007).

We use the quarterly series of the effective nominal and real ex-post SELIC rate. SELIC rate is a nominal interest rate that the Central Bank of Brazil sets as its target in open market operations. The selection of SELIC nominal rate follows Gertler and Gilchrist (1994). To try to capture the inflationary memory - that maybe still important in Brazil in our sample period- we also use SELIC real ex-post rate as an indicator of the stance of monetary policy.

We define a monetary contraction by looking at the first difference of nominal SELIC and real ex-post SELIC rate. A monetary contraction occurs in the quarter in which we observe that the first difference of the SELIC is greater than the mean of the series plus one standard deviation. Panel A and Panel B of Table 2 shows descriptive statistics of the series of the first difference of the SELIC nominal rate and of the SELIC real ex-post real interest rate in several sub samples periods.

Using these criteria, we observe 3 monetary contractions for both nominal and real ex-post SELIC rate. They occur in the following quarters: second quarter of 1995, fourth quarter of 1997 and fourth quarter of 1998.

[9] Bernanke and Mihov (1998) propose another form of identifying monetary shocks, in particular monetary contractions. They build a flexible VAR model that nests previous VARs based on more specific assumptions about FED´s monetary policy, such as funds rate target, and non-borrowed reserves target. The methodology is useful for calculating high frequency monetary shocks or as indicator of the overall stance of monetary policy.

Our third methodology of identifying monetary is related to the Boshen-Mills (1995) index. Boshen and Mills read the FOMC documents and classify monetary contractions in five categories: strongly expansionary, mildly expansionary, neutral, mildly contractionary, and strongly contractionary. The classification is based on relative weights they perceived the FED put on the short-term tradeoff between inflation against unemployment.

To build Boshen-Mills (1995) index for Brazil we read all COPOM documents and other official documents related to the interest rate decision and for each document classified monetary policy in one of the five categories mentioned above. Panel B of Table details the results of our classification. We identify five COPOM meeting that can be categorized as strongly contractionary. These meetings were in the second quarter of 1995, fourth quarter of 1997, the fourth quarter of 1998, the second quarter of 1999 and in the fourth quarter of 2002. The SELIC criteria identified three of these (second quarter of 1995, fourth quarter of 1997, the fourth quarter of 1998). The category with more observations is the neutral category, with more fifteen observations.

Table 2 Monetary Contractions

To define a monetary contraction we use two methods: SELIC rate and the Boshen-Mills (1995) index. Panels A and B shows the quarters of monetary contraction defined by the SELIC nominal and real rate respectively. With this method, We identify a monetary contraction when the first difference of the SELIC rate is greater than the average of the first difference of the SELIC rate plus one standard deviation. Panel C shows the Boshen-Mills index (1995). This method consists in reading all COPOM documents and classifying monetary policy in five categories: very expansionist, moderately expansionist, neutral, moderately contractionist and very contractionist.

Panel A Nominal SELIC rate

	1994/4 to 1998/3	1998/4 to 2002/4	2002/5 to 2007/4	1994/4 to 2007/4	Shocks
Mean of First Difference	-0.018	-0.0019	-0.003	-0.008	0.14
Standard Deviations of First Difference	0.082	0.046	-0.0024	0.057	0.017
Median of First Difference	-0.018	-0.0021	0.0009	-0.0031	0.15

Shocks: 1995/2, 1997/4 and 1998/4

Panel B Real SELIC rate

	1994/4 to 1998/3	1998/4 to 2002/4	2002/5 to 2007/4	1994/4 to 2007/4	Shocks
Mean of First Difference	0.013	-0.0082	0.0138	0.18	0.18
Standard Deviations of First Difference	0.086	0.051	0.0098	0.047	0.08
Median of First Difference	-0.00067	-0.0056	0.0027	-0.0019	0.14

Shocks: 1995/2, 1997/4 and 1998/4

Panel C Boshen-Mills (1995)

	1994/4 to 1998/3	1998/4 to 2002/4	2002/5 to 2007/4
Very Expansionist	3	0	0
Moderately Exansionist	2	5	12
Neutral	1	16	13
Moderately Contractionist	1	13	23
Very Contractionist	2	1	1

