Effects of Monetary Policy on Corporations in Brazil: An Empirical Analysis of the Balance Sheet Channel

Abstract

This paper investigates the transmission mechanism of monetary policy in Brazil. It is an empirical analysis of the effects of monetary policy on the behavior of corporations in Brazil. We use the balance sheet theory to investigate how corporations respond to monetary contractions. Our results show that small corporations are more sensitive to monetary contractions than large corporations.

Keywords: Monetary Transmission Mechanism, Balance Sheet Channel, Central Bank, Monetary Contractions

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1-Introduction

It is by now a well-established fact for OECD economies[1] that traditional monetary mechanisms of monetary policy are not capable of explaining completely the reactions of private agents to monetary shocks. Credit market imperfections related to informational asymmetries between financial institutions and households or firms play an increasing important role in the propagation of monetary policy in these economies.

Contrary to what is known in developed economies, very little is known about non-traditional monetary mechanisms operating in emerging markets. These economies have capital and credit markets much less developed than OECD countries. So one would suspect that market imperfections would play an even greater role in amplifying monetary shocks in these economies. In particular, monetary contractions should create more agency costs between banks and private agents. In the aggregate, this could lead to a much more severe downturn in the economy compared to a downturn if only traditional mechanisms were in place.

This paper fills a gap in the literature of transmission mechanism of monetary policy related to capital market imperfections, by analyzing empirically the impact of monetary shocks in an emerging market such as Brazil. We take account of asymmetries of information between financial institutions and firms. We use credit channel theories of monetary policy, specifically, the balance sheet theory to study the impact of monetary contractions in corporations in Brazil since the implementation of the Real Plan in July 1994.

Brazil is a very special case of an emerging market where asymmetries of information could play a very important role in the transmission mechanism of monetary policy. Brazil has a very interesting financial system. In some of its aspects, like its means of payments for instance, Brazil financial system rivals that of developed countries. However, as far as volume of credit to households and firms and depth of the capital markets is considered, Brazil still lags behind OECD countries.[2]

[1] See Bernanke (1993) or Mishkin (1997).
[2] The total credit to the private sector is around 30% of GNP, while in the USA, for example, it is over 100% of GNP.

The cost of capital in Brazil is very high when compared to international standards. The spread banks charge on their loans even for very good rated companies is well above what is charged worldwide. This high cost of capital creates enormous agency costs between private agents and financial institutions. The consequence of this looking at a micro perspective is that firms invest less and individuals consume also less than they could. In the aggregate, this could imply a very important role to the financial accelerator[3] theories of the monetary transmission mechanism.

One other very important peculiarity of corporations in Brazil is that due to the high costs of capital, many corporations look for a public development bank BNDES - Banco Nacional de Desenvolvimento Econômico e Social- for long term financing. Not only interest rates are much lower but also maturities are much longer. Monetary Policy affects only indirectly the long-term interest rates set by BNDES in its loans.[4]

Credit channel theories can be decomposed in two distinct theories: the bank lending and the balance sheet theories. In the former, monetary contractions increase the adverse selection problems between firms and banks, which may decrease the volumes of loans from banks to firms and households. The reason for this is that banks experience a decrease in the volume of demand deposits that can lead to a decrease in the volumes of loans if they are not able of substituting demand deposits by other financial instruments.

The balance sheet channel of monetary policy arises because the shifts in policy affect not only market interest rates but also the financial positions of borrowers, both directly and indirectly. A tight monetary policy directly weakens borrowers balance sheets in at least two ways. First, rising interest rates directly increase interest expenses, reducing net cash flows and weakening the borrower's financial position. Second, rising interest rates are also typically associated with declining asset prices, which among other things shrink the value of the borrower's collateral. In the aggregate, these effects could a lead to a substantial impact in aggregate demand

[3] This is the how the literature defines credit market imperfections in general terms.
[4] We looked at all off-balance financial statements of corporations in Brazil since July 1994 to verify if a corporation had outstanding loans with BNDES during our sample period. We control for this later on in our empirical analyses.

We document the reactions of firms in Brazil with respect to monetary contractions. We consider monetary contractions because we think they are much more relevant to understand the effects of monetary policy on firms in Brazil than monetary expansions. As Gertler and Bernake (1995) indicate there seems to be even in developed countries much more evidence of firms reacting to monetary contractions than to monetary expansions.

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 small or large. 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, long-term commercial paper, total market value of ordinary and preferred stocks in the market.

We start to study the reactions of corporations in Brazil to monetary policy beginning in the third quarter of 1994, just after the implementation of the Real Plan. The final quarter of the sample period is the third quarter of 2005. This choice of the 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 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.

Our results indicate that small firms in Brazil react somewhat differently from large firms to monetary contractions. Smaller firms seem to be more sensitive to monetary contractions than large firms. Growth rates of inventories divided by total assets, short-term debt divided by total assets, and net operational revenues divided by total assets that are directed linked to the balance sheet explanations of the monetary transmission mechanism respond differently to monetary shocks for small public firms if compared to large public firms. Our results seem robust to structural and non-structural analyses,

different specifications, different sample of firms, different time periods and aggregation or not of data of small and large firms.

The rest of the paper is organized as follows. Section 2 discusses the theoretical background. Section 3 describes the data we use. Section 4 shows non-structural analyses of the data of public firms. Section 5 presents structural analyses with aggregated data of public firms. Section 6 shows individual structural analyses of public firms. Section 7 repeats the individual analysis with data of private firms. Finally, Section 8 concludes.

2. Theoretical Background

Bernanke and Gertler (1983) show that credit channels are not in fact an alternative view to the traditional monetary transmission mechanism. They are a set of factors that amplify the conventional mechanisms. They are a set of mechanisms that enhance the propagation of monetary policy, not an independent or parallel channel. They emphasize how asymmetric information and costly enforcement of contracts creates agency problems in financial markets.

The credit channel considers the existence of a financial premium, that is a difference between the cost of funds raised externally (issued by equity or debt) and the opportunity costs of funds raised internally (by retaining earnings). The size of the external finance premium reflects imperfections in credit markets. The explanation of the dynamics of this premium can improve the timing and strength of monetary policy provided by traditional mechanism.

Credit channels rely on market imperfections. Contrary to traditional monetary transmissions mechanism, credit channel theories depend on some form of informational asymmetry between market participants. Credit channels can be decomposed in two distinct theories: the bank lending and the balance sheet theories.

In the bank lending theory, monetary contractions increase the adverse selection problems between firms and banks, which may decrease the volumes of loans from

banks to firms and households. The reason for this is that banks experience a decrease in the volume of demand deposits that can lead to a decrease in the volumes of loans.

According to this view, banks play a special role in the financial system because they are especially well suited to deal with certain type of borrowers, specifically small and medium firms. If the supply of banks loans is disrupted, bank dependent borrowers may be shut off from credit. Therefore, decreasing the supply of loans is more likely to increase the external finance premium and reduce real economic activity.

The empirical evidence on the bank-lending channel is not very convincing. Mishkin (1996) explains that commercial banks, nowadays, can issue a variety of financial instruments that can serve as substitutes for demand deposits. By doing this, they can relax the restrictions that otherwise would be imposed by a monetary contraction, like for instance, loosing demand deposits.

One interesting approach for testing the credit channel is provided by Kashyap, Stein, and Wilcox (1993). The authors establish a simple model that explains that two necessary conditions must be satisfied if monetary policy is to impact aggregate demand in part through a distinct lending channel. The first condition is that loans and commercial paper must be imperfect substitutes in bank assets. The second condition is that loans and commercial paper must be imperfect substitutes in corporate liabilities.

Contrary, to credit channel theories, balance sheet channel theories of monetary policy focus on the balance sheet of borrowers (households or firms) and not on the institutional details of financial institutions. In the balance sheet explanation, shifts in monetary policy affect the financial situation of borrowers, both directly and indirectly. A tight monetary policy directly weakens borrowers balance sheets in at least two ways. First, rising interest rates directly increase interest expenses, reducing net cash flows and weakening the borrower's financial position. Second, rising interest rates are also typically associated with declining asset prices, which among other things shrink the value of the borrower's collateral.

For firms there is also an indirect effect related to the deterioration in consumers expenses of its products. The firm's revenues will decline while its various fixed or quasi-fixed costs do not adjust in the short run. The financing gap, therefore, erodes the firm's net worth and credit worthiness over time.

Lower net worth means that lenders in effect have less collateral for their loans, and so losses from adverse selection are higher. A decline in net worth, which raises the adverse selection problem, thus leads to decreased lending to finance investment spending.

Lower net worth of business firms also increases the moral hazard problem because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Since taking on riskier investment projects makes it more likely that lenders will not be paid back, a decrease in business firm's net worth leads to a decrease in lending and hence in investment spending. [5]

In contrast to bank lending theory, balance sheet channel theory has had much more success empirically in explaining the reactions of firms to monetary policy, as posited by Gertler and Gilchrist (1994)[6]. Gertler and Gilchrist study the effects of a tightening of monetary policy on large and small manufacturing firms. They find that the effect of cash flow squeeze on economic behavior depend largely on firms' ability to smooth the drop in cash flows by borrowing. Gertler and Gilchrist indicate that in the case of firms, the balance sheet channel can be much more relevant for relatively small firms than for large firms. The classification of small and large firms for them is related to their capacity to access the financial markets.

The large firms can be at least temporally able to maintain their levels of production and employment in the face of higher interest costs and declining revenues through other sources of short-term credit like commercial paper. However, the small firms, who have

[5] Caballero et al (2001) and Caballero et al (2003) are theoretical approaches of the balance sheet theory from the perspective of firms.
[6] See also Krugman (1998) and Krugman (1999).

more limited access to short-term credit markets, tend to loose inventories by cutting work-hours and production. .[7]

The literature on the empirical relevance of balance sheet channel in developed countries is by now well established, Mishkin (1996). However, very little is known in this literature for emerging market economies. Mishkin (2001) stresses that these economies experience much more market imperfections in their financial markets than developed economies. They have much less developed financial markets, in particular much less developed capital markets. Therefore one can infer that balance sheet theory of monetary transmission can be even more relevant in emerging market economies than in developed economies.

The credit view as a whole is interesting and important for several reasons. First, if the credit view is correct, it means that monetary policy can affect the real economy without much variation in the open-market interest rates. Second, the view can explain how monetary contraction influences investment and inventory behavior. Finally, the credit view also implies that the impact of monetary policy on economic activity is not always the same. It is also sensitive to the state of firms' balance sheet and health of the banking sector.

In the next section, we will start describing the data we will later use in our econometric analysis.

