

# Shocks to the Cost of Borrowing and Capital Structure.

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## Abstract

We use the imposition of a non remunerated reserve on short term borrowing in Chile in 1991 as a cuasi natural experiment to test the effects of an increase in the cost of short term borrowing on capital structure and investment. The differential impact of this regulatory measure across firms allows us to perform a difference in differences analysis. We find a drastic drop in short term borrowing of regulated firms that was almost completely offset by additional long term borrowing. The nature of the experiment allows us to isolate a clear causality from changes in the cost of funds to capital structure, solving some of the endogeneity problems present in preexisting literature.

## 1 Introduction

The effect of financing constraints on firm behavior has attracted the attention of empirical corporate finance. The existing literature explores how asymmetric information, agency costs or market imperfections in general may alter the availability of funds and the optimal liability structure of a firm. These problems, in turn, may affect the investment policy of firms. While

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there is abundant literature on financing constraints and investment (See for example Fazzari, Hubbard and Petersen 1988 or Kaplan and Zingales 1997), very few articles have taken care of the potential endogeneity problems that arise in regressions that relate on the one hand the investment policy of the firm and on the other hand measures of its capital structure. The difficulty in this type of exercise is to find an exogenous source of variation for the determinants of firms' capital structure that is uncorrelated with the firm's investment opportunities and, at the same time, has some cross sectional variation across firms. Because this difficulty, just few attempts to isolate the causality from financing constraints to real effects have been developed. Some recent examples of those attempts have shown interesting results. Banerjee and Duflo (2004), use as a natural experiment changes in a direct credit lending program in India and investigate its impact on how both constrained and unconstrained firms reacted to it. They conclude that there is no evidence that directed credit is used as a substitute for other forms of credit. Likewise, Paravisini (2004) uses a credit market intervention in Argentina that changed exogenously the financial position of banks. He finds evidence that banks are liquidity constrained and hold private information about borrowers that hinders substitution of financing sources. Finally, Massa et al (2004) use the inclusion of firms on the S&P500 index as an exogenous shock, where the effect of index addition on the stock price does not depend on the management of firms. They find that companies experience a decrease in their cost of equity and react to this exogenous event by modifying their corporate financial and investment policies.

This paper intends to isolate the causality from changes in the cost of borrowing to capital structure by exploring the effects of the imposition of a legal constraint in foreign borrowing on local firms, taking as a natural experiment a control to short-term capital inflows imposed in Chile in 1991. By using data of financial statements and the amount of foreign borrowing of firms we estimate the effect of this exogenous shock that reduced availability of foreign borrowing for local firms. Figure 2 and Table 1 show the aggregate effect of this measure on foreign denominated loans. In the late 80s and up to 1990, the ratio of short-term debt to total debt denominated in foreign currency was around 90%. However, in 1991 the percentage dropped to 72.7% and it continued decreasing in the following years to finally reach a small portion of the total debt in 1997 (2.8%). This is precisely the period in which the legal constraint in foreign borrowing was in place. The experiment we chose is interesting as long as some firms suddenly and unexpectedly faced

a drastic increase in the cost of their short term funding, while others -those that previously had either restricted access to international markets or those that did not have access to dollar denominated loans at all- remained relatively unaffected. Hence the experiment allows us to evaluate the differential effects of this measure on firms with different exposure to it. By having a clear control group we are able to identify the causal effects the shock has on the capital structure of firms and, in turn, to evaluate the real effects induced by the new capital structure. The size of the effect in terms of cost of capital and availability of funds for affected firms is much larger than in the few experiments already present in the preexisting literature. In addition, the exogenous nature of such a measure allows us to avoid endogeneity, i.e. that the changes in foreign borrowing of firms are led by variations in their investment opportunities.

The exogenous shock that we use in this paper is the imposition of an unremunerated reserve requirement to selective categories of capital inflows by the Central Bank of Chile in June 1991. Under this control, foreign investors were limited to hold a portion of their new short term borrowing denominated in foreign currencies in an unremunerated fixed-term reserve account at the Central Bank, with a minimum of 90 days and up to 1 year. The initial percentage the reserve requirement was 20%.

We first identify firms obtaining foreign borrowing prior to the imposition of the measure to further calculate the propensity of each firm to access foreign capital markets at the time the capital inflow restriction was imposed. This propensity is estimated on the basis of lagged variables over a long period previous to the imposition of the reserve requirement and therefore measures the likelihood of a firm to have access to foreign currency denominated loans at the time when the capital restriction was introduced. Then, we use this propensity to construct a difference in differences estimator that we relate to different capital structure measures. Our results show that firms that were more likely to obtain foreign borrowing were actually restricted by the imposition of this unremunerated reserve requirement, and that they tended to substitute borrowing subject to the capital control for loan categories exempt from it. Furthermore, the effects of controls to capital inflows are not uniform across groups of firms; then firms more heavily affected are those that have relatively more propensity to finance their operations with foreign borrowing.

The effect of this unremunerated reserve requirement has already attracted substantial attention at a macroeconomic level. The existing litera-

ture has concentrated on potential effects on exchange rate appreciation (Soto and Valdés-Prieto 1996), changes in composition of capital inflows (Soto and Valdés-Prieto 1996, Eyzaguirre and Schmidt-Hebbel 1997, and Singh 2000), or the degree of autonomy of the Central Bank in applying its monetary policy (Edwards 1998). At a microeconomic level the focus has been primarily on measuring the impact of the unremunerated reserve requirement on the general balance structure and the cost of capital for firms (Gallego and Hernandez 2003). However, there are no studies that compare the relative impact of the measure according to the relative exposure of firms to foreign borrowing.

Along with the interesting results we obtain related to the effects of financing constraints on firms' policies, some useful insights can be drawn for designing financial policy related to capital controls. These issues might be of particular interest considering the debate ignited about the sources of the instability for international financial markets since the Mexico crisis in 1994-95, as well as the subsequent crisis in Russia, Brazil, and East Asia in 1997-98. Since then, controls to more volatile capital inflows have been considered a useful way to isolate local economies from volatility not related to their underlying economic fundamentals. The evidence provided by this paper indicates that at a microeconomic level, local firms are not uniformly affected by the imposition of such controls, and they tend to adapt their capital structure to the new economic and financial conditions by reducing non-exempted items and substituting them by exempted borrowing. Therefore, in imposing controls some of these findings may be considered.

