DOCUMENTOS DE TRABAJO

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N° 897 Enero 2021
BANCO CENTRAL DE CHILE

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Documentos de Trabajo del Banco Central de Chile
Working Papers of the Central Bank of Chile
Agustinas 1180, Santiago, Chile
Teléfono: (56-2) 3882475; Fax: (56-2) 3882231

Documento de Trabajo
N° 897

Working Paper
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Financial Constraints: a Propagation Mechanism of Foreign Shocks*

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Abstract
This essay seeks to contribute to the credit-channel literature by studying how the effects of foreign shocks can be amplified in the economy due to the existence of financial constraints at the firm-level in a small open economy as Chile. For this purpose, this study analyzes the evolution of Chilean manufacturing firms between 1995 and 2005 thanks to a panel based on the Annual National Survey of Industries, measures of financial constraints built on the work by Rajan and Zingales (1998) and pays special attention to the Asian crisis, an episode that hit particularly hard the Chilean economy in terms of contraction of the credit flow. Regarding the exit probability, during the Asian crisis firms with liquidity needs were more likely to leave the market. On the intensive margin side, the number of workers, wage-bill, total income, and value-added were more negatively affected by this crisis in financially constrained firms.

Resumen
Este trabajo busca contribuir a la literatura sobre el canal del crédito estudiando cómo los efectos de shocks externos pueden amplificarse en una economía pequeña y abierta como Chile producto de restricciones de financiamiento de las firmas. Con este objetivo, este estudio analiza la evolución de las firmas manufactureras chilenas entre 1995 y 2005, utilizando un panel de datos basado en la Encuesta Nacional Industrial Anual y medidas de restricciones de financiamiento construidas a partir de la metodología de Rajan y Zingales (1998). Se presta especial atención a la Crisis Asiática, un episodio que golpeó particularmente fuerte la economía chilena en términos de contracción del flujo de crédito. En relación a la probabilidad de salir del mercado, son las firmas con mayores necesidades de liquidez las que tienen una probabilidad mayor de dejar de existir durante la Crisis Asiática. Por el lado del margen intensivo, el número de trabajadores, las remuneraciones pagadas a los trabajadores, el ingreso total y el valor agregado fueron más duramente afectados por esta crisis en firma con mayores restricciones de financiamiento.

*I thank all valuable comments in the EH Clio Lab 2016 Thesis Seminar of the Instituto de Economía, Pontificia Universidad Católica de Chile (Conicyt PIA SOC 1102). Special thanks go out to Professors Jeanne Lafortune, José Tessada and Rolf Luders for their guidance and collaboration throughout the process. Any errors or omissions are my own responsibility. The views expressed in this paper are exclusively those of the author and do not necessarily reflect the position of the Central Bank of Chile or its Board members. E-mail: raldunate@bcentral.cl.

1 Introduction

In response to the economic crisis caused by the Covid-19 pandemic, central banks have significantly reduced their policy rates, in addition to implementing several unconventional policies to ensure credit flow in the economy and the proper functioning of the financial system, following the strategy of the U.S. Federal Reserve during the Great Recession. The purpose is to reduce the pressure of this crisis on the financial system, so that potential financial constraints do not become an amplifying mechanism but, on the contrary, access to credit allows to mitigate the severity of the crisis.

The financial literature has shown that one channel through which exogenous shocks, such as the spread of Codiv-19, can affect real economic activity, is the so-called credit channel. This channel operates through two mechanisms: one is the balance-sheet channel, where firms with weaker balance sheets see their financial capacity reduced in periods of crisis because they are less attractive to the financial system (Bernanke & Gertler, 1989). The other mechanism is the bank credit channel, through which banks have less funds available to meet the demand, thus curtailing real economic activity (Bernanke & Blinder, 1988).

Various authors have presented empirical evidence in favor of the credit channel, in particular, that firms more dependent on external financing are more affected during crises than firms with greater availability of internal funds (Braun & Larraín, 2005; Dell'Ariccia et al., 2008). This impact can occur at both the extensive and the intensive margins. Indeed, it has been documented that, in times of crisis, the financial situation of firms is a key factor for their survival (Spaliara & Tsoukas, 2013; Hunter & Isachenkova, 2006; Hallward-Driemeier & Rijkers, 2013). Moreover, in recessionary times, firms with higher external financial dependence reduce their investments (Crnigoj & Verbic, 2014; Duchin et al., 2010), plan further reductions in technology, capital and employment expenditures (Campello et al., 2010), experience deeper falls in value-added production (Kim et al., 2015) and inferior stock performance (Kang & Stulz, 2000). In addition, financial constraints may have negative effects on total factor productivity, because of distorted entry and technology adoption decisions (Midrigan & Xu, 2014) and of misallocation of capital and entrepreneurial talent (Buera et al., 2011).