Shocks: 1995/2, 1997/4, 1998/4, 1999/2 and 2002/4

After describing our sample of small and large firms as well as our monetary contractions, we proceed to our empirical analysis. We start by looking at firms with quarterly information. We divide it in there distinct parts. In the first place, we try to understand how small and large firms react to monetary policy by looking at some time series evidence of inventories/assets, long-term debt/assets and net operational revenues/assets around the quarters of monetary contractions. In the second place, we do some non-structural analysis of the reaction of small versus large firms considering systems of equations and impulse responses related to a VAR. In the third place, we will proceed by doing two types of structural analyses: a time series analysis with aggregate data or our sample of large and small firms and a individual analysis, by performing a dynamic unbalanced panel with random effects of large and small firms.

4. Empirical Analysis of Public and Private Firms with quarterly Data

We examine in more detail the evidence from the relative movements of bank and nonbank debt, following Oliner and Rudebush (1995). In the case of short-term bank debt, we use the variable Mix. Mix measures the proportion of the financing of firms from bank loans. It is defined as the ratio between total short-term loans and the sum of total short-term loans and other short term financing. In the case we also look at nonbank debt and higher maturities, we use the variable Fin. Fin is the proportion of total bank loans (short and long term) divided by total financing (short and long term).

We use quarterly information of public and private firms. We think that the inclusion of private firms in this case is very important due to the fact that they are naturally more bank dependent than public firms, which can finance themselves with a large array of financial instruments. Thus the inclusion of private firms enhances the quality of our results.

We look at individual data of firms. Mishkin (2001) discusses how monetary contractions enhance the agency costs between firms and financial institutions. Firms in which agency costs of debt are higher are the ones that are more sensitive to monetary contractions in general. In our regressions, to control for possible agency costs we use two variables: the ratio between fixed assets and total assets and a dummy variable indicating if a firms had obtained a financing with BNDES during our sample period. The former gives an idea of the level of collateral firms can, potentially, dispose to offer to financial institutions. The greater this ratio the less the agency costs. The latter is important in Brazil, due to the high costs of capital in the private market of bank loans. Firms that have access to BNDES can decrease their agency costs of debt.

We use (4) to model the dynamics of the first difference of the variables Mix and Fin. We estimate 2 specifications, one more complete including macroeconomic variables and another more in which we exclude these variables. We use a GMM Arellano Bond fixed effect unbalanced panel, as in equation (4) below.[10]

$$X_{it} = \eta + \sum_{k=0}^{1} \delta_k X_{it-k} + \sum_{k=0}^{3} \phi_k M_{t-k} + \sum_{j=0}^{3} \gamma_j \Delta GDP_{t-j} + \sum_{j=0}^{3} \rho_j \Delta \pi_{t-j}$$
$$+ \chi fa_{it} + \alpha BNDES + a_i + \mu_{it} \quad (4)$$

where X can be ΔMix or ΔFin; M is a dummy variable indicating a monetary contraction; fa is fixed assets divided by total assets and BNDES is a dummy indicating that a firm had written debt with the Banco de Desenvolvimento Econômico, BNDES, in our sample period. Panels A and B of Table 3 show the results of the estimation of the each of the dynamics for small and large firms.[11] We present only the sum of the indicators of monetary contractions coefficient. In Panel A of Table 3, we estimate the dynamics of ΔMix. For the 2 specifications

[10] We use Akaike and Shwarz criterion to select the number of lags of the regressors.
[11] We use robust standard errors in our regressions to correct for autocorrelation and heterocedasticity.

of small firms and for the two monetary shocks we see that the sum of the monetary coefficients is negative and significant. On the contrary, for large firms the sum of the coefficients is positive in all circumstances whether significant or not.

In Panel B of Table 3, we estimate the dynamics of ΔFin. Once more for the 2 specifications and for small firms we see that the sum of the monetary contraction coefficients is negative and significant. On the contrary for large firms the sum of the coefficients is positive in all circumstances whether significant or not.

For the 2 variables whose dynamics we study – Mix and Fin - the results we obtain with the panel analysis seem to indicate that small and large firms react very differently to monetary contractions. Small firms are more sensitive to these contractions and they decrease their financing from bank loans differently from what happens to large firms.