The rest of the paper is organized as follows: section 2 briefly describes the economic environment in which the rise in capital inflows to Chile led the Central Bank to apply the regulation, as well as it characterizes the unremunerated reserve requirement. Section 3 includes the pre-existing evidence and it justifies the experiment we develop based on the exogeneity of the measure, showing evidence that its imposition was unexpected by local firms, and so it had important effects. Section 4 characterizes the data we used and it describes our identification strategy, including the equations we estimate. In section 5 we show the results of our empirical analysis. In the final section we draw some conclusions.

## 2 Background

### 2.1 Capital Inflows to Chile in late 80s and early 90s

After a period of shortage of foreign currency reserves that followed the 1982 crisis, in the late 1980s and early 1990s Chilean economy faced massive inflows of foreign capital, which averaged 6.2% of Gross Domestic Product (GDP) over the period 1990-94. These inflows made excessive pressure on domestic asset prices and so they resulted in a wealth effect that led to unsustainable increases in consumption and investment. In addition, these foreign capital inflows involved real exchange rate appreciation as demand for Chilean peso increased, which eroded the competitiveness of the exporting-oriented Chilean economic model.

In order to cope with the potential inflationary pressures resulting from the high growth rates in consumption and investment, along with protecting the exporting sector, the Central Bank of Chile decided to increase interest rates of short term public bonds used to adjust the monetary base in January 1990. The increase of 190 basis points encouraged even further international investors to make arbitrage between international and local rates. A significant portion of foreign capital arrived in the form of shorter-term funds (Agosin & Ffrench-Davis, 1996), either as portfolio capital or short-term credits.<sup>1 2</sup>

To deal with the potential source of risk that short term inflows bring with, Chilean authorities adopted policies to partially insulate the economy from their negative impacts, to prevent an excessive appreciation of the currency and to maintain autonomy in the implementation of the monetary policy given the crawling-peg exchange rate rule present at the time. Three instruments were mostly used: (a) imposition of taxes and reserve requirements to capital inflows; (b) a “crawling-peg” exchange-rate policy based on “dirty floating” of the exchange rate with respect to a reference value pegged to a basket of currencies; (c) open-market operations to sterilize the mone-

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<sup>1</sup>The public bonds were the "Pagaré Reajutable del Banco Central" (PRBC) with a maturity of 90 days to 1 year, and the "Pagaré Descontable del Banco Central" (PDBC) with a maturity of 30 days.

<sup>2</sup>While the former was characterized by purchases of debt and equity securities such as stocks, bonds and money-market instruments -and channeled mainly through foreign mutual funds and through offerings of shares of Chilean companies on the New York Stock Exchange via American Depository Receipts (ADRs) (Ffrench-Davis et al., 1995)- the latter, was basically represented by short-term bank lending.

tary effects of exchange-rate transactions. All those measures were framed into a strictly prudent supervision and a continuous deepening of financial markets.<sup>3</sup>

The "dirty floating" of the local exchange rate exposed the Central Bank to an excessive purchasing of international reserves, which were sterilized by doing open-market operations, which pressured local interest rates even more and encouraged capital inflows even further. Because of this difficulty in finding a balance between the monetary and exchange rate policies, the Central Bank established an unremunerated reserve requirement (URR) to prevent the massive inflows of highly volatile capital.<sup>4</sup>

## 2.2 The Unremunerated Reserve Requirement

The Unremunerated Reserve Requirement (URR) was a control to short-term capital inflows imposed by the Central Bank of Chile in June 1991. It required investors to hold a portion of some selective categories of those short-term inflows -minimum of 90 days and up to 1 year- in an unremunerated fixed-term reserve account at the Central Bank. The rate for the URR was initially imposed at 20% for all new foreign borrowings, except for credits provided directly to Chilean exporters by foreign importers whose shipment occurred within six months (trade credit).<sup>5</sup> The reserve requirement was established in the same currency than the credit and the holding period was equal to the loan maturity with a minimum of 3 months and a maximum of one year.

Initially, credits linked to foreign direct investment (FDI) projects, those whose disbursement would occur abroad as well as those that would be used abroad were exempted. Instead of maintaining the required deposit in the unremunerated account, the Central Bank also offered foreign investors the option to pay an equivalent up-front payment, which was the financial cost associated with the portion of the investment that should have been otherwise

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<sup>3</sup>For a description of these policies see Cifuentes et. al. (2002)

<sup>4</sup>The selling of those public bonds at high rates brought up an unbalanced position for the Central Bank balance sheet. As long as the exchange rate continued decreasing – because capital inflows kept strong- Central Bank international reserves decreased in local currency value; on the other hand, bonds that the Central Bank issued to sterilize the increase in monetary base were issued at higher rates.

<sup>5</sup>The new reserve requirement was applied only for the external borrowing starting after June 17, 1991.

maintained at the Central Bank. The up front fee was equal to the product of the relevant foreign interest rate and the fraction of capital subject to the restriction. The relevant interest rate applied was the London Inter-Bank Offered Rate (LIBOR) plus a specified spread.<sup>6</sup>

The URR's features were changed over time between its starting date in June 1991 and September 1998 when it was finally dropped to zero. At the beginning, changes aimed at either to increase the effectiveness of the control or to close existing loopholes that allowed firms to partially elude it. Inversely, when in the second half of the 1990s inflows became scarce, changes were intended to reduce restrictions and so attract foreign capital. Features like the percentage rate or fraction of deposit, the category of the inflows subject to it, the holding period, the foreign currency in which the reserve deposit or fee payment could be denominated, the restrictions on the rollover of maturing investments, and other administrative requirements related to it were modified.<sup>7</sup>

### 3 Impact of the experiment

#### 3.1 Pre-Existing Evidence

Since the Mexico crisis in 1994-95 and the economic debacles in Russia, Brazil, and East Asia in 1997-98, the desirability of capital controls has been in the centre of the economic debate. Prominent economists, including Nobel Laureate Joseph Stiglitz, have advocated for its imposition after those disastrous events.