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 corporations in small and large. We will show that our small corporations have relatively less access to the

[7] Caballero et al (2001) and Caballero et al (2003) are theoretical approaches of the balance sheet theory

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 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. Our main empirical analyses are done with a database of public firms built on information of quarterly financial statements of public corporations. Our sample period for this database goes from the third quarter of 1994 to the third quarter of 2006.[8]We also use, for robustness analyses, another database of end of year financial statements of private firms. In this case our sample period goes from 1997 to 2004.[9]

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 and have much more access to capital markets, issuing more ordinary and preferred stocks.

Our classification scheme of small and large public firms is the following[10]. Our sample period starts in the third quarter of 1994 and ends up in the third quarter of 2005. In the first place, we exclude from our sample of public corporations in Brazil financial institutions. We exclude from our database firms whose financial statements are not available in all periods, because there were not public firms yet or because they closed their capital, or because there was a takeover or fusion or even because they went bankrupt during our sample period. Our final database is composed of 291 corporations.

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from the perspective of firms.
[8] Economatica and Comissão de Valores Mobiliários, CVM, provide the information.
[9] This is a Gazeta Mercantil database.
[10] Our classification scheme for private firms is similar except that we use yearly financial statements.

Later on, in our empirical analysis we will study the reaction of three variables to monetary contractions. The variables are growth rates of inventories, growth rates of net operational revenues and growth rates of short-term debt. These variables are as Gertler and Gilchrist (1994) stress the most important variables to identify the balance sheet channel. We are assuming that size of firms, which is the criteria we use to select our sample, is independent of these growth rates. This assumption guarantees that our selected sample is unbiased.

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 all quarters. 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 70 in all quarters. To choose the small firms, we consider those that we consider to be small in all quarters. By doing this we obtain 72 small firms and 55 large firms.

We look at every quarter 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 skewness (considering all periods) we observe for small firms was 0.80 and for large firms was 1.5. These results indicate that our classification scheme is not a bad one as far as the cut-off is size concerned.

Panel A of Table 1 shows the small and large public firms separated by the sector of the economy they belong to. As one would imagine, large firms (40%) come from the concessionaries followed by the telecommunications sector (15%) while small firms come mostly from services sector (20%) followed by the textile sector (16%).

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 public firms have greater long and short-term debt in average than small firms. Large public firms also issue much more long-term commercial paper, ordinary and preferred stocks

than small firms. Finally, 78% of large firms (43 firms) have much more outstanding loans at BNDES compared to only 29% of small firms (21 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 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 separated by the sector of the economy they belong to. We have 495 non-financial firms in our database with financial statements for all years from 1997 to 2004. There are 77 large firms and 36 small firms. Once again, large private firms (19%) come from the concessionaries followed by the electrical and electronic sector (16%) while small private firms come mostly from services sector (23%) followed by the textile sector (19%).

Finally, Panels E and F of Table 4 lists financial characteristics of small and large private firms as well mean tests. Large private firms 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.

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 two measures two indicate monetary contractions: the SELIC rate and the Boshen-Mills (1995). [11]

[11] 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

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 third quarter of 1999 to the third quarter of 2005).

We use the quarterly series of the effective SELIC rate. SELIC rate is a nominal interest rate that the Central Bank of Brazil sets as its target in open market operations. We consider this series more relevant to characterize monetary contractions than the real SELIC rate because the latter depends on expectations on inflation. Only recently, have expectations of inflation of the private agents became public. If we use this series therefore this would hamper our capacity to perform empirical tests.

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

Using this criteria, we observe 3 monetary contractions. They occur in the following quarters: fourth quarter of 1997, fourth quarter of 1998 and second quarter of 1999.

Our second 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 since its creation and for each document classified monetary policy in one of the five categories

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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

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 first quarter of 1995, fourth quarter of 1997, the fourth quarter of 1998, the second quarter of 1999 and in the fourth quarter of 2002. Of the four, three (fourth quarter of 1997, the fourth quarter of 1998, the second quarter of 1999) are the same we identify using the SELIC rate methodology. The category with more observations is the neutral category, with more fifteen observations.

After describing our sample of small and large firms as well as our monetary contractions, we proceed to our empirical analysis. 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 growth rates of inventories, short-term debt and net operational revenues 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- Non Structural Empirical Analysis of Public Firms

4.1 Time Series Evidence

We study in this paper the reactions to monetary contractions of growth rates of three variables: inventories divided by total assets, net operational revenues divided by total assets and short-term debt divided by total assets. Inventories are of interest partly because they are important for business fluctuations and partly because they provide some help in identifying the influence of financial factors.

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overall stance of monetary policy.

We construct each one of the three series for small and large firms in following manner. We take an average of each series at every quarter for small and large firms from the third quarter of 1994 to the third quarter of 2005.

Graph 1, 2 and 3 show for each type of firms, small or large, the accumulated and non-accumulated growth rates of each of the three series above with seasonal adjustments around monetary contractions.

We consider in the graphs four quarters of monetary contractions. Three are related to the SELIC criteria, fourth quarter of 1997, fourth quarter of 1998, second quarter of 1999. We include another quarter of monetary contraction defined by Boshen-Mills (1995) index: the third quarter of 2002. A simple visual inspection shows that for small public firms growth rates of inventories, net operational revenues and short-term debt show some much more volatility than the correspondent large public firm series.

Graph 1 shows that in general small public firms immediately after a monetary contraction tend to accumulate inventories at a higher pace, but 2 or 3 quarters after the shock experience a decrease in the growth rate of inventories. In the case of large public firms the pattern of response to monetary contractions differ depending on the quarter the monetary contraction occurs. For the monetary contractions of the second phase of the Real Plan, starting in January 1999, large public firms do not experience a decrease in the growth rates of inventories. The contrary happens in the first phase of the Real Plan, where as much as a 60% decrease in the growth rate of inventories is observed. It seems then that large public firms have more capacity to adjust the dynamics of their inventories than small firms.

In the case of net operational revenues, Graph 2 makes clear that small and large public firms respond very differently. The former after almost all monetary contractions, experience a decrease in the growth rate of operational revenues. In some cases the growth rates decrease as much as 20%. Net operational revenues of large public firms are much less sensitive to monetary contractions on the contrary. They hardly decrease and in most monetary contractions increase after a monetary contraction.

In the case of short-term debt, we also see differences in the responses of small and large public firms. Large public firms seem to respond either decreasing the growth rate in the monetary contractions, like in the fourth quarter of 2002 and fourth quarter of 1998 or increasing the growth rate after others shocks. For small firms the series of short-term debt is less volatile. In all monetary contractions, the large firms after some quarters manage to increase the growth rate of short-term debt, what the small firms are not capable of doing.

After having done a descriptive analysis of the behavior of the growth rates of inventories, short term debt an net operational revenues of small and large firms near monetary contractions, we look at some more formal evidence in the next section. We start by doing some non-structural analysis using systems of equations and a VAR to see how these series react to monetary contractions.

4.2 Systems of Equations

We start with a system of equations approach. Each equation models the dynamic of the growth rate of inventories divided by total assets, short-term debt divided by total assets and net operational revenues divided by total assets.[12] We estimate 2 types of system. In one of them we have only as regressors lags of the dependent variable, lags of a dummy variable indicating a monetary contraction and in the case of the growth rates of inventories and short-term debt we include one lag of net operational revenues. We refer to this system from now as System1. In the second type of system we use the same regressors of System1 and include some lags of macroeconomic variables, such as the growth rate of GDP, inflation rate and the SELIC rate. We call this system from now on System2.

For System1 we choose as regressors 4 lags of the dependent variable and 8 lags of the monetary contraction dummy variables. In the case of inventories and short-term debt

[12] We define short-term debt as the sum of short-term domestic debt and net short term external debt. Net short term external debt is obtained subtracting from short term external debt the short term open positions in foreign exchange swpas

we use also as regressors 4 lags of net operational revenues as regressors. We use the Akaike and Schwarz criteria to identify the number of lags of all the regressors.

We look for empirical evidences that the growth rates of the dependent variables are affected differently by monetary contractions depending if they are small or large. Our null hypothesis in the case of small firms is that the sum coefficients of the monetary contractions dummies are negative. We expect to reject this hypothesis in the case of large firms, though. We estimate all systems using weighted least squares to correct for heterocedasticity and autocorrelation.

Table 3 shows that small and large public firms react differently to monetary contraction. For System1 and System2, we can see that the sum of the coefficients of the dummies that indicate monetary contractions are negative and significant for the growth rates of inventories/assets, short-term debt/assets and net operational revenues/assets of small firms. On the contrary, the sum of the monetary contractions is always positive and in most cases not significant in the case of large firms.

For small public firms and System1, in the case of net operational revenues the sum of the monetary contraction coefficients is –0.87 (p-value 0.0); in the case of inventories/assets the sum of the coefficients is –0.08 (p-value 0.0) and finally in the case of short term debt/assets the coefficient is –0.26 (p-value 0.06). For small public firms and System2, in the case of net operational revenues the sum of the monetary contraction coefficients is –0.93 (p-value 0.04); in the case of inventories/assets the sum of the coefficients is –0.84 (p-value 0.0) and finally in the case of short term debt/assets the coefficient is –0.91 (p-value 0.08).

For large public firms and System1, in the case of net operational revenues the sum of the monetary contraction coefficients is 0.18 (p-value 0.43); in the case of inventories/assets the sum of the coefficients is 1.37 (p-value 0.45) and finally in the case of short term debt/assets the coefficient is –0.34 (p-value 0.14). For large public firms and System2, in the case of net operational revenues the sum of the monetary contraction coefficients is –0.32 (p-value 0.85); in the case of inventories/assets the sum

of the coefficients is 0.61 (p-value 0.18) and finally in the case of short term debt/assets the coefficient is 0.42 (p-value 0.23).

We also estimate other specifications, decreasing the number of lags of monetary policy and other regressors, as well as changing the regressors of several of the specifications. Due to space considerations, we do not the results here but in general they confirm the ones we have just presented.

Next, we look at some evidence of the sensitivity of large and small public firms to monetary contractions by examining impulse response functions of the growth rate of inventories, short-term debt and net operational revenues in a VAR.

4.3 VAR Analysis

We build a 2 variable VAR. Each VAR has as one of its variables the growth rate of inventories divided by total assets, the growth rate of short-term debt divided by total assets and the growth rate of net operational revenues divided by total assets and as another variable the first difference of the SELIC rate. We use the Akaike and Schwarz criteria to define the number of lags of the VAR and consider the first difference of the SELIC rate as the more exogenous variable.