This paper studies how crisis episodes affect financially constrained firms, by analyzing both changes in the exit probability, as well as changes in employment, income, value added and fixed capital investment. To this end, I compare the evolution of Chilean manufacturing firms between 1995 and 2005, using an unbalanced panel created from the Annual National Survey of Industries (ENIA by its Spanish acronym) and measurements of the financial characteristics that are constructed following the methodology of Rajan & Zingales (1998)

and Raddatz (2006). These measures rely on technological assumptions and are therefore exogenous to macroeconomic conditions.

To prevent issues with my econometric identification given that the decade considered in the sample includes both boom and bust episodes, I use the methodology of Braun & Larraín (2005) to define recessions according to a "peak-to-trough" criterion, which resembles finding growth episodes deviated from trend growth. This methodology identifies 1998-1999 and 2001-2003 as recessionary periods. These two periods differ in terms of financial conditions: while the period of the Asian crisis was particularly hard in terms of credit flow, the 2001-2003 slowdown had better financial conditions both domestically and abroad. Therefore, one can compare the particular effect of a crisis with worse financial conditions with respect to a recession where the credit channel should have played a mitigating role rather than an amplifying one.

The findings of this study indicate that there is no relationship between financial constraints and the probability of exiting the market during episodes defined as recessive. However, when studying the additional impact that the worsened financial conditions during the Asian crisis have on the extensive margin, it appears that liquidity needs determine firms' survival. On the intensive margin, in episodes when growth is less than its trend, firms with higher external financial dependence reduce in a larger magnitude the number of workers, wage-bill, and total income, while firms with liquidity needs reduce more importantly their value added. Furthermore, when studying the impact that financial constraints had during the Asian crisis compared to 2001-2003 given the worse financial conditions during the former, both short-term and long-term constraints negatively affected the number of workers, wage-bill, and income earned, while value-added creation was affected only in firms that relied on external financing. No effect is found for fixed capital investment.

This paper is related to other research that uses the framework developed by Rajan & Zingales (1998) to study the credit channel, such as Hallward-Driemeier & Rijkers (2013) who documented the impact of the Asian Crisis in Indonesia on the extensive and intensive margins. It is also related to the paper by Bleakley & Cowan (2008), who analyze the balance-sheet channel in Latin America and show that, during depreciation, firms indebted in US dollars do not have a different investment behaviour than firms with debt in local currency. From another perspective, this paper is also related to previous studies that quantify the impact of financial constraints at a sectoral level on value added (Kroszner et al., 2007), growth rate (Braun & Larraín, 2005), and growth (Cowan & Raddatz, 2013).

This paper is organized as follows: section 2 presents the related literature, section 3 resume the macroeconomic landscape in Chile from 1990 to 2007. Section 4 develops the empirical strategy with special attention to the data and the econometric approach. Section

5 presents the results and, finally, section 6 concludes.

2 Related literature

The phenomenon through which shocks affect real activity has been called the credit channel and it is considered a mechanism for the propagation of shocks. This channel operates through two mechanisms: one is the balance-sheet channel, which affects the solvency of firms. In effect, in times of crisis, the financial system reduces its funding to firms that have weaker balance sheets and, therefore, financing restrictions may be more relevant than in times of economic stability (Bernanke & Gertler, 1989). The connection between the solvency of firms and their borrowing capacity can be explained by moral hazard problems, information asymmetry on the banks side, or by the lack of collateral to use as guarantees. The second mechanism is the bank credit channel, this corresponds to the fact that, during crises, banks have less availability of funds to lend to those who need them, which reduces real economic activity (Bernanke & Blinder, 1988).

In the case of the balance-sheet channel, foreign shocks propagate though a reduction in internal funds that translates into less access to external funds, which amplifies the initial shock, particularly in firms that are more dependent on external financing. In the case of the bank credit channel, as there is a direct reduction in the availability of loanable funds, the firms that most dependent on bank financing are the most affected (Braun & Larraín, 2005).

Empirically, it has been documented that the credit channel affects both the extensive margin, affecting the survival probability of firms, and the intensive margin, reducing firms' growth, which translates into a decline in real activity. Relative to the impact on the extensive margin, the sensitivity of survival to financial indicators is significantly higher during times of crisis than during more stable periods. Moreover, financial constraints increase the probability that firms leave the market in times of crisis, but there does not seem to be an impact in normal times (Spaliara & Tsoukas, 2013). It has also been documented that sectors more dependent on external financing have a greater probability of exiting the market during crises, a pattern that is repeated when liquidity needs is considered as a measure of financial constraints (Hallward-Driemeier & Rijkers, 2013). In addition, the impact of financial constraints during the Asian crisis was more pronounced for larger Asian firms (Clarke et al., 2012). On the other hand, it is worth nothing that in Chile during the 1990's, foreign companies only had a greater probability of exiting the market during the Asian crisis (Álvarez & Gorg, 2009).