In particular, the experience of Chile in imposing controls on capital inflows has been extensively studied and often mentioned as a successful example of such controls. However, academic literature has mostly focused on measuring its macroeconomic consequences and their correlation with the policy objectives pursued by the Central Bank. Issues drawn have been: (a) the effectiveness of monetary policy under a crawling peg exchange rate rule (Eyzaguirre and Schmidt-Hebbel 1997, Edwards 1998, De Gregorio, Edwards and Valdés 2000)<sup>8</sup>; (b) the contribution of the URR to a more depreciated

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<sup>6</sup>In July 1991 the margin above LIBOR was fixed at 2.5%.

<sup>7</sup>See Annex 1 for a chronology.

<sup>8</sup>A “crawling-peg” exchange-rate policy based on “dirty floating” of the exchange rate

real exchange rate (Soto and Valdés-Prieto 1996); (c) to what extent URR reduced total capital inflows or changed their composition from short term (or financial) to long-term inflows (or non-financial) (Soto and Valdés-Prieto 1996, Singh 2000)<sup>9</sup>; (d) and to what extent URR partially isolated Chilean economy from contagion from external shocks.

In a microeconomic perspective, some previous literature already gives us some evidence on the impact of the imposition of the URR on the Chilean firms that had access to foreign capital markets. However, the attention has not defined causality; rather it has focused mostly on measuring the effects of capital controls on firms' capital structure. In this regard, by analyzing the effects of URR on 73 Chilean firms during its application, Gallego and Hernandez (2003) find that the URR introduced a distortion that changed the funding patterns and costs of funds for firms, but the effects were, however, not uniform across groups of firms. In terms of the composition of debt, they argue that firms shortened the maturity of debt while, at the same time, reduced the relatively short-term financial debt.

## 3.2 Exogeneity of individual borrowing

The imposition of the URR responded to the reasons already explained in section . The appreciation of the exchange rate, the high growth rates in consumption and investment that increased asset prices, and the necessity to reduce the costly sterilization of the monetary base produced by capital inflows, forced the Central Bank to introduce the capital control. Therefore, there might be considered that a potential correlation between the aggregate expenditure and the imposition of the URR is present. This endogeneity would come from the fact that, at the aggregate level, the excess of expenditure -partly because the increasing foreign borrowing- might have forced the Central Bank to impose the URR. If so, the shock might be related endogenously to the aggregate investment opportunities of firms as a whole.

However, unlike the behavior at the aggregate, individual firms faced the imposition of the reserve requirement as an exogenous shock since they did

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with respect to a reference value pegged to a basket of currencies was in place until September 1999. Since then a free float was adopted.

<sup>9</sup>According to Singh, between 1991 and 1996, short term inflows decreased from 72% of total inflows to just 3.2%. According to Edwards (1999), when residual instead of contractual maturity is used, the proportion of short-term flows is higher.

not internalize their individual contribution to the increase in the aggregate demand for foreign credit. Furthermore, given that our identification strategy relies on the differential impact of the URR across firms we should not be capturing the relationship between aggregate investment opportunities and the imposition of the capital control.

In order to give further evidence of this exogeneity, we first take into account the public information available at the moment in which the URR was introduced, as a way to evaluate if individual firms could foresee the imposition of the URR before it actually was in place. Hence, we searched all the references to unremunerated reserve requirement in the news in all the major financial and non-financial publications available between January 1, 1990 and December 31, 1995.<sup>10</sup>

As it can be seen in Figure 1, there was no public information about the URR either in the first or the second quarter of 1991. The first information about the URR in the international financial news appeared in the third quarter 1991 –specifically in July 1991–, i.e. more than one month later the URR was introduced by the Central Bank. As there is this delay in the appearance about the URR, it is likely that local firms did not expect the introduction of the capital control on short-term foreign borrowing, and it was therefore totally unexpected by the market. After the first news was publicly known, other five references to the URR appeared in 1992, along with three references in 1993, and just one in 1994. The most of the news in the international financial press are concentrated in 1995, when 25 news appeared, which in fact represents more than 71% of the total news appeared in the period considered.

### **3.3 Effect on total borrowing of individual firms**

The natural experiment setting we have chosen may be characterized by its exogeneity, as the shock restricted unexpectedly the supply of foreign borrowing that local firms were able to get. The rough impact of the URR can be seen observing the decrease in aggregate inflows and the change in their composition. Table 1 shows the amount (in USD million) and the composition of the aggregate inflows arrived to Chile between 1988 and 1997, which covers the period in which URR was in place. Also, Table 1 shows the de-

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<sup>10</sup>The news were searched in the Lexis-Nexis database with tickers “reserve requirement AND Chile”, “Encaje AND Chile”, and “Capital Controls AND Chile”.

posits in the Central Bank due to reserve requirements. It can be seen that the composition shifted dramatically after 1990 because URR requirements tend to change the term composition of the capital flows received by Chilean economy towards relatively long term and more stable flows such as foreign direct investment (FDI). In the aggregate, just between 1990 and 1992, the proportion of short term flows into the total flows decreased from 90.3% to 28.9%, and it continued declining up until 1997, when short term flows amounted only 2.8% of the total flows arrived.<sup>11</sup> In particular, between the twelve-months period between December 1990-1991 the decline in the proportion of short term foreign inflows amounted almost 18 percentage points, decreasing to 72.7% at the end of 1991.

Also at individual level local firms were impacted significantly by the URR. Figure 2 shows the behavior of the average foreign debt for firms that received foreign borrowing within a period of twelve quarters, between the first quarter 1990 and the fourth quarter 1992, i.e. six quarters before and after the moment of the imposition of URR. The index was constructed taking into account the average debt for all firms in that twelve-quarters window, and it is 100 for the average of all the firms in the sample. Even though there is a decrease in the second quarter of 1990 (related to the huge effect of the credits of largest companies maturing at that time) it can be easily seen a systematic decline in the index after the third quarter 1991. Although URR was imposed at the end of the second quarter 1991, firms' borrowing was maybe impacted with some delay as there was outstanding borrowing that could not be adjusted automatically. Hence, the decline in the index is consistent with the idea of exogeneity of individual borrowing and that local firms had no expectations of the imposition of URR.