We look at the accumulated impulse response function. As Graph 4 shows the accumulated responses of the growth rates of inventories/assets for small and large public firms are different. The accumulated response after 3 periods for small public firms is negative, although statistically non significant, and the accumulated response for large public firms after 3 quarters is positive and statistically non significant as well. After 10 periods, both accumulated growth rates are positive and non significant.

We repeat the same exercise substituting the growth rate of inventories divided by total assets for the growth rate of short-term debt divided by total assets and for the growth rate of net operational revenues divided by total assets. After 3 periods the accumulated response of the growth rate of short-term debt divided by total assets is negative though non significant for small firms and positive and non significant for large firms. After 10

periods the accumulated responses are positive for large firms and negative for small firms, though again in both cases non significant statistically.

In the case of the growth rate of net operational revenues divided by total assets the accumulated responses are negative for small public firms series and positive for large public firms after 2 periods. After 10 periods both accumulated responses are positive. In all cases, the responses are not statistically significant.

We also test the robustness tests of the previous results. We implement a 4 variable VAR including the inflation rate, the growth of GDP and one of the following variables, inventories, short term debt, operational revenues.[13] In Graph 5 we how the results that are similar to the ones we obtain in previous 2 variable VAR.

We look at the accumulated impulse response function. As Graph 5 shows the accumulated responses of the growth rates of inventories/assets for small and large firms are different. The accumulated response after 3 quarters for small public firms is negative, although statistically non significant, and the accumulated response for large firms after 3 quarters is positive and statistically non significant as well. After 10 periods, the accumulated growth rate of small public firms is negative while that of large public firms is positive, being both statistically non significant.

We repeat the same exercise substituting the growth rate of inventories divided by total assets for the growth rate of net operational revenues divided by total assets and for the growth rate of short-term debt divided by total assets and. After 3 periods the accumulated response of the growth rate of net operational revenues divided by total assets is negative and significant in the case of small firms and positive and significant as well in the case of small firms. After 10 periods the accumulated responses are positive for large firms and negative for small firms, though again in both cases non significant statistically.

[13] The order of the VAR was growth of GDP as the more exogenous variable, followed by the inflation rate, the SELIC and as the more endogenous variable inventories or operational revenues or short term debt.

In the case of the growth rate of short term debt divided by total assets the accumulated responses are negative for the small firms series and positive for large firms after 3 periods. After 10 periods the accumulated responses for small firms are negative and for large firms are positive. In all cases, the accumulated responses are not statistically significant.

The results with both types of VAR do not confirm the evidences presented with the systems of equations approach related to the response of small and large firms to monetary contractions. The great majority of accumulated responses are non significant. However the overall directions of the responses seem to be in line with the results with the systems of equations.

The evidences so far are not conclusive to state that small and large public firms are reacting differently to monetary contractions. To get a much better understanding if this really happening, we need to perform more structural analysis that take in consideration specific aggregate or individual characteristics of small and large firms respectively. Our next section starts to perform such analysis starting with aggregate data of small and large firms.

5. Structural Analysis with Aggregate Data of Public Firms

To perform structural analysis with our aggregate data we need to do two things first. First of all, we need to define a control variable in our regressions that can capture the balance sheet effects of monetary contractions. We also need to specify the dynamics of the growth rates of inventories divided by total assets, short-term debt divided by total assets and net operational revenues divided by total assets.[14]

To capture the balance sheet effects we use a proxy to the one Gertler and Gilchrist (1994) use[15]. We call this variable the balance sheet variable (BS from now on) and define it as the ratio between net operational revenues and financial expenses. The

[14] We use the same dynamics for small and large firms.

[15] The authors use cash flow instead of operational revenues in the numerator. We are not able to do this because information on cash-flows of firms is not public yet in Brazil.

numerator captures the effects of monetary contractions related to the assets side of the balance sheets of the corporations while the denominator captures the effects related to the liabilities side.

We also need to model the dynamics of inventories divided by total assets, short-term debt divided by total assets and net operational revenues divided by total assets. For inventories we follow Gertler and Gilchrist (1994)[16] and model the dynamics of the quotient between inventories and total assets as in equation (1). We divide the dynamics in short term and long term[17]. The long term dynamics is modeled by the co-integration between the ratio of net operational revenues and total assets (from now on R_t), and the ratio of inventories and total assets (from now on St); the short term dynamics is modeled by an AR(1) and by lags of the balance sheet variable.

$$(1)\quad \Delta S_t = a_0 + \alpha_1(\Delta S_{t-1}) + \alpha_2(BS_{t-1}) + \alpha_3(BS_{t-2}) + \alpha_4(BS_{t-3}) + \alpha_5(BS_{t-4}) + \alpha_6(R_t - S_t) + \alpha_7(R_{t-1}) + \varepsilon_t$$

To model the growth rate of quotient between debt (called Debt in the regression) and total assets we use an AR(1) from now on specification including lags of the balance sheet variable and one lag of the growth rate of net operational revenues divided by total assets, following Géczy, Minton and Schrand (1997). The justification for including the ratio between net operational revenues and total assets in this dynamics is that it shows the ability of the firm to provide collateral, which increase the capacity of firms to issue debt. We also include four lags of the balance sheet variable.[18]

$$(2)\quad \Delta Debt = b_0 + b_1 \Delta Debt_{t-1} + b_2 \Delta Debt_{t-2} + b_2(BS_{t-1}) + b_3(BS_{t-2}) + b_4(BS_{t-3}) + b_5(BS_{t-4}) + b_6 \Delta R_{t-1} + \varepsilon_t$$

---

[16] We changed the specification of Gertler and Gilchrist (1994) by considering that $_i(\mathrm{E}_{t-1} S_t) = S_{t-1t}$, that is revenues follow a random walk.

[17] To avoid endogeneity problems all control variables in our regressions are lagged.

[18] Debt is short term debt divided by total assets

As for the growth of net operational revenues divided by total assets, we follow Bathke et al (1984) and model it as an AR(2) process with the inclusion of 4 lags of the balance sheet variable.

(3)

$$\Delta R_t = c + \alpha_1(\Delta R_{t-1}) + \alpha_2(\Delta R_{t-2}) + \alpha_3(BS_{t-1}) + \alpha_4(BS_{t-2}) + \alpha_5(BS_{t-3}) + \alpha_6(BS_{t-4}) + \varepsilon_t$$

We have two null hypotheses for the case of small firms. One is that at least one coefficient of the balance sheet variable is positive. The other is that sum of balance sheet coefficients is positive. Our null hypothesis for large firms is that no balance sheet coefficient is significant or that the sum of the coefficients is negative. It is important to mention that the variable balance sheet captures not only changes in the balance sheet of firms due to monetary policy but also changes that are independent of monetary policy, such as the ones that are related to normal operations of the firms.

Panel A, B and C of Table 3 shows the results of our least squares regressions for the case of small and large public firms. In these panels we show the results considering several specifications. As we would expect on a priori basis, when significant the balance sheet regressor is positive and significant in some lags (or in one lag only) for the small firms specifications or the sum of the balance sheet coefficients is always positive when significant. On the contrary, the balance sheet variable is not positive in any of the large public firms regressions.[19]

In all panels of Table 4, we estimate the dynamics of the growth rates of inventories divide by total assets. We test the overall significance of the regression. We also test for heterocedasticity with White test and autocorrelation with the Breush-Godfrey autocorrelation test . In the presence of heterocedasticity we correct using the Newey West. In the presence of autocorrelation, we include more lags of the dependent variable.

[19] All necessary diagnosis tests were done. In Table 4 we report the LM autocorrelation test, the normality test of the residuals as well as the heterocedasticity tests.

In Panel A, We test 2 specifications for small and large firms: one not including the growth rate of net operational revenue divided by total assets as a regressor (1) in the case of small firms and (3) in the case of large firms and another specification including this term (2) for small firms and (4) for large firms. For specification (1) we see that the lag 2 of the balance sheet regressor is positive 0.23 (p-value 0.0) and the sum of balance sheet coefficients is positive but non significant 0.63 (p-value 0.18). For specification (2) the lag (2) of the balance sheet coefficient is positive and significant 0.23 (p-value 0.0) and the sum of balance sheet coefficients is positive and non significant 0.52 (p value 0.25) is non significant. In the case of large firms, specification (3) and (4) shows that all balance sheet coefficients are negative and non significant as well as the sum of the balance sheet coefficients, -1.02 (p-value 0.23) in the case of specification (3) and –1.36 p-value(0.84) in the case of specification (4).

In Panel B, we test 2 specifications for small and large firms related to the growth rate of short-term debt: one not including the growth rate of net operational revenue divided by total assets as a regressor (5) in the case of small firms and (7) in the case of large firms and another specification including this term (4) for small firms and (6) for large firms. For specification (5) we see that the lag 1 and lag 4 of the balance sheet regressor is positive 0.70 for lag 1 (p-value 0.06) and 0.38 for lag 4(p-value 0.0) respectively. For specification (6) the lag 3 of the balance sheet coefficient is positive and significant 0.72 (p value 0.03) and the sum of balance sheet coefficients is positive and non significant 0.03 (p value 0.22) is non significant. In the case of large firms, neither the balance sheet coefficients nor their sum is significant in any specification.

In Panel C, we test 2 specifications for small and large firms related to the growth rate of net operational revenues: one not including the growth rate of net operational revenue divided by total assets as a regressor (9) in the case of small firms and (11) in the case of large firms and another specification including this term (10) for small firms and (12) for large firms. In the case of large firms, neither the balance sheet coefficients nor their sum is significant in any specification.

We do several robustness tests. We change our sample period. We interact the dummy variable that indicates a monetary shock with all 4 lags of the balance sheet variable.

We also include a control variable that indicates a financial crisis in Brazil in our sample period. In general, our results do not change. Due to space considerations once more we do not report the results.

Our results with the structural analyses with aggregate data are in line with the previous results related to the systems of equations and VARs. Small public firms seem to respond differently to monetary contractions than large public firms do. The results so far indicate that they respond very much like the balance sheet theory of monetary policy would predict. In the next section we look a little deeper in the responses of small versus large firms by looking at individual data on firms. To do this we perform a GMM estimation of an unbalanced dynamic panel with random effects.

6- Individual Analysis of the Responses of Small and Large Public Firms to Monetary Contractions

In this section, we investigate a little further how small and large public firms in our sample respond to monetary contractions. We look at individual data of public firms. By doing this, we use in our regressions control variables that describe several specific characteristics of firms. These characteristics may explain their responses to monetary contractions at an individual level. The characteristics we control for are related to agency costs between the financial markets and firms. Mishkin (2001) discusses how monetary contractions enhance the agency costs between firms and banks. Firms in which agency costs of debt are higher are the ones that are more sensitive to monetary contractions in general.