On the intensive margin, it has been documented that financially constrained firms

reduce their corporate investment in a greater magnitude (Crnigoj & Verbic, 2014; Duchin et al., 2010). Furthermore, their CFOs plan further reductions in technology, capital, and employment expenditures in addition to postponing or cancelling attractive investments in times of crisis (Campello et al., 2010). On the other hand, during recessions, firms that most dependent on external financing in countries with less developed financial systems experience deeper drops in value-added production (Kroszner et al., 2007) and inferior stock performance (Kang & Stulz, 2000). In addition, during banking crises, exporting firms that rely more intensively on bank financing grow considerably less than those who do not, particularly in the case of firms that produce durable goods (Iacovone & Zavacka, 2009), and they reduce the portfolio of goods offered abroad (Bricongne et al., 2012).

A work strongly related to this paper is the one by Kim et al. (2015). They study the impact on the extensive and intensive margin of the Asian crisis on financially constrained Korean firms. They find that firms with higher levels of short-term debt in foreign currency are more likely to file for bankruptcy and that, conditionally on surviving, the most financially restricted firms are the ones that see their income fall the most. Nevertheless, this work has several methodological differences with the one of Kim et al. (2015). I use a difference-in-difference model and financial constraints variables that follow the methodology initiated by Rajan & Zingales (1998), which is later used by several other works (Braun & Larraín, 2005; Micco & Pagés, 2006; Raddatz, 2006) and has the advantage of being exogenous to any change at the macroeconomic level.

3 Macroeconomic landscape in Chile: 1990-2007

During the early 1990's, Chile was in a very favorable economic situation, with real GDP growth rates that exceeded 10% in 1992 and 1995 and an average of 7.4% between 1985 and 1997, in addition to a sustained drop in the unemployment rate from 11% in 1987 to 6.5% in 1996, and a decreasing annual inflation rate. Furthermore, unlike other countries in the region, the so-called "Tequila crisis" in the mid-1990's had no relevant effects in Chile.

However, the situation changed drastically in 1997, when the country was hardly hit by the Asian crisis and the Russian crisis, particularly by the former. Chilean fiscal and monetary policies were expansionary at the time. Moreover, banks and companies with access to international financing had borrowed heavily abroad because of the large differential between domestic and foreign interest rates, the expectations of continuous capital inflows, and the fall in the risk premium (Agosin & Montecinos, 2011).

The Asian crisis began in Thailand in July 1997, when the Thai currency depreciated and the stock market fell because of a very volatile financial situation in Asia. This shock quickly

spread to other Asian countries. The consequences of this shock for Chile were relevant because the Asian market represented a third of Chile's exports at the time and, because of the crisis, the trade balance deteriorated sharply. The crisis spread by two mechanisms: a sharp fall in terms of trade and a generalized contraction of capital flows to emerging countries, including Chile. The situation in Chile was further aggravated by the outflow of residents as a result of perceiving a higher exchange rate risk and a significant deterioration in expectations (Agosin & Montecinos, 2011). In fact, according to Cowan & De Gregorio (2007), the Asian crisis should be understood mainly as a reversal of the trade balance combined with an outflow of capital from residents, a sudden-start, and not as a period of unexpected capital outflow from non-residents, a sudden-stop.

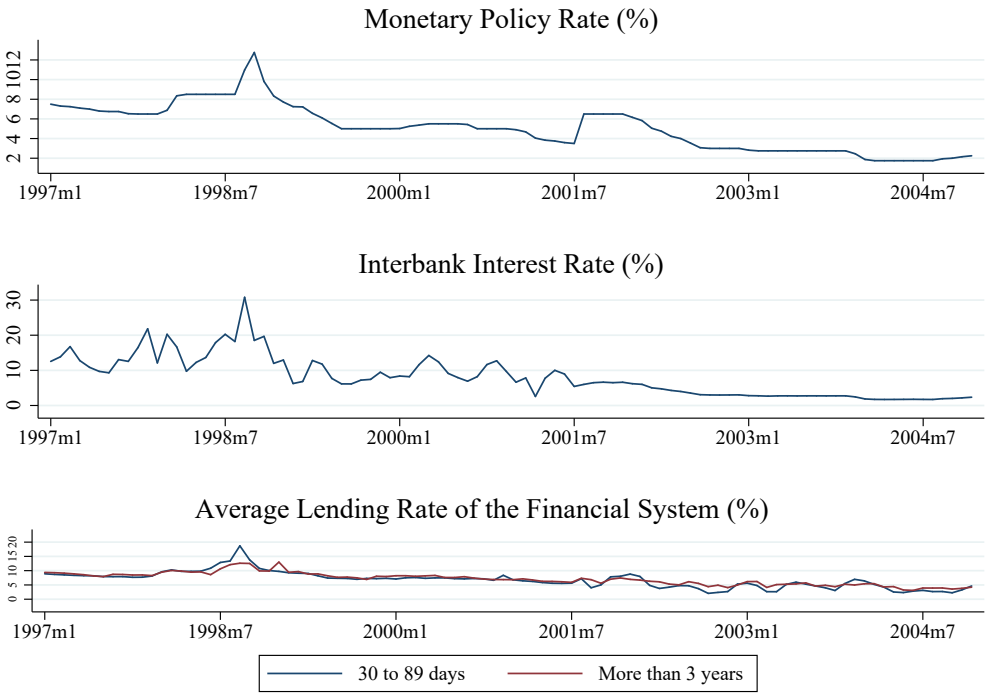
During the crisis, the Chilean peso suffered three speculative attacks. The first occurred at the end of October 1997 when, as a consequence of the increase in domestic interest rates in Asian countries and the massive outflow of capitals, there was a profound drop in the stock market. The second occurred in June 1998 due to pressure on the Brazilian exchange rate system produced by the Russian crisis and the Brazilian deficit. The third occurred in August 1998 also due to the Russian crisis and because of a new pressure on the Brazilian currency.