Even though the decrease after third quarter 1991 is clear, we expect that movements in foreign inflows of largest companies represent a heavy proportion of the total. To avoid the problem of excessive weight of large firms into the total effect we calculated the ratio of foreign debt to average foreign debt by firm for the same twelve-month period than in the previous index. Figure 3 shows the average of this ratio for the sample of firms. The decrease in the ratio is significant if we consider that between the first quarter of 1991 and the third quarter of 1991 it declined 28.4%.

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<sup>11</sup>It is noteworthy that URR was in place until mid-1998.

## 4 Methodology

In this paper we intend to find the causal effects of the imposition of controls to capital inflows on the balance structure of firms. We use the imposition of the URR as a shock that exogenously reduced the amount of foreign borrowing that local firms could access to. In so doing, we are able to estimate causality in a context of a natural experiment setting, because the sudden restriction to the availability of foreign funds for local firms is independent of their investment opportunities. This approach, therefore, allows us to find a clean relationship between the behavior of firms and the restrictions they face to access foreign capital, avoiding the potential endogeneity that arises from the fact that the changes in foreign borrowing of firms are led by variations in the marginal productivity of their investments.

### 4.1 Data

Before proceeding with the empirical specifications, we first describe the data sources we used. For our analysis we merged two different datasets containing information of individual firms. The first source we used details information of financial statements of firms -balance sheet and profit and loss statements- between 1986 and 2003 on a quarterly basis. The average number of firms in this sample in each quarter is around 550 firms. These firms correspond to those that have listed public instruments in the Superintendencia de Valores y Seguros in Chile (SVS), and so they are obliged to provide the public with financial information on a quarterly basis, according to the standard "Ficha Estadística Codificada Uniforme" (FECU). Our estimates are based on the sub sample that lasts from the last quarter 1989 to the last quarter 1992, i.e. six months before and after the date the URR was introduced.

The second source we used is also financial information contained in the database Fecus-Plus, which is an electronic database that contains the FECUs in an electronic format. In this case, a panel of 229 firms was constructed on a quarterly basis between the first quarter 1990 and the first quarter 2003. Three additional variables that do not belong to FECUs were added to this database: the foreign private debt per firm, the prices of derivatives transactions (forwards) maturing up to one year, and their amounts. This information is recorded by the Gerencia de Análisis y Operaciones Internacionales and the Gerencia de Comercio Exterior y de Política Comercial of the Central Bank of Chile. Given that firms must inform the amount of

foreign borrowing they received to the Central Bank of Chile in order to meet exchange rate regulations at the time, we were able to identify a subset of firms with the characteristic of having actually received foreign borrowing in that period. In this database each observation represents an inflow for the firm  $i$  in the period of time  $t$ . There were 76 firms in the sub sample that actually received foreign debt, either in some or all the twelve quarters.

## 4.2 Identification Strategy

In order to identify the differential effect of the imposition of the URR across firms we first constructed a measure of the propensity of different firms to raise funding denominated in foreign currency. To do so we run a probit regression on the six quarters previous to the imposition in which the dependent variable is a dummy variable ( $Debt_{it}$ ) that takes value zero for firms that do not have any debt denominated in foreign currency and value one whenever firms do use foreign denominated debt. As independent variables we use four lags of total assets ( $Assets$ ) as a size variable, four lags of the return on assets before interest and taxes ( $ROA$ ) as a profitability measure, a general time trend and sector specific dummies. This first stage of our analysis can be summarized in Expression 1 where the subindex  $i$  corresponds to each firm,  $t$  to each period (quarter),  $j$  to the relevant sector and  $k$  corresponds to the number of lags.

$$Debt_{it} = \alpha + \sum_{k=1}^4 \beta_{t-k} Assets_{it-k} + \sum_{k=1}^4 \gamma_{t-k} ROA_{it-k} + \lambda t + \delta_j + \varepsilon_{it} \quad (1)$$

We then predict the propensity of each firm in our sample to hold foreign debt at the moment of the imposition of the URR defining a new variable  $Propensity_i = \widehat{Debt}_{i1991,2}$ . The definition of this variable plays two roles in our identification strategy:

The first role is to have an exogenous measure of the exposure of firms to the impact of the URR that does not depend directly on the amount of debt that they were holding at the moment of its imposition. Given that  $Propensity$  is calculated as a function of lagged variables it does not suffer from the possible endogeneity problems that could arise if we used as a measure of exposure the effective use of foreign debt. Furthermore some firms might not have used foreign debt when the URR was imposed but were affected by the measure because the cost of potential future access to it was

increased. As  $Propensity_i$  captures the likelihood that a firm used foreign debt this problem is at least partially mitigated.

The second role is to expand the sample of firms that we can use for our analysis. The  $Debt_{it}$  variable corresponds to the more restrictive sample of 229 firms for which we have more detailed data, while all the right hand side variables in Expression 1 correspond to the full sample of 550 firms.

Once we have constructed our  $Propensity$  measure we use it to run standard difference in differences regressions to assess the impact of the introduction of the URR on different aspects of the firms' capital structure and behavior. For this analysis we use the six quarters previous to the introduction of the URR and the six quarters after its introduction. The  $Propensity$  measure is used as a continuous treatment. The structure of each of these regressions can be seen in expression 2:

$$Y_{it} = \theta PropensityExp + \alpha + \sum_{k=1}^4 \beta_{t-k} Assets_{it-k} + \sum_{k=1}^4 \gamma_{t-k} ROA_{it-k} + \delta_i + \mu_t + \varepsilon_{it} \quad (2)$$

Where  $PropensityExp$  takes value zero in all periods prior to the introduction of the URR and value equal to  $Propensity$  in all periods after its introduction. The parameter of interest of this second stage is  $\theta$  that measures the differential change in  $Y_{it}$  between a hypothetical firm that had a 100% probability of using foreign debt and a firm with no probability at all of using it. The inclusion of individual fixed effects and time dummies guarantees that the regression does not capture any preexisting differences between the treated and non treated firms nor a general time change on the dependent variable.