To verify the existence of agency costs, we use the ratio of market value of firms to the book value of firms and the ratio of fixed assets to total assets. The ratio of market value to book value shows the growth capacity of the firm. The more the market perceives this company as capable of growing, the greater the effects for the company of monetary contractions. The ratio between fixed assets and total assets gives an idea of the level of collateral firms can potentially dispose to offer to banks. The greater this ratio the less the agency costs.

We use as dynamics for the growth rate of inventories divided by total assets, short term debt divided by total assets and net operational equations divided by total assets equations (4), (5) and (6) respectively. The dynamics are similar to the dynamics of the aggregate series except for the inclusion of the following regressors: a binary variable indicating a small firm (Small); an interaction term between Small and BNDES (Small*BNDES) indicating that a small firm had outstanding debt with BNDES during our sample period; an interaction term between the small firm regressor and a lag of the dependent variable; and two variables that try to capture agency costs mentioned above: market value/book value (vmbv) and fixed assets/total assets (fixassets)[20].

(4)

$$\Delta S_{it} = a_0 + \alpha_1(\Delta S_{it-1}) + \alpha_2(BS_{it-1}) + \alpha_3(BS_{it-2}) + \alpha_4(BS_{it-3}) + \alpha_5(BS_{it-4}) + \alpha_6(R_{it} - S_{it}) + \alpha_7(R_{it-1}) + \alpha_8 Small + \alpha_9 Small*BNDES + + \alpha_{10} Small*(\Delta S_{it-1}) + \alpha_{11}(fixassets_{it-1}) + \alpha_{12}(vmbv_{it-1}) + \varepsilon_{it}$$

(5)

$$\Delta D_{it} = a_0 + \alpha_1(\Delta D_{it-1}) + \alpha_2(\Delta D_{it-2}) + \alpha_3(BS_{it-1}) + \alpha_4(BS_{it-2}) + \alpha_5(BS_{it-3}) + \alpha_6(BS_{it-4}) + \alpha_7(R_{it-1}) + \alpha_8 Small + \alpha_9 Small*BNDES + + \alpha_{10} Small*(\Delta D_{it-1}) + \alpha_{11}(fixassets_{it-1}) + \alpha_{12}(vmbv_{it-1}) + \varepsilon_{it}$$

(6)

$$\Delta R_{it} = a_0 + \alpha_1(\Delta R_{it-1}) + \alpha_2(\Delta R_{it-2}) + \alpha_3(BS_{it-1}) + \alpha_4(BS_{it-2}) + \alpha_5(BS_{it-3}) + \alpha_6(BS_{it-4}) + \alpha_8 Small + \alpha_9 Small*BNDES + \alpha_{10} Small*(\Delta R_{it-1}) + \alpha_{11}(fixassets_{it-1}) + \alpha_{12}(vmbv_{it-1}) + \varepsilon_{it}$$

We are interested in the sign of the dummy variable of the small firms. If the balance sheet explanation of the monetary policy is prevalent the sign of this coefficient should

[20] We use robust standard errors and perform IM, Pesaran and Shin unit root test for panel data that confirms that all series are stationary.

be negative. In the case of the agency costs variable, we expect the fixed assets divided by total assets variable to be positive, meaning that firms with more collateral have less agency costs; in the case of market value divided by book value we expect the coefficient to be negative, because firms in which this ratio is higher have more growth opportunities- more projects with positive present value- with less collateral, therefore with more agency costs. As for the balance sheet variables we expect it to be positive in all lags or that that their sum be positive.

We use GMM with random effects- due to the fact that we have dummy variables as regressors that invalidates the use of GMM with fixed effects- Arelano Bond (1991)-. We use White period error robust covariance to control for heterocedasticity and autocorrelation related to the error. We test the endogeneity of the regressors in all estimations with Haussman tests. We test several instruments and over identification of the instruments.[21]

Panels A, B and C of Table 6 show the results of the estimation of the dynamics of growth rates of inventories/total assets, short term debt/total assets and net operational revenues/total assets.[22] As it is evident the coefficient of small firms is significant has the expected negative sign in the great majority of the small firms specifications.

In Panel A of Table 6, we estimate the dynamics of the growth rates of inventories divided by total assets. For all 3 specifications of small public firms we see that the coefficient is negative and significant. In equation (1), coefficient is –0.31 (p-value 0.08), while in equation (2) where we interact the small dummy variable with the first lag of the dependent variable the coefficient is –0.32 (p-value 0.09). Finally, when we interact the regressor BNDES with the regressor, indicating that the small firm has outstanding debt with BNDES, once again the coefficient of small firms is negative and significant, -0.012 (p-value 0.06).

[21] We used as instruments in all estimations four lags of market value divided by book value and four lags of fixed assets divided by total assets. The other instruments were the dummy regressor small and the interactions of small with other variables.

[22] We use robust standard errors in our regressions to correct for autocorrelation and heterocedasticity.

In Panel B of Table 6, we estimate the dynamics of the growth rates of short-term debt. As we can see the small firms coefficient is negative and significant in all 3 specifications. In equation (4), the coefficient is –0.038 (p-value 0.0), while in equation (5) in which we interact the small dummy with one lag of the dependent variable is –0.034 (p-value of 0.0). Finally, in equation (6), when we interact the small regressor with the BNDES regressor we observe that the coefficient is negative and significant -0.037 (p-value 0.0).

In Panel C of Table 6, we estimate the dynamics of the growth rates of net operational revenues divided by total assets. For all 3 specifications of small firms we see that the coefficient is negative and significant. In equation (7), the coefficient is –0.044 (p-value 0.0), while in equation (8) in which we interact the small dummy with one lag of the dependent variable the coefficient is –0.61 (p-value 0.0). Finally, when we consider include as a regressor BNDES a variable that indicates if the firm has access to long term financing, once again the coefficient of small firms is negative and significant, -0.09 (p-value 0.0).

For the 3 variables whose dynamics we study - growth rate of inventories/total assets, growth rate of net operational revenues/total assets and the growth rate of short term debt/total assets- the results we obtain with the panel analysis seem to confirm the results we obtain with both the descriptive and non structural analysis. The results indicate that small and large public firms react very differently to monetary contractions. Small firms seem to be more sensitive to these contractions than large firms.

We also do several other robustness exercises. We try different specifications; change the definition of the balance sheet ratio (using coverage ratio defined as EBIT/interest expenses[23]); use other forms to correct for heterocedasticity and autocorrelation (White Covariance matrix). Due to space considerations, we do not report the results but they confirm in general terms the previous ones.

[23] EBIT is earnings before interest and taxes

The results seem to indicate a relevant asymmetry in the reaction of small and large firms to monetary contractions. This asymmetry reflects different access capacity to the financial markets of corporations in Brazil. Large public firms having more access have more financing alternatives than small firms therefore are able to suffer less discontinuity in terms of investment, revenues and short term financing.

7- Individual Analysis of the Responses of Small and Large Private Firms to Monetary Contractions

We repeat the exercises above with individual data for private firms. Considering the fact that our database has only yearly information of private firms we have to change slightly our previous definition of monetary contractions. We consider a monetary contraction in a certain year if it occurred in the four previous quarters. Therefore, for the following exercise we have only three years with monetary contractions. These are 1998, 1999 and 2002.[24] Panels A, B and C of Table 7 show the results of the estimation of the dynamics of growth rates of inventories/total assets, short term debt/total assets and net operational revenues/total assets.[25] As it is evident the coefficient of small firms is significant has the expected negative sign in the great majority of the small firms specifications.

In Panel A of Table 7, we estimate the dynamics of the growth rates of inventories divided by total assets. For all 3 specifications of small firms we see that the coefficient is negative and significant. In equation (1), coefficient is –0.81 (p-value 0.00), while in equation (2) where we include the ratio of revenues minus inventories scaled by assets the coefficient is –0.11 (p-value 0.09).

In Panel B of Table 7, we estimate the dynamics of the growth rates of short-term debt. As we can see the small firms coefficient is negative and significant in all 3 specifications. In equation (3), the coefficient is –1.21 (p-value 0.00), while in equation

[24] We are sure of how long are the lags of monetary policy. Changing to 2 or three quarters does not alter our results. We also do not have information about if the firms had financing from the BNDES during our sample period.
[25] We use robust standard errors in our regressions to correct for autocorrelation and heterocedasticity.

(4) in which we interact the small dummy with one lag of the dependent variable is –0.91 (p-value of 0.09).

In Panel C of Table 7, we estimate the dynamics of the growth rates of net operational revenues divided by total assets. For all 3 specifications of small firms we see that the coefficient is negative and significant. In equation (5), the coefficient is –0.34 (p-value 0.0), while in equation (6) in which we interact the small dummy with one lag of the dependent variable the coefficient is –0.11 (p-value 0.09).

In all regressions, the marginal effect of being small is much higher for small private firms than for small public firms. Therefore, small private firms seem to be much more sensitive to monetary contractions than their public counterparts. We think that future research could explore more this analysis by incorporating better data on private firms. This would certainly enhance our understanding of the balance sheet channel in Brazil.

8. Conclusion

This paper investigates the balance sheet explanation of the monetary transmission mechanism in Brazil. We look at how small and large companies in Brazil react to monetary contractions.

We use mostly data from public companies to draw most of our main results. Of course, large companies are relatively bigger than private companies. But in Brazil even among relatively larger companies there are differences in the way these companies access the financial markets. Some that we classify as large have much more access than the ones we classify as small.

Our results indicate that small public corporations are much more sensitive to monetary contractions than large firms. The results are robust to several different econometric techniques, both structural and non-structural analyses, several different specifications and different sample periods.

The results seem to indicate that small public firms have more difficulty in accessing the financial markets than large public firms. This creates asymmetries in their responses to monetary policy. The differences in access are very much related to a segmented credit market, where long term financing coming from BNDES is much easier for large corporations, which meet the necessary requisites for the loans.

When we consider private firms in our study, the evidence points to the fact that small private firms are much more sensitive to monetary contractions than their small public firms counterparts. Credit restrictions seem to be even more relevant for these firms than for public firms. However, due to limitations of our database of private firms, we are not very confident in generalizing the results we observed. Considering the great number of private firms in Brazil with small size, we understand that future research on the balance sheet channel should address with much more depth the sensitiveness of small private firms to monetary contractions.

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Table 1. Small and Large Firms: Financial Characteristics

Our sample is composed of 291 non-financial public corporations in Brazil. We collect financial statements from these corporations starting in the third quarter of 1999 and ending in the third quarter of 2005. We classify a corporation as large when its logarithm of its total assets is above the percentile 70 in every quarter of our sample period. We classify a corporation as small when the logarithm of its total assets is below percentile 30 in every quarter. Panel A shows small and large separated by sectors of the economy. Panel B shows some financial characteristics of small and large firms. Panel C shows the results of mean tests of financial characteristics of small and large firms. Finally, Panel D shows correlations between financial characteristics of all the firms in our sample.