To prevent a significant depreciation of the Chilean peso, during the first attack to the currency, the Central Bank of Chile decided to increase the interest rate and strongly intervene the exchange market. These measures were boosted and repeated during the next two attacks. In particular, after the third attack, in September 1998, the Monetary Policy Rate reached 14% and the interbank interest rate reached values above 30%, which had a relevant impact on the market (Figure 1).

These foreign shocks and the policies in response to these shocks, specially the policies aimed at defending the exchange rate, had very negative effects in the Chilean economy: from the fourth quarter of 1998 to 1999, the real GDP growth rate dropped to negative values, reaching -3.7% in the second quarter of 1999 (Corbo & Tessada, 2002; Covarrubias, 2001). In the same period, the unemployment rate increased sharply, reaching 10% in 1999.

In 2000, the Chilean economy began to improve; GDP growth rose to 5%, but Chile was subsequently affected by global macroeconomic instability, specifically by the slowdown in developed countries such as Japan, Germany, and the United States. Even if the impact in Chile was much lower compared to other Latin American countries, the country maintained GDP growth rates of near 3% between 2001 and 2003, well below the growth rates prior to the Asian crisis. According to different authors, Chile did not experience a rapid recovery after the Asian crisis because of this international context (Schmidt-Hebbel, 2006; Agosin & Montecinos, 2011).

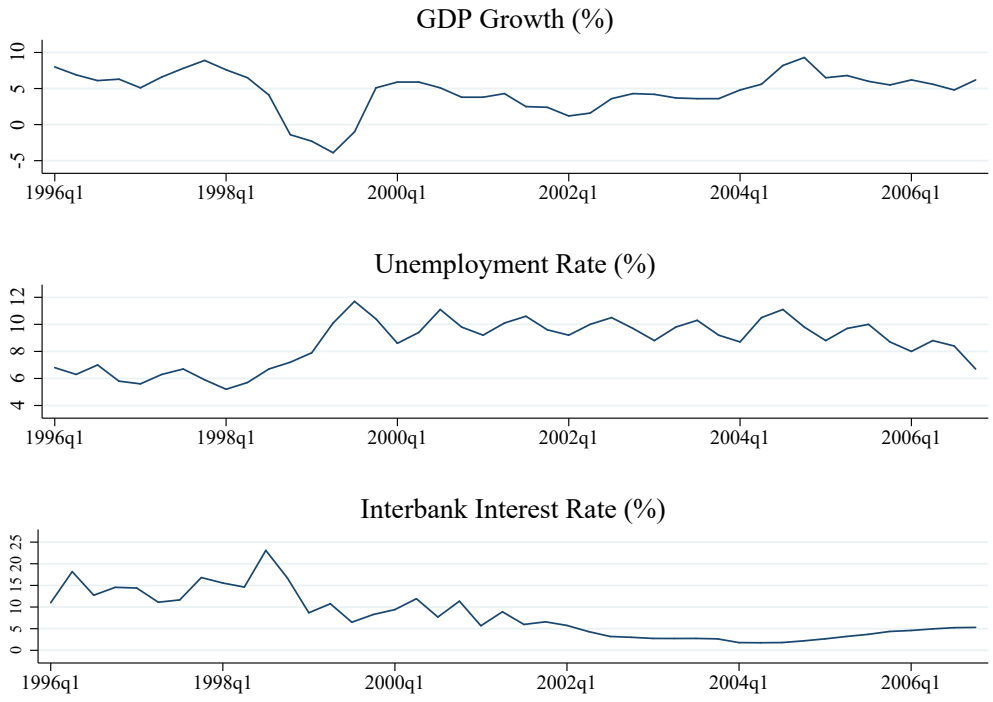
Figure 1: Monthly MPR and other interest rates between 1997 and 2004



Source: Author's calculation based on data from the Central Bank of Chile.