As is common knowledge, the effects on the corporate cash squeeze on economic behavior depend largely on firm´s ability to smooth the drop in cash flows by borrowing. Firms that have relatively poor access to credit markets may have to respond to declining cash-flows by cutting production and employment, while firms with good access to credit will face less financial stress.

Our results are in line with those of Gertler and Gilchrist (1994). The authors study the differential impact of a cash squeeze on different types of firms. Just like us, they find striking differences between large and small firms. Small firms who are more likely to have recourse to short-term bank loans typically respond to a contractionary monetary policy by declining the volume of such loans.

Gertler and Gilchrist (1994) also show that small firms are not able to increase short term borrowing after a monetary contraction. They note that large firms increase trade credit to small firms. But this does not offset the decline in loans to small firms. This is something that we could not measure because we did not have the data.

Bonomo and Graminho (2002) suggest that, in Brazil, a considerable number of companies are dependent of bank lending. We think that this dependency is particularly more important

with respect to small financially restricted firms such as the ones whose reactions we report above.[12]After a monetary contraction, the cost of capital increases in Brazil making it more difficult for small firms to obtain new loans.

One possible explanation for our results may be related in some extent to the findings of Valverde and Del Passo (2009). They analyse the financing behaviour of Spanish firms during 1992–2003 is related to their liquidity holdings and how this relationship may affect the effectiveness of the bank lending channel. Their empirical evidence suggests that firms holding high liquid assets may replace bank lending by other sources of financing. Hence, higher liquidity holdings allow firms to invest in attractive investment projects in the event of a tightening of monetary conditions. Our data supports this result. Large firms in our database have much higher working capital as well as other short-term assets than small firms. [13]

Our results differ, however, from those of Oliner and Rudebusch (1995). Their results with data from the manufacturing sector provide no support for the bank-lending channel in the USA. We suspect the differences reside on the fact that we use firms from all sectors of the economy not only from the industrial sector.

To us it seems clear that small firms and large firms react very differently to monetary contractions in Brazil. Maybe the reaction of large firms can be explained by the following reasons: they have more access to the external credit market and also more access to both short and long term financing from Banco Nacional de Desenvolvimento Econômico e Social –BNDES - an official development bank. [14]

[12] In the case of Brazil, there are no papers that we know of that study the bank-lending channel concentrating on the behavior of firms.
[13] Working capital for large firms is twice as large than for small firms.
[14] In all our regressions the dummy variable BNDES is always positive and significant. Large firms have easier access to BNDES than small firms in Brazil.

Table 3 Disaggregated Data for Public and Private Firms with Quartely Data: Panel Analysis

Our sample period is quarterly and goes from the fourth quarter of 1994 to fourth quarter of 2007. We have 291 public corporations and 102 private firms with quarterly information. The information of the public firms is from "Comissão de Valores Mobiliários, CVM and the information of the private firms is confidential information from SERASA and Gazeta Mercantil. We classify these firms in small or large. We classify a firm as large when the logarithm of its total assets is above the 70 percentile in at least one quarter of our sample period. We classify a firm as small when the logarithm of its total assets is below the 30 percentile in at least one quarter of our sample period. We have 2 types of regressions simple and multiple. In the simple regressions we have only as regressors lags of the dependent variable, lags of a dummy variable indicating a monetary contraction. In the multiple regression, we use the same regressors and include the following regressors growth rate of GDP. We use GMM Arellano Bond fixed effects technique. We use the exogenous regressors and lags of total assets as instruments. In Panel A, we show the results for the dependent variable ΔMIX. In Panel B, we show the results for the dependent variable ΔFin.. ΔMIX show the variation in the composition of short term financing of firms; ΔFin shows the variation in composition of total financing of firms. In parenthesis, p-values.