Panel A Small and Large Corporations by Sectors of the Economy

Industries	**Large**			**Small**			**Total**
	N	**Log(Assets)**	**Net Operational Revenues/Assets**	**N**	**Log(Assets)**	**Net Operational Revenues/Assets**	
Chemical Petroleum	3	18.35	0.74	0	17.32	0.64	7
Food and Beverages	4	14.22	0.67	6	12.21	0.35	21
Mining Metallurgy	6	19.32	0.35	8	16.43	0.56	21
Electro/Electronic Equiptment	0	13.25	0.43	12	12.11	0.45	28
Transportation	3	12.22	0.68	3	10.23	0.34	16
Public Services	21	19.12	0.61	0	13.25	0.46	41
Textiles	0	12.24	0.43	12	10.24	0.5	28
Services	1	13.43	0.56	15	11.34	0.61	32
Others	17	11.22	0.67	16	10.01	0.35	97
Total	55			72			291

Panel B Financial Characteristics of Corporations

Financial Characteristics	Large Firms (A)				Small Firms (B)			
	N	Mean	Median	Standard Deviation	N	Average	Median	Standard Deviation
Log(Assets)	53	16.99	13.0	3.42	72	11.28	10.50	3.96
Operational revenues/Assets	55	0.61	1.0	0.50	72	0.28	0.0	0.44
Financial Expenses/Assets	55	0.01	0.0	0.18	72	0.04	0.0	0.18
Fixed Assets/ Assets	55	0.56	0.45	0.35	72	0.37	0.41	0.52
Market Value/Book Value	55	0.66	0.0	1.33	72	0.39	0.0	2.64
Preferential Shares /(Assets)	55	0.24	0.0	0.50	72	0.14	0.0	0.64
ShortTerm Debt/Assets)	55	0.70	0.62	0.46	72	0.64	0.02	0.45
Short Term Dollar Debt/(Assets)	55	0.45	0.0	0.35	72	0.32	0.02	0.35
LongTerm Commercial Paper/Assets	55	0.23	0.02	0.31	72	0.15	0.04	0.18
BNDES Loans	43 (78%)				21 (29%)			

Panel C Mean Tests of Financial Characteristics of Large and Small Firms

	Mean Tests		
	4T1994	**1T2000**	**3T2005**
Ln(Assets)	4.315 (0.000)	5.005 (0.000)	5.155 (0.000)
Ln(inventories)	2.626 (0.000)	2.987 (0.000)	2.859 (0.000)
Ln(net operational revenues)	3.186 (0.000)	4.502 (0.000)	4.782 (0.000)
Ln(short term debt)	3.290 (0.000)	4.255 (0.000)	4.333 (0.000)
Ln(longTerm Commercial Paper)	1.25 (0.02)	1.45 (0.04)	1.76 (0.03)

Panel D Small and Large Private Firms by Sectors of the Economy

Industries	Large			Small			Total (2002)
	N	Log(Assets)	Net Operational Revenues/Assets	N	Log(Assets)	Net Operational Revenues/Assets	
Chemical Petroleum	4	14.15	0.72	1	10.24	0.67	215
Food and Beverages	14	12.22	0.60	6	11.21	0.45	239
Mining Metallurgy	5	16.32	0.31	1	12.43	0.36	129
Electro/Electronic Equiptment	12	11.25	0.42	2	10.11	0.25	'34
Transportation	10	10.22	0.69	1	9.73	0.14	101
Public Services	14	11.12	0.59	1	8.25	0.36	42
Textiles	8	10.24	0.23	7	7.24	0.65	345
Services	2	18.51	0.16	8	13.34	0.71	1054
Others	08	14.20	0.57	16	9.02	0.45	5602
Total	77			36			

Panel E Financial Characteristics of Private Firms

Financial Characteristics	Large Firms (A)				Small Firms (B)			
	N	Mean	Median	Standard Deviation	N	Average	Median	Standard Deviation
Log(Assets)	77	13.79	11.0	4.42	36	10.28	10.50	3.96
Operational revenues/Assets	77	0.51	0.9	1.50	36	0.18	0.5	0.44
Financial Expenses/Assets	77	0.12	0.01	2.18	36	0.14	0.03	0.18
Fixed Assets/ Assets	77	0.46	0.35	0.25	36	0.27	0.31	0.52
ShortTerm Debt/Assets)	77	0.51	0.52	0.56	36	0.31	0.02	0.45
Short Term Dollar Debt/(Assets)	77	0.25	0.19	0.21	36	0.12	0.02	0.35
LongTerm Commercial Paper/Assets	77	0.13	0.12	0.11	36	0.08	0.04	0.18
BNDES Loans								

Panel F Mean Tests of Financial Characteristics of Large and Small Private Firms

	Mean Tests		
	1997	**2002**	**2004**
Ln(Assets)	3.216 (0.000)	6.005 (0.000)	2.266 (0.000)
Ln(inventories)	1.435 (0.000)	1.887 (0.000)	2.569 (0.000)
Ln(net operational revenues)	2.347 (0.000)	3.402 (0.000)	4.572 (0.000)
Ln(short term debt)	3.190 (0.000)	4.355 (0.000)	4.453 (0.000)
Ln(longTerm Commercial Paper)	2.25 (0.02)	1.25 (0.04)	1.96 (0.06)

Table 2 Monetary Contractions

To define a monetary contraction we use two methods: SELIC rate and the Bosch-Mills (1995) index. Panel A shows the quarters of monetary contractions defined by the SELIC rate. With this method we identify a quarter of 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 B shows the Boshen-Mills (1995) method. The method consists of reading all COPOM documents and classifing monetary policy in five categories: very expansionist, moderately expansionist, neutral, moderately contractionist and very contractionist.

Panel A SELIC Rate

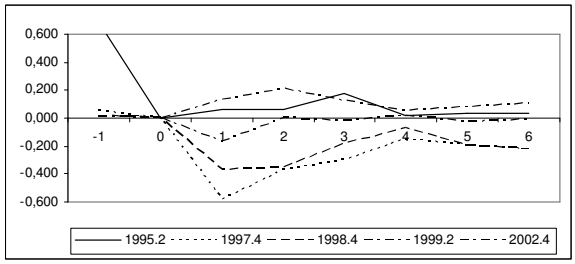
	First Phase of Real Plan	Second Phase of Real Plan	Third Phase of Real Plan	Whole Sample	Shocks
	1994/3 to 1998/4	**1999/1 to 2001/4**	**01/2002 to 2005/4**	**1994/3 to 2005/4**	**1997/4; 1998/4; 1999/2**
Mean of |First Difference|	0.11	0.08	0.08	0.14	0.64
Standard deviations SELIC |First Difference|	0.24	0.09	0.09	0.15	0.18
Median of |First Difference|	0.06	0.053	0.04	0.065	0.32
Mean of Level SELIC	25.88	35.79	19.54	21.85	30.02
Standard deviations of level of SELIC	12.51	20.10	3.65	8.56	22.12
Median level of SELIC	19.88	18.62	19.62	20.12	18.15

Panel B Boshen-Mills (1995)

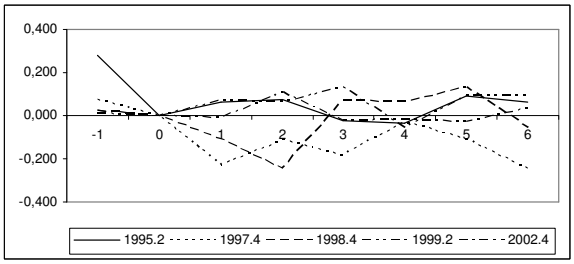
	First Phase of Real Plan	Second Phase of Real Plan	Third Phase of Real Plan
	1996/3 to 1998/4	**1999/1 to 2001/4**	**2001/2 2005/3**
Very Expansionist	3	0	0
Moderately Expansionist	2	5	12
Neutral	1	16	13
Moderately Contactionist	1	13	23
Very Contractionist	2 1995/2, 1997/4 and 1998/4	1 1999/2	1 2002/4

Graph 1 – Growth Rates of Inventories/Assets near Monetary Contractions

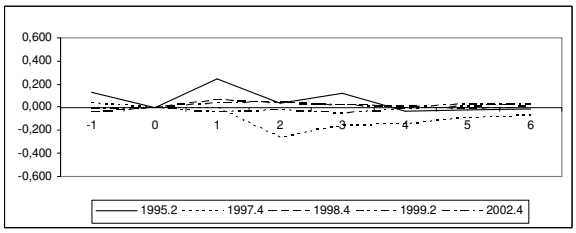
Accumulated Average
Large Firms



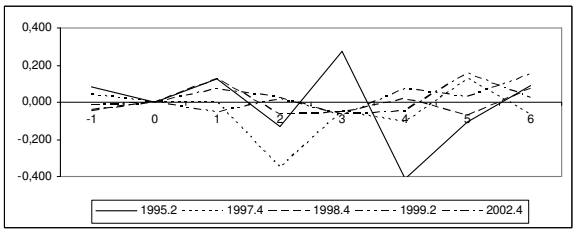
Non Accumulated Averages
Large Firms



Small Firms

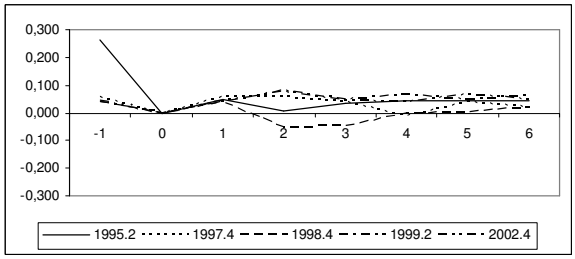


Small Firms

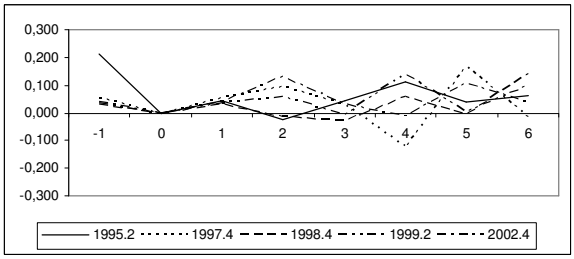


Graph 2 – Growth Rates of Net Operational Revenues/Assets near Monetary Contractions