It is important to highlight the differences in financial conditions between both periods of deceleration (Figure 2). As previously mentioned, conditions were very unfavorable during the Asian crisis, because of a strong outflow of funds and very high interest rates. During the period 2001-2003, there was a more stable financial situation. In effect, there was a greater availability of foreign funds, better credit risk indicators, laws that seek to facilitate financial integration with foreign markets, and a greater diversification of the domestic financial system. In addition, the interest rates were lower than during the Asian crisis because the Central Bank carried out several policies to stimulate the domestic demand (Central Bank of Chile, 2001, 2002, 2003). Furthermore, during those years, the comparison with the economic situation of neighbouring countries made Chile attractive for foreign investors, which allowed a greater access to external funds (IMF, 2001, 2002, 2003). Since 2004, the country recovered, reaching a GDP growth rate of 7%, remaining above 5% until 2007, and the unemployment rate fell to 7% in 2007 (Schmidt-Hebbel, 2006).

Figure 2: GDP growth, unemployment rate and interbank interest rate (1996-2006)



Source: Author's calculation based on data from the Central Bank of Chile.

4 Empirical Strategy

4.1 Data

The data used in this work comes from the Annual National Survey of Industries (ENIA by its Spanish acronym), which is carried out by the National Institute of Statistics (INE by its Spanish acronym). This survey includes all manufacturing establishments with ten or more employees. Given that this work seeks to study the impact of financial constraints at the firm level, if a firm has more than one establishment, I collapse the information from all its establishments. Therefore, between 1995 and 2005, it is possible to build an unbalanced panel of firms that includes different variables such as sales, value-added, number of workers according to type of contract, wage-bill, taxes, training, and fixed assets.[1] Following Bergoeing et al. (2003), I drop all firms with less than ten employees and firms that report

[1] All values are delivered in Chilean pesos, therefore, they are converted to a indexed currency (*Unidad de Fomento*) in order to work with real variables.

negative or null value added, since they would be indicators of measurement errors.[2]

This survey has the advantage of classifying the establishments according to the International Standard Industrial Classification of All Economic Activities (ISIC rev. 2), which allows me to associate the financial constraints measures constructed following the Rajan & Zingales (1998) methodology to each industry.

Financial constraints measures

The financial constraints measures considered in this paper follow the literature initiated by Rajan & Zingales (1998). The hypothesis behind the construction of these variables is that technological reasons explain why one industry depends more intensively on external financing than another and that those differences in technology and, therefore, in financial constraints persist between countries. Rajan & Zingales (1998) calculate the need for financing by industry in the United States and apply it to other countries, following the premise that if an industry needs a larger scale and takes longer to develop than another in the United States, this phenomenon must also occur in other countries. The identification does not require that firms in each country have the same external financial dependence as in the United States, it only needs that the implicit ordering between industries remains stable. Since these financial constraint variables are constructed based on the previously mentioned technological assumptions, they have the advantage of being exogenous to the business cycle.

Rajan & Zingales (1998) compute external financial dependence as the ratio of the difference between the sum of capital expenditures and the sum of operating cash flows to the sum of capital expenditures between 1980 and 1989 for firms in the Compustat. Next, they take the median by industry, where industry corresponds to groups (3 digits of ISIC) or classes (4 digits) depending on the industry, to prevent outliers from changing the results. This same methodology is used by Raddatz (2006), who always considers aggregation at class level to define industry. Moreover, this author calculates a measure of liquidity needs to analyze short-term financial constraints. This variable is constructed as the median by sector of the ratio of inventories to total sales between 1980 and 1989.

Table 1 presents descriptive statistics for the merge of the survey with each financial constraint variable. On average, the level of external financial dependence (EFD) is higher when I consider the one built by Raddatz (2006), this might be due to the fact that aggregation at group level hides significant heterogeneity in terms of external financial dependence. Due to data issues, not all industries in the sample can be matched with information for

[2]The ENIA includes certain establishments with less than ten employees when they are considered multi-units so as not to loose information on intermediate processes. The elimination of firms by number of employees or according to value-added is carried out after grouping the industrial establishments by firm.

financial constraints.

Table 1: Summary statistics for financial constraints variables

	N	Mean	SD	Min.	Max.
EFD Rajan & Zingales (1998)	43,622	0.27	0.30	-0.45	1.49
EFD Raddatz (2006)	38,139	0.14	0.29	-1.53	1.47
LN Raddatz (2006)	38,139	0.14	0.05	0.05	0.3

Source: Author's calculations based on the data from Annual National Survey of Industries.