The dependent variables included in the second stage of regressions are all measures of capital structure measured as a proportion of the total assets of the firm. In particular *short term debt* corresponds to the short term debt of the firm (maturity below one year) over total assets, *extended short term debt* also includes the portion of long term debt with maturity lower than one year, *long term debt* measures the long term debt of the firm as a proportion of total assets, *total debt* is the leverage ratio of the firm, *short term liabilities* includes short term debt and other liabilities such as promised dividends or provisions over total asset, *long term liabilities* is the equivalent ratio for maturities longer than one year and excludes the net value of the firm. Finally *trade credit* is the ratio of trade credit over total assets.

## 5 Results

### 5.1 First stage

Table 2 shows the results of the probit regression corresponding to the first stage of our estimation. The total number of observations is 6,265 and the R-square of this regression is 0.187. The most significant variable is year (trend) that has a negative relationship with *Propensity*. The variable quarter (not reported) is also significant. All the other variables, i.e. the four lags in total assets (*logtotalassets*), and the four lags in ROAII help to explain *Propensity*, although their individual statistical significance is low. In general, the relationship between *Propensity* and lags in total assets (*logtotalactivos*) is positive (except the first lag), while it is negative in the case of the lags of ROAII. Note that while individually each of the coefficients associated with the independent variables is not statistically significant at 95% confidence level, the joint explanatory power of these variables is relatively high, reaching an  $R^2$  of 19%.

### 5.2 Second stage

Table 3 shows the estimated parameters for the second stage. There is a negative and significant relationship between *PropensityExp* and *short term debt*, as well as to the *extended short term debt* (Columns 1 and 2). The reduction in short-term debt is almost 2.75%, while in the case of the extended short term debt the decrease is 1.93%. If we consider that the difference between the first and the third quartile is 0.21 percentage points, therefore the differential effect in short term debt is 0.57% (in the case of the extended short term debt the differential effect reaches 0.42%), which represents an important impact for firms.

The relationship between *PropensityExp* and *long term debt* is also positive and significant (Column 3). The increase in long term debt induced by *PropensityExp* is about 3%. However, the relation between *PropensityExp* and total liabilities is positive but not significantly different from zero (Column 4). From these results some useful issues arise. First, firms were effectively impacted by the exogenous shock produced by the URR, i.e. there was a causal effect between the imposition of the restriction and the foreign borrowing of firms. Second, firms were affected differently among groups.

Those that previously had a higher propensity to borrow using foreign debt were more heavily impacted than those that had a lower propensity. Third, firms tended to substitute exempted (short term) for not-exempted (long term) debt, with a practically null effect on total debt.

Overall, the results in columns one to four of Table 3 indicate that the imposition of the URR made the firms that had access to borrowing denominated in foreign currencies substituted away from short-term borrowing, increasing their long-term. Furthermore the substitution is almost full. While we are not able to measure directly what part of this substitution corresponds to foreign denominated debt, our identification strategy along with the evolution of aggregate borrowing indicates that this substitution was largely between debt denominated in foreign currencies. Taking into account that the objective of the introduction of the URR was to reduce the exposure of the Chilean economy to the volatility of short term international inflows of capital, the evidence that we find is quite supportive of the success of the measure.

Table 4 shows the results for variables that consider a broader definition of total liabilities. As it was mentioned above, this variables contain not only debt but also other sources of firms' funding -like accounts payables, creditors other than banks, deferred taxes, provisions, dividends, etc. Hence, when those variables are considered, *PropensityExp* has a negative and significant impact on *short term liabilities* about 9.9% (Column 1). This negative relationship indicates that firms also tended to reduce their reliance on almost all types of short term funding, not only short term debt.

As it was found before in the case of long term debt, the relation between *PropensityExp* and *long term liabilities* is also positive and significant (Column 2). Long term liabilities increased in 2.6% as a result of the exogenous shock faced by firms. Therefore, when a broader definition of liabilities is considered, it can be seen that substitution of exempted (long term liabilities) for non-exempted (short term liabilities) is also present.

It is noteworthy, however, the decrease in almost 2% in trade credit (Column 3). Financial theory indicates that firms would typically substitute trade credit when they face rationing on borrowing. In this case, however, substitution does not seem to be present. It is likely the case that firms faced problems to substitute trade credit by non-exempted liabilities, may be because direct trade credit was exempted from the URR only if shipment occurred within six months. The possibility to substitute was limited then. Also, the higher cost related to trade credit must have played a role. How-

ever, further research should be done in order to explain this effect in more detail.

Overall, the results in Table 4 reflect the adjustment of non-debt parts of the balance sheet to the rebalancing of debt maturity generated by the imposition of the URR.

## 6 Conclusions

This paper provides evidence of the reaction of domestic firms to an exogenous shock in the cost of foreign borrowing. We explore the effects of the imposition of a legal constraint to short term foreign borrowing and find that local firms reduce their reliance on short term borrowing while they increase long term borrowing. However we do not find a significant effect with respect to total borrowing.

Taking the natural experiment provided by the imposition of a control to short-term capital inflows in Chile in 1991, we avoid the endogeneity problems associated to most studies on capital structure dynamics, namely that reductions in foreign borrowing may come from changes in the investment opportunities of firms. We are able to isolate the causality between the unexpected restriction in foreign borrowing and firms' behavior. Local firms substitute exempted by non-exempted sources, in this case typically long term debt by short term debt. Furthermore, they adjust not only the non-exempted type of borrowing but almost all type of short term sources of funds.