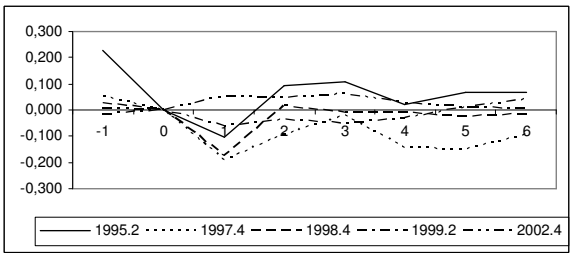
Accumulated Average
Large Firms



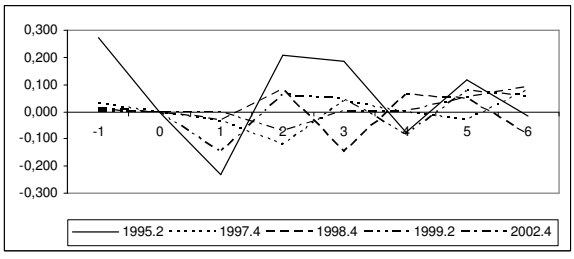
Non Accumulated Averages
Large Firms



Small Firms



Small Firms



Graph 3 – Growth Rates of Short-Term Debt/Assets near Monetary Contractions

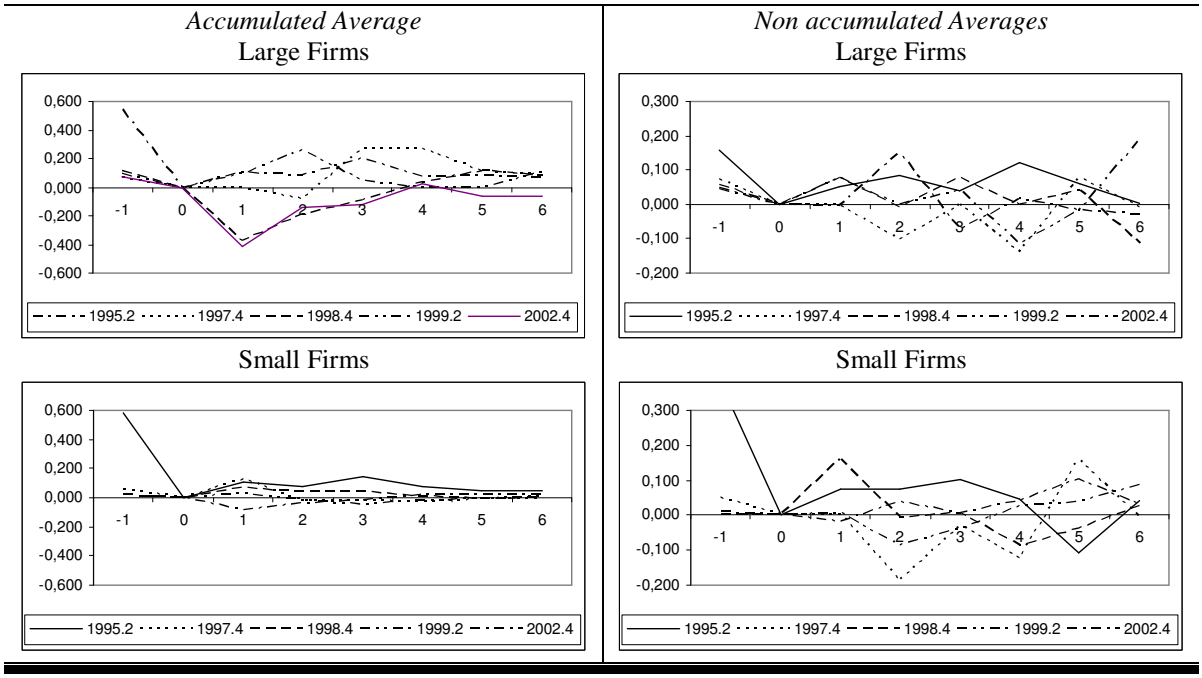
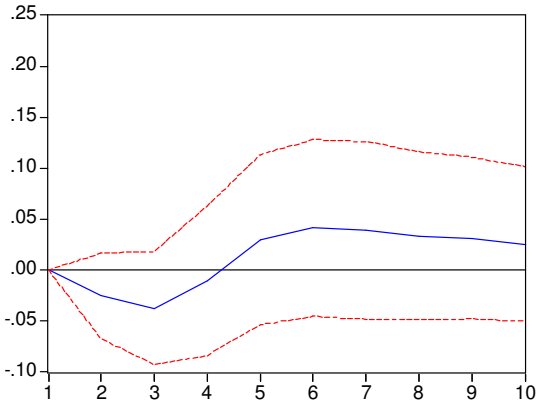
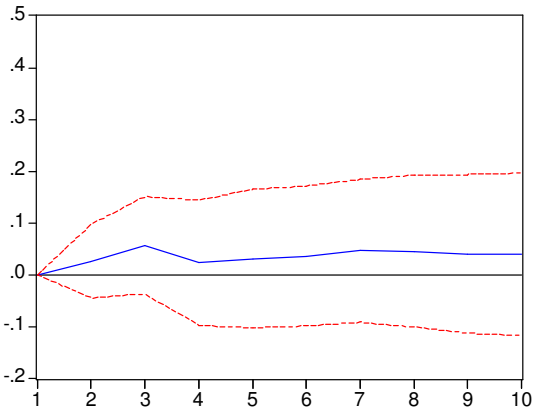
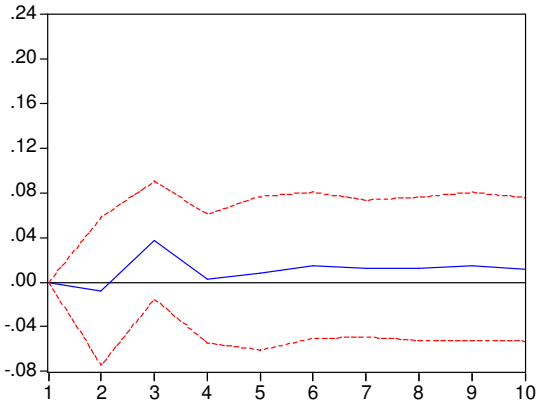
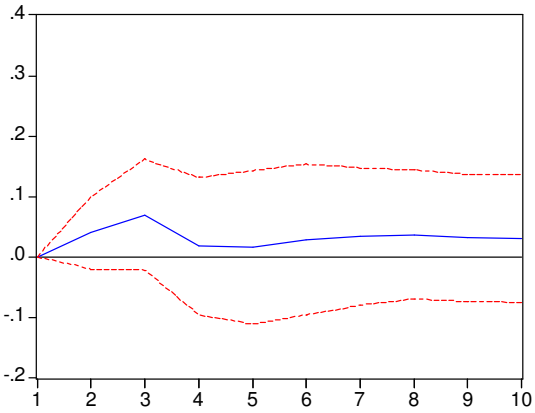
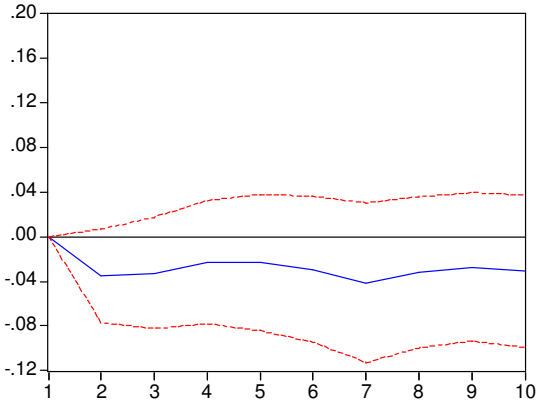
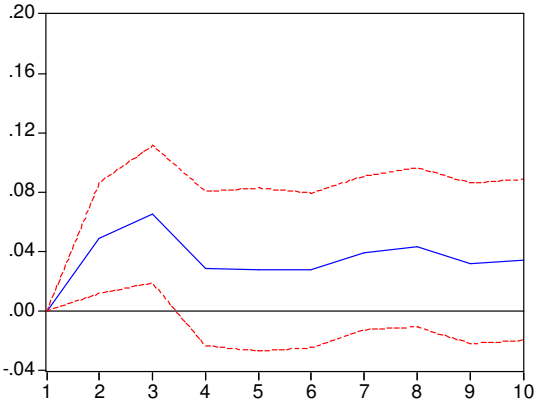


Table 4 – Effects of Monetary Contractions: System of Equations using Generalized Least Squares

Our sample period goes from the third quarter of 1994 to third quarter of 2005. We have 291 non financial firms in our database. We estimate 2 types of system. In one of them we have only as regressors lags of the dependent variable, lags of a dummy variable indicating a monetary contraction and in the case of the growth rates of inventories divided by total assets and short-term debt divided by total assets we include one lag of net operational revenues. We refer to this system from now as System1. In the second type of system we use the same regressors of System1 and include four lags of macroeconomic variables, such as the growth rate of GDP, inflation rate and the SELIC rate. We call this system from now on System2. P-values are in parenthesis. The first parenthesis below the number is the p-value of the Wald test of sum of the monetary contractions coefficient. The second parenthesis below the number is the p-value of the Walt test for the joint significance of the monetary contractions coefficients. We use generalized least squares

System	**Dependent Variable**	**Sum of Coefficients**	
		Small	Large
System1	ΔNet Operational Revenues/Assets	-0.87	0.18
		(0.0)	(0.43)
		(0.23)	(0.23)
	ΔInventories/Assets	-0.08	1.37
		(0.0)	(0.45)
		(0.0)	(0.23)
	ΔShort Term Debt/Assets	-0.26	-0.34
		(0.060)	(0.14)
		(0.07)	(0.01)
	R2	0.85	0.37
	Durbin Watson	2.13	1.97
System2 (macroeconomic variables)	ΔNet Operational Revenues/Assets	-0.93	-0.32
		(0.04)	(0.85)
		(0.02)	(0.72)
	ΔInventories/Assets	-0.84	0.61
		(0.0)	(0.18)
		(0.08)	(0.32)
	ΔShort Term Debt/Assets	-0.91	0.42
		(0.08)	(0.23)
		(0.07)	(0.13)
	R2	0.65	0.87
	Durbin Watson	1.96	1.86
Sample		1994Q3 to 2005Q3	1994Q3 to 2005Q3