Financial constraint variables will be considered in two ways: (1) continuously, i.e., imputing the value assigned by the authors to each industry and (2) as a dummy that takes the value of 1 if the firm belongs to an industry in the 50% more restricted and 0 otherwise. This second approach follows Laeven et al. (2002),[3] and it is a robustness check of the results since it reduces the possible measurement error of the variables calculated according to the methodology of Rajan & Zingales (1998).

Identifying recessions and the Asian Crisis episode

To determine the recessive periods present in the sample, I follow the methodology of Braun & Larraín (2005), who use a "peak-to-through" criterion. The methodology consists of defining the lowest point (through), i.e., years when the logarithm of the current GDP fall by more than one standard deviation from its trend level, using the Hodrick-Prescott filter to compute the trend component. Next, for each low point, they search a local peak, which is the closest previous year for which the cyclical component of GDP is higher than the other following years. A recession comprises all years between the local peak and the through. To replicate the methodology, I use data from the World Bank between 1990 and 2014.

The methodology determines two recessive periods: 1998-1999 and 2001-2003, which is consistent with the Chilean macroeconomic panorama previously discussed (Figure 3). The first period corresponds to the Asian crisis and the second corresponds to the period of deceleration due to the slowdown in developed countries, such as Japan, the United States, and Germany. To support the empirical strategy used, it is important to emphasize that both the Asian crisis and the slowdown of 2001-2003 respond initially to foreign shocks (Corbo & Tessada, 2002; Schmidt-Hebbel, 2006).

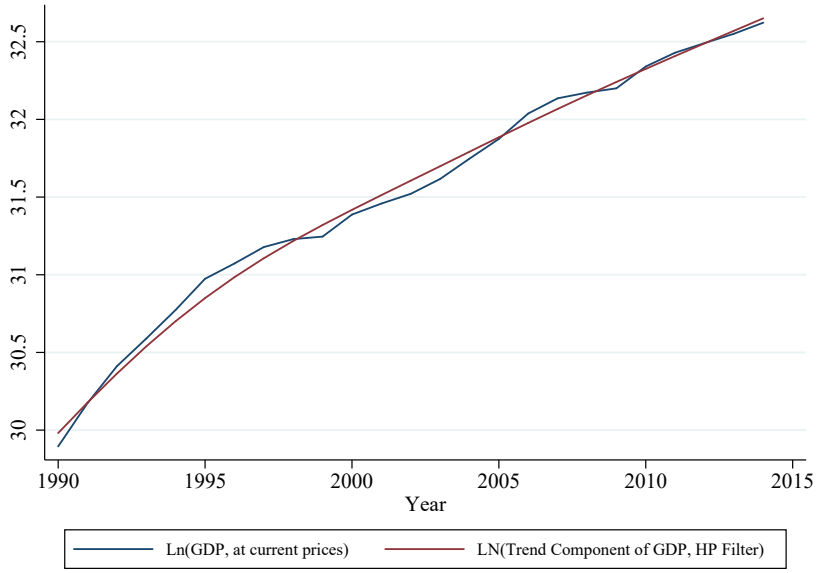
According to Braun & Larraín (2005), a period defined as recession does not necessarily correspond to a period of negative growth, but it should be understood as a period of growth under trend. Thus, it must be taken into account that the period 2001-2003 corresponds to

[3]This work was later published as Kroszner et al. (2007).

a period of deceleration while the period 1998-1999 was an episode of crisis, but the concept of recession will be used onward for both periods.

In order to study the additional impact of the Asian crisis with respect to 2001-2003, I will consider a dummy that takes the value of 1 if the years are 1998-1999 and zero otherwise.

Figure 3: GDP and trend component of GDP



Source: Author's calculation based on data from the World Bank.

4.2 Difference-in-difference model

As in the literature related to this work, a differences-in-differences model is used. In this case, the first difference corresponds to the difference between financially constrained firms and firms without funding problems. The second difference corresponds to the difference between normal periods and recessions. This approach avoids potential endogeneity between financial constraints and recessions, since it can be assumed that recessions do not modify the implicit ordering of the level of external financial dependence or liquidity needs. This allows studying the difference in the change on the extensive and intensive margin for financially restricted firms during recessions with respect to the change experienced by unrestricted firms during the same period. The underlying premise is that if industries that are more restricted are more affected during a recession, recessions have an independent negative effect on real economic activity.

As the research question seeks to analyze the impact of the Asian crisis, since it is assumed that it affects more harshly because financial conditions at that time were hard

than during the slowdown of 2001-2003, a third difference is considered as a robustness check, which allows studying whether the Asian crisis had a greater impact or not.