The effect of the unexpected shock is also different across groups of firms. By constructing a measure of the firm's propensity to acquire foreign debt we have an exogenous measure of their exposure of the impact of the URR. An important feature of this propensity is that it does not depend on the amount of debt that firms held at the moment of the shock. By identifying firm's propensity rather than firm's use of foreign debt we avoid to associate a potential restriction in foreign borrowing to firms that decided not to use them. Therefore, the potential endogeneity that could arise from a measure of exposure based on the effective use of firms of foreign debt was avoided. Results indicate that those firms initially more exposed to foreign borrowing were relatively more affected by the shock than firms that were either less exposed or that those that had no exposure at all.

Finally, the paper provides some useful insights that can be drawn in terms of policy implications. The results indicate that once a legal and unexpected restriction on foreign borrowing is imposed firms may be heavily affected, primarily those more exposed to use that type of funding as a source of their operations. In the case of emerging markets for instance, those firms can be typically bigger firms, which because their size can access to international capital markets. Furthermore, since the impact of the restriction may force those firms to make adjustments in their capital structure such that they rely on long term debt beyond the optimal equilibrium, even potential liquidity problems for the whole economy might arise.

## Annex 1

- Credits granted by foreign commercial banks to Chilean commercial banks as part of restructuring packages were exempted from 20% URR

- An alternative means of satisfying the 20% URR in the form of a special repurchase agreement with the Central Bank was established. In June 27 1991 the URR was allowed to be a front fee payment, equal to the financial cost of the URR using LIBOR for the calculation. Also, URR was extended to all credits whose disbursement would occur abroad and those that would be used abroad, along with credits linked to FDI projects. This extension covered a “loophole” that remained open since the imposition of the URR.

- In July 1991, the 20% URR was extended to existing credits, except for credits with maturity of less than 6 months. The requirement on existing credits maturing between July 11 and December 31, however, would be phased.

- In January 23<sup>rd</sup> 1992, URR was extended to foreign exchange denominated term deposits held at commercial banks by domestic and foreign residents (which also represented a previous loophole)

- In May 28 1992, URR was risen up to 30 percent, with the exemption of direct borrowing by firms (it remained at 20%). The holding period was set at one year for all flows. In August 19<sup>th</sup> 1992, URR is set uniformly at 30 percent.

- Also in May the front fee payment was calculated at LIBOR + 2.5%. Afterwards in October 30 1992 the paid-up front fee increased to LIBOR + 4%.

- In October 1993, shipment of merchandise using trade credit -already exempt from URR- was enlarge and allowed to occur within 300 days (it increased the loophole)

- In November 1994 the up front fee becomes payable only in dollars

- In July 4 1995, secondary ADRs become subject to the URR, since these are not longer considered as foreign direct investment (FDI). Other inward financial—non-FDI and non- primary ADRs— become subject to the URR. (Closes a loophole. (Note: since primary ADRs were considered capital additions, they were never subject to the URR.)

- In December 1995 all the new foreign borrowing to prepay other loans was exempted from URR, when these new loans were of equal or shorter maturity than the remaining maturity of the (old) loan to be repaid

- In June 1996, foreign credits were not allowed to be rolled over more than once within a year (it closes another loophole)
- In October 23, 1996 FDI classifies as such—and is exempt from URR—only if it increases productive capacity (The FDI committee is in charge of determining whether the attempted investment classifies as FDI).
- In December 5<sup>th</sup> 1996 Foreign borrowing for up to US\$ 200,000 (or US\$ 0.5 MM per year) is exempted from URR. In March 1997 the minimum amount for exemption of the URR was reduced to US\$ 100,000 in 12 months
- In April 18, 1997 The remittance of funds—principal and profits—from investments by Chileans abroad is exempt from URR
- In September 22, 1997 The proceeds from closing positions in derivatives (options) in foreign markets becomes exempt from the URR
- June 1998 URR was reduced to 10 percent, except for credit lines and foreign currency denominated deposits
- August 1998 URR was eliminated for secondary ADRs. This had the objective of recovering liquidity for ADRs, and reversing the declining volume of transactions in the local stock market.
- September 16, 1998 URR was reduced to 0 percent

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Table 1: Aggregate Flows

Year	Shor-term flows	% of Total	Long-term flows	% of Total	Total	Deposits*
1988	916,564	96.3	34,838	3.7	951,402	-
1989	1,452,595	95.0	77,122	5.0	1,529,717	-
1990	1,683,149	90.3	181,419	9.7	1,864,568	-
1991	521,198	72.7	196,115	27.3	717,313	587
1992	225,197	28.9	554,072	71.1	779,269	11,424
1993	159,462	23.6	515,147	76.4	674,609	41,280
1994	161,575	16.5	819,699	83.5	981,274	87,039
1995	69,675	6.2	1,051,829	93.8	1,121,504	38,752
1996	67,254	3.2	2,042,456	96.8	2,109,710	172,320
1997	81,131	2.8	2,805,882	97.2	2,887,013	331,572

\* Deposits in the Banco Central de Chile due to reserve requirements

Source: Central bank of Chile

Table 2: First Stage

	Use of foreign debt
log (total assets) $_{t-1}$	-0.0994 [9.48]***
log (total assets) $_{t-2}$	[0.57] 0.0652
log (total assets) $_{t-3}$	[0.28] 0.2710
log (total assets) $_{t-4}$	0.1726 [1.26]
Return on assets $_{t-1}$	-0.1461 [0.67]
Return on assets $_{t-2}$	-0.0441 [0.16]
Return on assets $_{t-3}$	-0.2419 [1.46]
Return on assets $_{t-4}$	-0.0070 [0.21]
year	-0.0599 [9.48]***
Observations	6265
Pseudo R <sup>2</sup>	0.19

Absolute value of z statistics in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 3: Second Stage