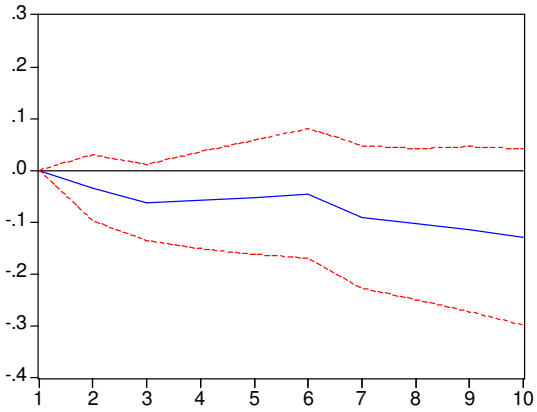
Graph 4 – Accumulated Impulse Responses to Monetary Contractions: VAR with 2 Variables:

Small Firms	Large Firms
ΔInventories/Assets	**ΔInventories/Assets**
	
ΔNet Operational Revenues/Assets	**ΔNet Operational Revenues/Assets**
	
ΔShort Term Debt/Assets	**ΔShort Term Debt/Assets**
	

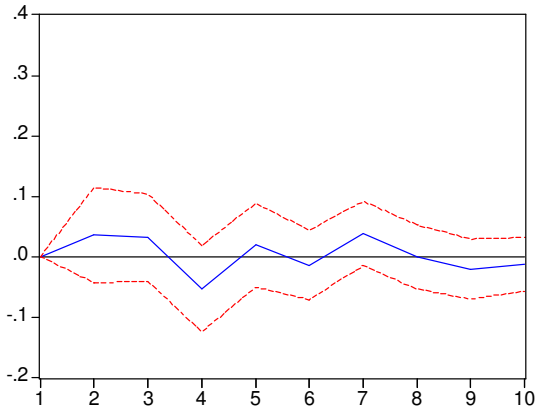
Graph 5 – Accumulated Impulse Responses to Monetary Contractions: VAR with 4 Variables

Small Firms	Large Firms

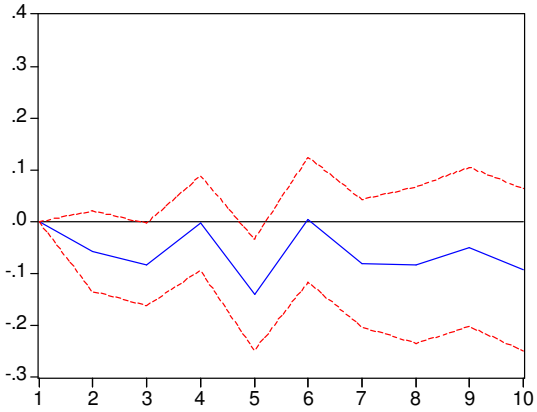
ΔInventories/Assets



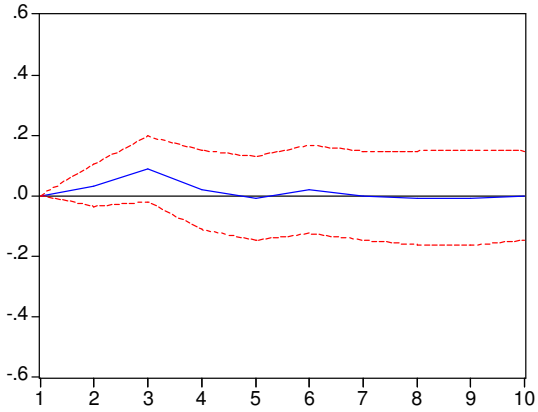
ΔInventories/Assets



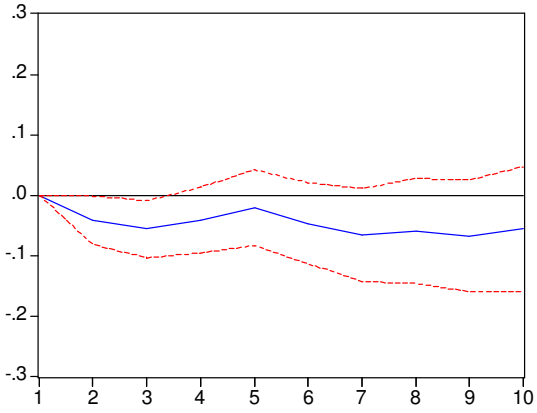
ΔNet Operational Revenues/Assets



ΔNet Operational Revenues/Assets



ΔShort Term Debt/Assets



ΔShort Term Debt/Assets

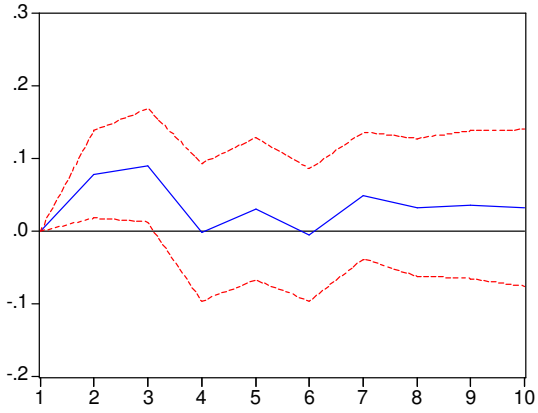


Table 5 OLS with Aggregate Data

Our sample period goes from the third quarter of 1994 to third quarter of 2005. We have 291 non financial firms in our database. Panel A presents the results of OLS estimation for the dynamics related to the growth rate of inventories/ assets. Our main specification follows equation (1) in the text. Panel B presents the results of OLS estimation for the dynamics related to the growth rate of short term debt/ assets. Our main specification follows equation (2) in the text. . Panel C presents the results of OLS estimation for the dynamics related to the growth rate of net operational revenues/assets. Our main specification follows equation (3) in the text. In all estimations, we perform tests for autocorrelation and heterocedasticity of the residuals. In the presence of heterocedasticity we correct we Newey West and in the presence of autocorrelation we include other lags of the dependent variables as regressors. In this last case, we only report the estimated coefficients of the regressors of our main specifications. In parenthesis we have p-values.

Panel A Growth Rate of Inventories/Total Assets

Dependent Variable	Growth Rate of Inventories/Assets (ΔInventories)			
	Small Firms		**Large Firms**	
Equations	**(1)**	**(2)**	**(3)**	**(4)**
Constant	0.17 (0.39)	0.17 (0.64)	0.77 (0.55)	0.68 (0.56)
Δ(Inventories/Assets)(-1)	-0.33 (0.0)	-0.33 (0.09)	0.32 (0.01)	0.32 (0.07)
Balance sheet (-1)	0.23 (0.0)	0.23 (0.09)	-0.59 (0.60)	-0.67 (0.43)
Balance sheet (-2)	-0.18 (0.14)	-0.19 (0.34)	-1.23 (0.29)	-0.13 (0.13)
Balance sheet (-3)	-0.66 (0.55)	-0.67 (0.72)	1.72 (0.16)	0.16 (0.16)
Balance sheet (-4)	-0.01 (0.98)	0.011 (0.99)	-0.92 (0.42)	-0.72 (0.45)
Δ(Net Operational Revenues/Assets)(-1)	-0.17 (0.46)	-0.17 (0.61)	0.29 (0.16)	0.24 (0.26)
Net Operational Revenues/Assets- (Inventories/Assets)(-1)		0.0 (0.97)		0.04 (0.11)
Sum of Balance Sheet Coefficients Wald Test	-0.63 (0.18)	-0.52 (0.25)	-1,02 (0.23)	-1.36 (0.84)
Serial Autocorrelation - LM	(0.17)	(0.18)	(0.37)	(0.45)
Heterocedasticity-White (cross)	(0.0)	(0.03)	(0.66)	(0.43)
Significance of the regression (F)	(0.0)	(0.0)	(0.18)	(0.16)
Adjusted R2	(0.57)	0.55	0.08	0.10
Sample	1994Q3 to 2005Q3	1994Q3 to 2005Q3	1994Q3 to 2005Q3	1994Q3 to 2005Q3

Panel B Growth Rate of Short Term Debt/Total Assets

Dependent Variable Equations	ΔDebt/Assets			
	Small Firms		**Large Firms**	
	(5)	**(6)**	**(7)**	**(8)**
Constant	-0.34 (0.41)	-0.37 (0.37)	-0.77 (0.83)	-0.91 (0.81)
Growth Rate Short Term Debt/Assets(-1)	-1.07 (0.0)	-0.41 (0.68)	-0.70 (0.15)	1.7 (0.77)
Growth rate Short Term Debt/assets(-2)	-0.59 (0.04)	-0.52 (0.09)	-0.19 (0.68)	-0.14 (0.77)
Balance sheet ratio (-1)	0.70 (0.06)	0.42 (0.79)	0.17 (0.86)	5.6 (0.49)
Balance sheet ratio (-2)	0.31 (0.53)	-0.75 (0.64)	0.49 (0.66)	-4.8 (0.55)
Balance sheet ratio (-3)	0.84 (0.0)	0.72 (0.07)	0.43 (0.68)	0.23 (0.83)
Balance sheet ratio (-4)	-0.38 (0.0)	-0.36 (0.03)	-1.1 (0.0)	-0.92 (0.0)
Growth Rate (Operational Revenues)(-1)		-0.95 (0.49)		-3.16 (0.50)
Sum of Balance Sheet coefficients Wald Test	1.47 (0.03)	0.03 (0.22)	-0.01 (0.82)	7.53 (0.80)
Serial Autocorrelation - LM	(0.84)	(0.28)	(0.06)	(0.19)
Heterocedasticity-White (cross)	(0.05)	(0.07)	(0.56)	(0.67)
Significance of the regression (F)	(0.0)	(0.0)	(0.44)	(0.81)
Adjusted R2	0.42	0.41	0.01	0.49
Sample	1994Q3 to 2005Q3	1994Q3 to 2005Q3	1994Q3 to 2005Q3	1994Q3 to 2005Q3

Panel C Growth Rate of Net Operational Revenues/ Total Assets

Dependent Variable	Growth Rate of Net Operational Revenues/Assets			
	Small Firms		**Large Firms**	
Equations	(9)	(10)	(11)	**(12)**
Constant	0.15 (0.49)	0.15 (0.47)	1.11 (0.12)	1.17 (0.12)
Δ(Operational Revenues/Assets)(-1)	0.14 (0.42)	0.14 (0.39)	-0.55 (0.0)	-0.56 (0.0)
Δ(Operational Revenues/Assets) (-2)	-0.56 (0.01)	-0.57 (0.0)	-0.27 (0.03)	-0.27 (0.02)
Balance sheet (-1)	-0.14 (0.31)	-0.46 (0.30)	0.08 (0.92)	-0.01 (0.98)
Balance sheet (-2)	0.31 (0.05)	0.31 (0.04)	-0.13 (0.16)	-1.24 (0.23)
Balance sheet (-3)	-0.004 (0.79)	-0.42 (0.78)	0.097 (0.88)	0.46 (0.55)
Balance sheet (-4)	-0.14 (0.11)	-0.14 (0.11)	-0.28 (0.66)	-0.66 (0.42)
Δ(Inventories/Assets)(-1)	0.0 (0.94)	0.0 (0.94)		0.04 (0.44)
Sum of Balance Sheet Coefficients Wald Test	-0,38 (0.54)	0.71 (0.54)	-0.23 (0.15)	1.45 (0.14)
Serial Autocorrelation - LM	(0.12)	(0.11)	(0.65)	(0.63)
Heterocedasticity-White (cross)	(0.14)	(0.11)	(0.96)	(0.95)
Significance of the regression (F)	(0.0)	(0.70)	(0.04)	(0.95)
Adjusted R2	0.31	0.32	0.18	(0.31)
Sample	1994Q3 to 2005Q3	1994Q3 to 2005Q3	1994Q3 to 2005Q3	1994Q3 to 2005Q3