Extensive margin: exit probability

A probit model is considered for the probability of exiting the market. The dependent variable is a dummy that takes the value of 1 if the firm is not present in the sample that year, being active for the last time the previous year, and 0 otherwise.[4] It is worth mentioning that in this database the reason behind firms' exit cannot be identified, so mergers, voluntary liquidations, or bankruptcies are all considered as equal (Schary, 1991).

Let firm i in sector s in year t, the estimation is as follows:

$$Pr(exit_{i,s,t} = 1) = \Phi(\alpha + \beta FC_s * dRecession_t + \lambda_t + \mu_s) \tag{1}$$

where $FC_s * dRecession_t$ corresponds to the interaction between the financial constraint variable and a dummy that takes the value of 1 for recessions, defined by the methodology proposed by Braun & Larraín (2005), λ_t is a year fixed effect and μ_s is an industry fixed effect (defined at 3 digits of ISIC rev2). Due to collinearity issues, only the interaction between the variables can be included and not the financial constraint and recession variables separately. However, this is not a fundamental issue since this work seeks to study the effect of the interaction. The interest coefficient is β (Puhani, 2012) and it is expected to be positive and significant, consistent with the previous literature.

To study the additional impact of the Asian crisis, the following regression is considered as a robustness check of the results:

$$\begin{aligned} Pr(exit_{i,s,t} = 1) = \Phi(\alpha + \beta FC_s * dRecession_t + \\ \gamma FC_s * dRecession_t * dAs_t + \lambda_t + \mu_s) \end{aligned} \tag{2}$$

where dAs_t corresponds to the dummy for the Asian crisis. The coefficient of interest is γ and it is expected to be positive and significant, based on the hypothesis that has been presented. In both models, standard errors are clustered at the industry level, where industry is defined as group (3 digits of the ISIC code) (Bertrand et al., 2004).

As I work with a non-linear probability model, the marginal effects are presented. When the financial constraint variable is considered continuously, the marginal effects quantify how the probability of firm's exit changes during recessions when financial constraints marginally

[4]Given that establishments with less than 10 employees are not included in the survey, both firm closures or reductions to less than 10 employees are considered as exits.

increase and they represent how the exit probability changes during recessions for financially restricted firms, in the case that the financial constraint variable is a dummy.

Intensive margin: growth

To study the impact on growth, a regression with fixed effects is considered:

$$\frac{Y_{i,s,t} - Y_{i,s,t-1}}{Y_{i,s,t-1}} = \alpha + \beta FC_s * dRecession_t + \lambda_t + \mu_s \tag{3}$$

where $Y_{i,s,t}$ corresponds to one of these four outcome variables: number of workers, wage-bill, total income, and value-added.[5] For fixed capital investment, the dependent variable considered is $\frac{Investment_{i,s,t}}{Assets_{i,s,t}}$, a common definition in the financial literature (see, for example Lang et al. (1996) or Aivazian et al. (2005), among others), where $Investment$ corresponds to the sum of investment in land, buildings, machinery and vehicles and $Assets$ corresponds to the sum of the stock of each one of these types of capital. As for the extensive margin, only the interaction between both variables can be included due to collinearity problems, and I consider clustered standard errors.

This methodology might face a problem of selection bias, since firms' exit is expected to be non-random. If I do not correct for this potential section bias, the impact on the intensive margin could be overestimated by changes on the extensive margin. Cerda & Saravia (2009) proposed a solution to correct the possible selection bias in ENIA using the Heckman-Lee methodology.[6] This methodology considers two assumptions in order to properly identify the coefficients: there are no individual fixed effect when the data is pooled together and there is at least one instrument available to estimate firms' exit. Moreover, the methodology consists of a two-stage estimation: first, the exit probability is estimated by a non-linear probability model that includes the same variables as for growth and the instruments, and, then, a second stage to study growth. It is important to bear in mind that the second stage does not consider fixed effects and errors cannot be clustered.

Following the literature on industrial organization, Cerda & Saravia (2009) propose two exogenous instruments that are supposed to affect the exit decision but not the investment decision. These instruments are: (1) the Herfindahl Index and (2) the Minimum Efficient Scale. The Herfindahl Index (HI) measures the concentration of a particular industry and is calculated as the sum of the squared market share of each firm of a particular industry. The

[5]To prevent the inclusion of potential outliers, the top 5% and the bottom 5% are eliminated for each variable.

[6]See Heckman (1974), Heckman (1976), Lee (1978), or Cerda & Saravia (2009) for more details about this approach.

effect of this index on the probability of exit can be positive if we assume that competition is very intense in that sector or negative if it is considered that a sector with a high HI has high mark-ups. The Minimum Efficient Scale (MES) corresponds to the median number of workers per industry. The effect of this variable on exit probability is ambiguous: it can have a positive impact if small firms entering industries with large MES are unable to achieve the level of efficient production. However, industries with large MES are generally associated with industries with high mark-ups, which reduces the probability of exit.