Panel A

	ΔMIX			
	Small		Large	
	Simple Version	Multiple Version	Simple Version	Multiple Version
(1) Sum of ϕ_k				
coefficients	-0.18	-0.51	0.76	0.85
(SELIC)	(0.03)	(0.01)	(0.15)	(0.18)
(1) Sum of ϕ_k				
coefficients	-0.46	-0.34	0.86	0.93
(COPOM)	(0.08)	(0.02)	(0.03)	(0.35)
Adjusted R^2	0.23	0.19	0.51	0.36
Normality test	(0.01)	(0.03)	(0.01)	(0.04)
Serial Correlation				
LM test	(0.78)	(0.67)	(0.54)	(0.36)

White Heteroskedasticity Test	(0.42)	*(0.34)*	(0.71)	*(0.41)*
Sagan Statistic				

Panel B

	Δ Fin			
	Small		Large	
	Simple Version	Multiple Version	Simple Version	Multiple Version
(1) Sum of ϕ_k coefficients (SELIC)	-0.52	-0.41	0.86	0.92
	(0.03)	(0.02)	(0.55)	(0.43)
(1) Sum of ϕ_k coefficients (COPOM)	-0.31	-0.81	0.66	0.87
	(0.04)	(0.04)	(0.02)	(0.02)
Adjusted R^2	0.24	0.18	0.22	0.17
Normality test	(0.00)	(0.00)	(0.00)	(0.00)
Serial Correlation LM test	(0.63)	(0.88)	(0.41)	(0.51)
White Heteroskedasticity Test	(0.51)	*(0.00)*	(0.74)	*(0.00)*

We also estimate the same dynamics with aggregate data and the results are very much alike as Table 4 shows. For all three variables the sum of the coefficients of monetary contractions for small corporations is negative. The contrary happens in the case of large corporations.

Table 4 Aggregated Data for Public and Private Firms with Quarterly Information: OLS Analysis

Our sample period goes from the fourth quarter of 1994 to fourth quarter of 2007. We have 291 public corporations and 102 private firms with quarterly information. The information of the public firms is from "Comissão de Valores Mobiliários, CVM, and the information of the private firms is confidential information from SERASA and Gazeta Mercantil. We classify these firms in small or large. We classify a firm as large when the logarithm of its total assets is above the 70 percentile in every quarter of our sample period. We classify a firm as small when the logarithm of its total assets is below the 30 percentile in every quarter of our sample period. We estimate the following equation for each class of firms

: $X_t = \eta + \sum_{k=0}^{n} \delta_k X_{t-k} + \sum_{k=0}^{n} \phi_k M_{t-k} + \sum_{j=0}^{3} \gamma_j \Delta GDP_{t-j} + \mu_t \quad (2')$, where X is ΔMix, Δ Fin ; ΔMIX show the variation in the composition of mean short term financing of firms; ΔFin shows the variation in composition of mean total financing of firms. In parenthesis p-values.

	ΔMIX	Δ Fin
Aggregate Manufacturing Large Firms		
SELIC	-0.21	0.32
	(0.34)	(0.76)
COPOM	-0.41	0.43
	(0.08)	(0.04)
Aggregate Manufacturing Small Firms		
SELIC	-0.11	-0.23
	(0.94)	(0.54)
COPOM	-0.65	-0.34
	(0.04)	(0.07)
Adjusted R^2	0.97	0.08
Normality test	(0.13)	(0.07)
Serial Correlation LM test	(0.87)	(0.32)
White Heteroskedasticity Test	(0.2)	*(0.56)*

We did several robustness tests: we changed the definition of small and large firms using percentiles 20 and 80 instead of percentiles 30 and 70; we used other instruments such as lags of total assets in our panel estimation; we considered only public firms in our estimation of firms with quarterly data and divided our sample in subsamples, from 1994 to 1999 and from 2000 to 2007. Due to space considerations, we do not report our results. In all cases, our results were similar to the ones we report above.

5. Empirical Analysis of Private Firms with Yearly Information

We repeat the same estimation as in (4) with a database of private firms. As our database of private firms has yearly observations only, we define a monetary contraction in a certain year when it occurs in at least one quarter of that year.

Panels A, B of Table 5 show the results of the estimation of the each of the dynamics for small and large private firms.[15] In Panel A of Table 9, we estimate the dynamics of ΔMix. Once again, for the 2 specifications of small firms and for the two monetary shocks we see that the sum of the monetary coefficients is negative and significant. On the contrary for large firms the sum of the coefficients is positive in all circumstances whether significant or not.

In Panel B of Table 5, we estimate the dynamics of ΔFin. Once more for the 2 specifications and two monetary shocks of small firms we see that the sum of the monetary coefficients is negative and significant. On the contrary for large firms the sum of the coefficients is positive in all circumstances whether significant or not.