Table 6. Dynamic Panel with Random Effects: Small and Large Firms-GMM with Random effects

Our sample period goes from the third quarter of 1994 to third quarter of 2005. We have 291 non financial firms in our database. We estimate all dynamic panels using GMM with random effects We correct for heterocedasticity and autocorrelation in all estimations using the use the White period robust covariance matrix. We use random effect for the cross section fixed effect and no period effect. Panel A show the results of the estimation of the dynamics of the growth rate of inventories/assets. Panel B show the results of the estimation of the dynamics of the growth rate of short term debt. Panel C show the results of the estimation of the dynamics of the growth rate of operational revenues. rate of operational revenues lagged 2 periods. The list of instruments for each dynamics is specified below. We perform Haussman tests to verify the endogeneity of the regressors and Partial F test to verify the weakness of our instruments. We use just identified instruments in all estimations. P-values are in parenthesis

Panel A Growth Rate of Inventories/Total Assets

List of intruments:Equations (1):Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small; Equation (2): Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small; Equation (3): Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small and BNDES*PQN

Dependent Variable	Growth Rate of Inventories/Assets		
	(1)	**(2)**	**(3)**
Constant	0.17 (0.06)	0.18 (0.07)	-0.08 (0.23)
Growth Rate of Operational Revenues/Assets(-1)	0.39 (0.30)	0.45 (0.12)	0.06 (0.76)
Balance sheet (-1)	0.002 (0.19)	0.002 (0.19)	0.00014 (0.51)
Balance sheet(-2)	0.002 (0.10)	0.003 (0.11)	0.000489 (0.0575)
Balance Sheet(-3)	-0.000725 (0.49)	-0.00008 (0.48)	0.000052 (0.0)
Balance sheet (-4)	-0.000736 (0.16)	-0.00079 (0.08)	0.000195 (0.11)
Fixed Assets/Assets(-1)	0.15 (0.12)	0.15 (0.12)	0.11 (0.01)
Market Value/Book Value (-1)	-0.022 (0.19)	-0.02 (0.19)	-0.00075 (0.96)
Small	-0.31 (0.08)	-0.32 (0.09)	-0.012 (0.06)
Small* Growth Rate of Operational Revenues/Assets(-1)		-0.22 (0.04)	-1.23 (0.02)
Revenues/Assets – Inventories/Assets (-1)	0.43 (0.15)	0.76 (0.61)	0.19 (0.09)
BNDES*Small			0.099 (0.12)
Sum of Balance Sheet Coefficients Wald Test	0.0024 (0.0)	0.05 (0.15)	0.008 (0.27)
DW	1.65	1.64	2.8
J statistic	0.0	0.0	3.36

Partial F	38.53 (0.0)	30.23 (0.0)	31.24 (0.0)
Sample		1994Q3 2005Q3	

Panel B Growth Rate of Short Term Debt/Total Assets

List of intruments: Equations (4):Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small; Equation (5): Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small; Equation (6): Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small and BNDES*PQN

Dependent Variable	Growth Rate of Short Term Debt/Assets		
	(4)	**(5)**	**(6)**
Constant	0.018 (0.0)	0.015 (0.0)	0.018 (0.0)
Growth Rate of Short Term Debt/Assets(-1)	0.03 (0.91)	-2.37 (0.0)	-0.27 (0.17)
Balance sheet (-1)	0.241 (0.0)	-0.00029 (0.67)	0.00020 (0.0)
Balance sheet (-2)	0.251 (0.00)	0.00018 (0.0)	0.00024 (0.0)
Balance sheet (-3)	-0.00154 (0.13)	-0.00120 (0.0)	-0.00001 (0.20)
Balance sheet (-4)	-0.00482 (0.15)	0.00126 (0.47)	-0.00004 (0.43)
Fixed Assets/Assets(-1)	0.019 (0.0)	0.022 (0.0)	0.02 (0.0)
Market Value/Book Value (-1)	0.052 (0.18)	-0.001 (0.11)	0.00338 (0.26)
Small	-0.038 (0.0)	-0.034 (0.0)	-.037 (0.0)
Small (Growth Rate of Short Term Debt/Assets)(-1)		-1.18 (0.0)	-0.22 (0.26)
BNDES*Small			-0.018 (0.0)
Sum of Balance Sheet Coefficients	0.490 (0.0)	0.00006 (0.04)	0.44 (0.16)
DW	1.45	1.74	2.01
J statistic	0.5	0.20	4.36
Partial F	28.91 (0.0)	34.76 (0.0)	29.02 (0.0)

Sample	1994Q3 2005Q3

anel C Growth Rate of Net Operational Revenues/Total Assets

List of intruments: Equations (7):Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small; Equation (8): Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small; Equation (9): Fixed Assets/Assets(-1 to -4) Market Value/Book Value(-1 to -4) Small and BNDES*PQN

Dependent Variable	Growth Rate of Net Operational Revenue/Assets		
	(7)	(8)	(9)
Constant	0.036 (0.0)	-1.09 (0.0)	0.018 (0.0)
Growth Rate of Net Operational Revenues/Assets(-1)	-0.91 (0.0)	15.22 (0.0)	-0.11 (0.07)
Balance sheet (-1)	0.041 (0.0)	-0.008 (0.0)	0.000058 (0.0)
Balance sheet(-2)	0.048 (0.0)	-0.0087 (0.0)	0.00138 (0.0)
Balance sheet(-3)	-0.003 (0.0)	-0.000094 (0.0)	- 0.0000135 (0.0)
Balance sheet (-4)	-0.0013 (0.0)	0.0041 (0.0)	0.000007 (0.19)
Fixed Assets /Assets(-1)	0.01 (0.0)	0.42 (0.0)	-0.041 (0.0)
Market Value/Book Value(-1)	-0.006 (0.02)	0.83 (0.0)	0.003 (0.01)
Small	-0.044 (0.0)	-0.61 (0.0)	-0.09 (0.0)
Small*growth rate Net Operational Revenues/Assets(-1)		-14.86 (0.0)	-1.34 (0.07)
BNDES*Small			0.11 (0.00)
Sum of Balance Sheet Coefficients	0.98 (0.0)	-0,12 (0.0)	0.0013 (0.0)
DW	1.24	1.30	1.7
J statistic	0.24	0.0	1.95
Partial F	43.23 (0.0)	24.21 (0.0)	39.56 (0.0)

Sample	1994Q3 to 2005Q3

Table 7. Dynamic Panel with Random Effects: Small and Large Private Firms-GMM with Random Effects

Our sample period goes from 1997 to 2004. We have 495 firms in our database, of which 82 are classified as being large and 22 are classified as being small. We estimate all dynamic panels using GMM with random effects. We correct for heterocedasticity and autocorrelation in all estimations using the White period robust covariance matrix. We use random effects and no period effect. Panel A show the results of the estimation of the dynamics of the growth rate of inventories/assets. Panel B show the results of the estimation of the dynamics of the growth rate of short-term debt. Panel C show the results of the estimation of the dynamics of the growth rate of operational revenues. The list of instruments for each dynamics is specified below. We perform Haussman tests to verify the endogeneity of the regressors and a Partial F test to verify the weakness of our instruments. We use just identified instruments in all estimations. P-values are in parenthesis

Panel A Growth Rate of Inventories/Total Assets

List of intruments: Equations (1):Fixed Assets/Assets(-1 to -4) Small; Equation (2): Fixed Assets/Assets(-1 to -4) Small

Dependent Variable	Growth Rate of Inventories/Assets	
	(1)	**(2)**
Constant	0.01 (0.18)	1.22 -0.17
Balance sheet (-1)	0.22 (0.01)	0.12 -0.29
Fixed Assets/Assets(-1)	0.83 (0.01)	0.95 (0.22)
Small	-0.81 (0.00)	-0.11 (0.09)
Small*growth rate inventories/assets(-1)		-1.25 (0.02)
Revenues/Assets – Inventories/Assets (-1)	0.42 (0.91)	0.04 (0.02)
DW	1.71	1.84
J statistic	0	0
Partial F	48.53 (0.00)	50.23 (0.00)
Sample	1997 2004	1997 2004

Panel B Growth Rate of Short Term Debt/Total Assets

List of intruments: Equations (3):Fixed Assets/Assets(-1 to -4) Small; Equation (4): Fixed Assets/Assets(-1 to -4) Small;

Dependent Variable	Growth Rate of Inventories/Assets	
	(3)	**(4)**
Constant	1.23	4.22
	(0.87)	(0.37)
Balance sheet (-1)	0.44	0.51
	(0.09)	(0.59)
Fixed Assets/Assets(-1)	0.31	0.85
	(0.21)	(0.31)
Small	-1.21	-0.91
	(0.00)	(0.09)
Small*growth rate short term debt/assets(-1)		-1.41
		(0.12)
DW	1.31	1.94
J statistic	0	0
Partial F	32.21	80.23
	(0.00)	(0.00)
Sample	1997 2004	1997 2004

Panel C Growth Rate of Net Operational Revenues/Total Assets

List of intruments: Equations (5):Fixed Assets/Assets(-1 to -4) Small; Equation (6): Fixed Assets/Assets(-1 to -4) Small; :

Dependent Variable	Growth Rate of Inventories/Assets	
	(5)	**(6)**
Constant	0.01	1.22
	(0.18)	-0.17
Balance sheet (-1)	0.22	0.12
	(0.01)	-0.29
Fixed Assets/Assets(-1)	0.83	0.95
	(0.01)	(0.22)
Small	-0.34	-0.11
	(0.00)	(0.09)
Small*growth rate net operational revenues/assets(-1)		-1.25
		(0.02)
DW	1.71	1.84
J statistic	0	0
Partial F	48.53	50.23
	(0.00)	(0.00)
Sample	1997 2004	1997 2004