	1	2	3	4
	Short Term Debt	Ext Short Term Debt	Long Term Debt	Total Debt
PropensityExp	-0.0268 [2.78]***	-0.0200 [1.89]*	0.0295 [2.72]***	0.0122 [0.86]
1log (total assets) $_{t-1}$	0.018 [3.11]***	0.018 [2.88]***	0.003 [0.50]	0.024 [2.82]**
2log (total assets) $_{t-2}$	-0.001 [0.21]	0.000 [0.06]	0.005 [0.59]	0.005 [0.46]
3log (total assets) $_{t-3}$	-0.003 [0.46]	-0.003 [0.45]	-0.004 [0.48]	-0.010 [0.93]
4log (total assets) $_{t-4}$	0.001 [0.23]	0.004 [0.77]	0.008 [1.39]	0.014 [1.77]*
Return on assets $_{t-1}$	-0.030 [2.22]**	-0.044 [2.48]**	-0.025 [1.37]	-0.066 [2.78]***
Return on assets $_{t-2}$	0.0002 [0.01]	0.014 [0.77]	-0.012 [0.62]	0.004 [0.17]
Return on assets $_{t-3}$	-0.017 [1.02]	-0.029 [1.49]	-0.020 [1.02]	-0.047 [1.83]*
Return on assets $_{t-4}$	-0.009 [0.66]	-0.021 [1.38]	-0.020 [1.31]	-0.028 [1.40]
Observations	2351	2342	2385	2332
Number of firms	242	240	245	239
R-squared	0.04	0.04	0.02	0.04

All dependent variables measured as ratio over total assets

Fixed effects included in all regressions

Absolute value of t statistics in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Table 4: Second Stage b

	1	2	3
	Short Term Liabilities	Long Term Liabilites (except provisions)	Trade Credit
PropensityExp	-0.0987 [5.75]***	0.0255 [2.45]**	-0.0200 [2.58]***
log (total assets) $_{t-1}$	-0.052 [4.92]***	0.007 [1.09]	0.019 [4.31]***
log (total assets) $_{t-2}$	0.010 [0.75]	0.004 [0.54]	-0.008 [1.33]
log (total assets) $_{t-3}$	0.007 [0.58]	-0.004 [0.59]	-0.007 [1.16]
log (total assets) $_{t-4}$	0.016 [1.71]*	0.010 [1.76]*	-0.001 [0.24]
Return on assets $_{t-1}$	-0.068 [2.33]**	-0.035 [2.00]**	-0.003 [0.25]
Return on assets $_{t-2}$	-0.012 [0.40]	-0.014 [0.76]	-0.057 [5.05]***
Return on assets $_{t-3}$	-0.031 [0.98]	-0.041 [2.15]**	-0.016 [1.15]
Return on assets $_{t-4}$	-0.036 [1.46]	-0.005 [0.36]	-0.013 [1.21]
Observations	2289	2370	2382
Number of firms	236	245	245
R-squared	0.05	0.03	0.03

All dependent variables measured as ratio over total assets

Fixed effects included in all regressions

Absolute value of t statistics in brackets

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Figure 1: Impact of URR on foreign currency denominated borrowing