For the 2 variables whose dynamics we study – Mix and Fin - the results we obtain with the panel analysis with yearly information of private firms seem to confirm our results with quarterly data that small and large private firms react very differently to monetary contractions. Small private firms are more sensitive to these contractions and they decrease their financing from bank loans differently from what happens to large private firms.

[15] We use robust standard erros in our regressions to correct for autocorrelation and heterocedasticity

Table 5 Disaggregated Data for Private Firms with Yearly Information: Panel Analysis

Our sample period goes from 1997 to 2007. We have 4, 797 private firms in our database. The information of the private firms is confidential information from SERASA and Ggazeta Mercantil. We classify these firms in small or large. We classify a firm as large when the logarithm of its total assets is above the 70 percentile in at least one year of our sample period. We classify a firm as small when the logarithm of its total assets is below the 30 percentile in at least one year of our sample period. We estimate 2 types of regressions for each class of firms. In one of them we have only as regressors lags of the dependent variable, lags of a dummy variable indicating a monetary contraction. In the second type of regressions we use the same regressors and include the following regressors growth rate of GDP. We use GMM Arellano Bond fixed effects technique. We use the exogenous regressors and lags of total assets as instruments. Panel A we show the results for the dependent variable ΔMIX. In Panel B we show the results for the dependent variable ΔFin.; ΔMIX show the variation in the composition of short term financing of firms; ΔFin shows the variation in composition of total financing of firms. In parenthesis, p-values.

Panel A

	ΔMIX			
	Small		Large	
	Simple Version	Multiple Version	Simple Version	Multiple Version
(1) Sum of ϕ_k coefficients	-0.32	-0.71	0.41	0.73
(SELIC)	(0.03)	(0.03)	(0.09)	(0.65)
(1) Sum of ϕ_k coefficients	-0.31	-0.43	0.76	0.73
(COPOM)	(0.07)	(0.23)	(0.08)	(0.78)
Adjusted R^2	0.64	0.32	0.42	0.51
Normality test	(0.12)	(0.03)	(0.35)	(0.48)
Serial Correlation LM test	(0.54)	(0.63)	(0.96)	(0.85)
White Heteroskedasticity Test	(0.54)	*(0.32)*	(0.61)	*(0.81)*

Panel B

	Δ Fin			
	Small		Large	
	Simple Version	Multiple Version	Simple Version	Multiple Version
(1) Sum of ϕ_k coefficients (SELIC)	-1.51	-0.82	0.72	0.92
	(0.07)	(0.09)	(0.64)	(0.03)
(1) Sum of ϕ_k coefficients (COPOM)	-0.17	-0.71	0.66	0.77
	(0.05)	(0.04)	(0.05)	(0.12)
Adjusted R^2	0.73	0.34	0.55	0.34
Normality test	(0.32)	(0.04)	(0.86)	(0.02)
Serial Correlation LM test	(0.97)	(0.78)	(0.61)	(0.73)
White Heteroskedasticity Test	(0.46)	*(0.66)*	(0.78)	*(0.32)*

6. Conclusion

We studied the relevance of the bank-lending channel in Brazil using micro data of 291 public and 4,797 private firms in Brazil. The empirical analysis is based on fixed effects unbalanced panel estimation. The results found in this paper indicate that there are evidences of the existence of an active bank-lending channel in the transmission of the Brazilian Monetary Policy as far as small firms - firms with financial restrictions- are concerned.

Both when using the SELIC rate (nominal and real ex post) and when using the Boshen-Mills index (1995) to identify monetary contractions, we found that small firms decrease their financing using bank loans. This, however, does not happen in the case of large firms.

The reaction of large firms can be explained by the following reasons: they have more access to the external credit market and also more access to both short and long term financing from Banco Nacional de Desenvolvimento Econômico e Social –BNDES - an official development bank.

One important issue that this paper does not address but that we think relevant for future research is the understanding of how important the bank lending channel is in the aggregate. If small firms comprise only a minor part of aggregate supply of the economy in Brazil then it maybe that the asymmetry of responses among large and small firms have little impact on the monetary transmission mechanism.

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