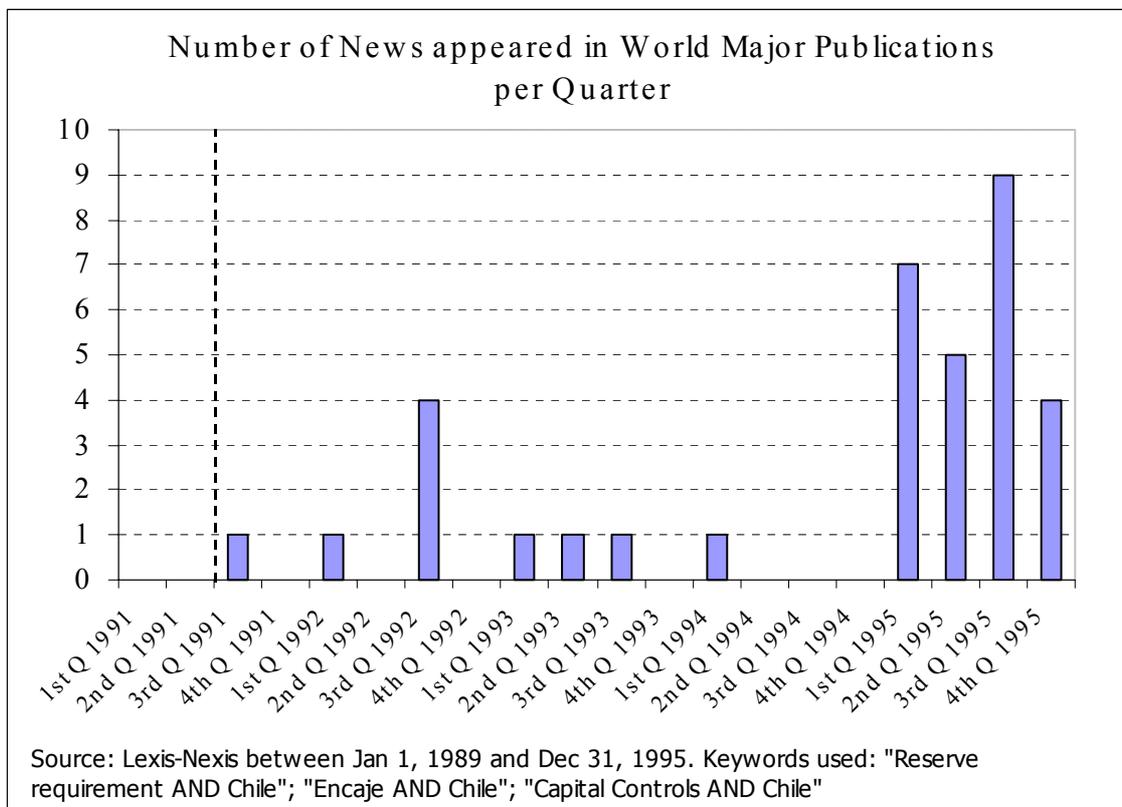


Figure 2: Impact of URR on foreign currency denominated borrowing

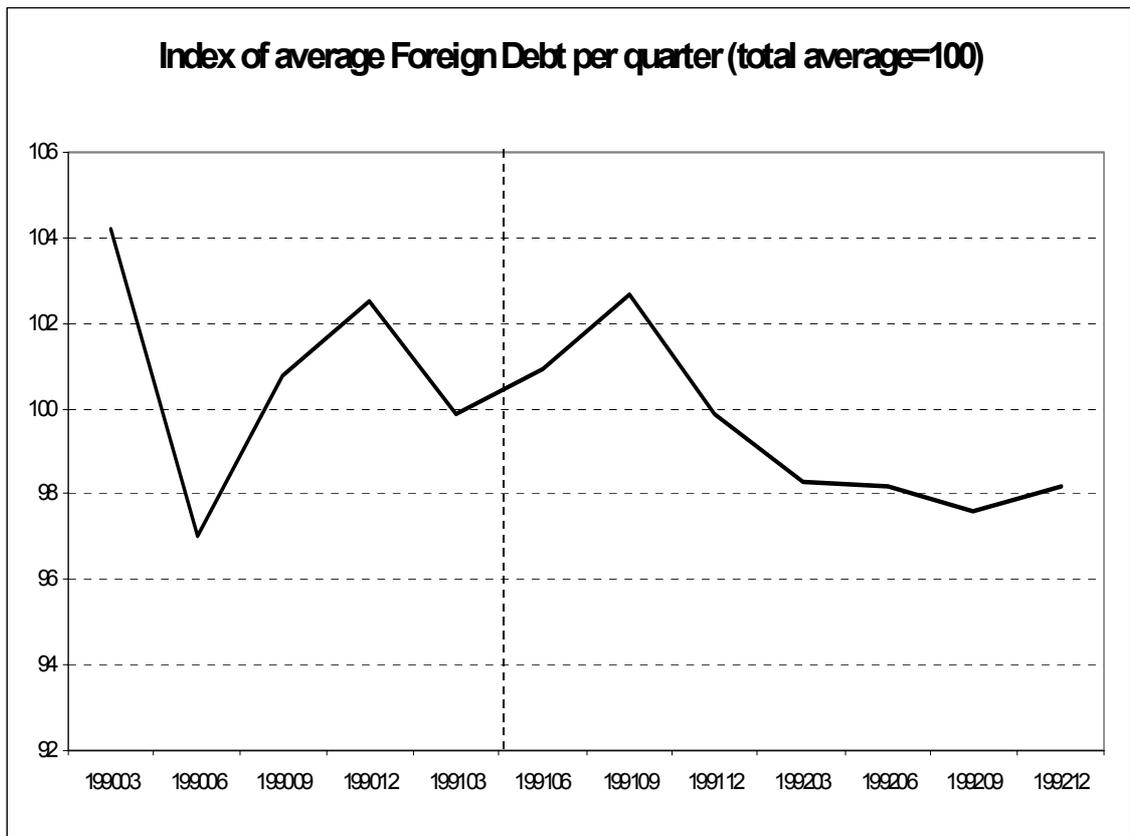


Figure 3: Impact of URR on foreign currency denominated borrowing

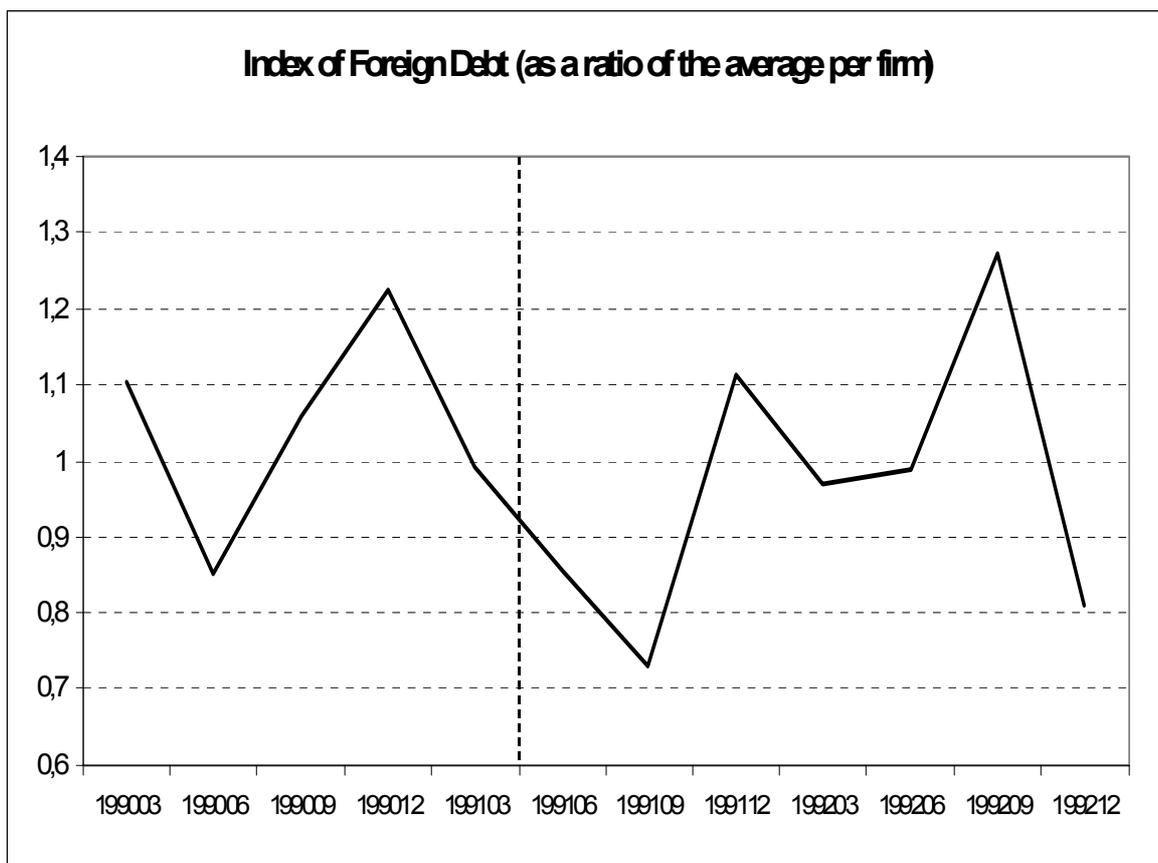


Figure 4: Impact of URR on cost of borrowing