The first stage of this model is:

$$\begin{aligned} Pr(exit_{i,s,t} = 1) = \Phi(\alpha + \beta FC_s * dRecession_t + \lambda_t + \delta_0 FC_s + \\ \delta_1 dRecession_t + \lambda_0 HI_{s,t} + \lambda_1 MES_{s,t}) \end{aligned} \tag{4}$$

and the second stage is:

$$\frac{Y_{i,s,t} - Y_{i,s,t-1}}{Y_{i,s,t-1}} = \alpha + \beta FC_s * dRecession_t + \delta_0 FC_s + \delta_1 dRecession_t + \lambda(\frac{1}{Mill\ Ratio}) \tag{5}$$

Furthermore, as in the non-linear model, to quantify the specific effect of the Asian crisis, a third difference is included to compare the effect of the Asian crisis to the other episode defined as a recession by the methodology of Braun & Larraín (2005).

The regression with fixed effects is:

$$\frac{Y_{i,s,t} - Y_{i,s,t-1}}{Y_{i,s,t-1}} = \alpha + \beta FC_s * dRecession_t + \gamma FC_s * dRecession_t * dAs_t + \lambda_t + \mu_s \tag{6}$$

and the second stage of the Heckmann-Lee correction:

$$\begin{aligned} \frac{Y_{i,s,t} - Y_{i,s,t-1}}{Y_{i,s,t-1}} = \alpha + \beta FC_s * dRecession_t + \gamma FC_s * dRecession_t * dAs_t \\ + \delta_0 FC_s + \delta_1 dRecession_t + \delta_2 dAs_t + \lambda(\frac{1}{Mill\ Ratio}) \end{aligned} \tag{7}$$

On the one hand, the regression with fixed effects has the advantage of including variables that seek to capture unobservables that could be biasing the results and allows to use clustered errors, which in a methodology of differences-in-differences is relevant, but does not allow correcting for selection bias. On the other hand, the Heckman-Lee methodology corrects for the potential selection bias and isolates the effect in the intensive margin, but it has strong assumptions, and it assumes that the two instruments considered only affect the exit probability. Therefore, both methods have advantages and weaknesses, and they include different variables, so they cannot be compared with each other. For this reason, I

also present the results using OLS.

$$\frac{Y_{i,s,t} - Y_{i,s,t-1}}{Y_{i,s,t-1}} = \alpha + \beta FC_s * dRecession_t + \delta_0 FC_s + \delta_1 dRecession_t \tag{8}$$

$$\begin{aligned}\frac{Y_{i,s,t} - Y_{i,s,t-1}}{Y_{i,s,t-1}} = \alpha + \beta FC_s * dRecession_t + \gamma FC_s * dRecession_t * dAs_t \\ + \delta_0 FC_s + \delta_1 dRecession_t + \delta_2 dAs_t\end{aligned} \tag{9}$$

5 Effects of financial constraints during recessions

To compute the results, I use three variables that measure financial constraints, the variable of external financial dependence by Rajan & Zingales (1998) (RZ), the one constructed by Raddatz (2006) ($Raddatz$) and liquidity needs computed by this same author (LN). This last measure is the only one that considers short-term financial constraints; the other two correspond to long-term restrictions. Furthermore, as previously mentioned, the financial constraints variables will be considered in two ways: (1) continuously, i.e., imputing the value assigned by the authors to each industry (FC) and (2) as a dummy that takes the value of 1 if the firm belongs to an industry in the 50% more restricted (dFC) and 0 otherwise. The later approach is a robustness check of the results since it reduces the possible measurement error of the variables calculated according to the methodology of Rajan & Zingales (1998) (Laeven et al., 2002).

First, I will present the results when both recessive periods are consider alike, so, the coefficient of interest is the one related to the interaction of $Financial\ Constraint{*}dRecession$. Next, I will provide the results related to the second hypothesis of this work: the particular impact of the Asian crisis due to the worst financial conditions, thus, the coefficient of interest is the one that accompanies the interaction of $Financial\ Constraint * d\ Recession * d\ Asian\ Crisis$. I will follow Braun & Larraín (2005) and Gallego & Tessada (2012) to analyze the results.

The intuition to understand the hypotheses is as follow: consider two firms for which internal and external funding are not perfect substitutes because of market's frictions. The main difference between these firms is that one has access to internal funds and the other relies mostly on external funds for its operation and investment decisions. When a recession occurs, both firms see their internal funds reduced so they must resort to external funds to stay in the initial situation. The firm that has less financial constraints can better weather the recession since it has a greater availability of internal funds. In contrast, the financially constrained firm is even more constrained during the recession since external financing costs

are higher than in normal times and, therefore, it is more difficult to access those funds. This same argument can be applied when the difference between the two firms is due to liquidity needs (Raddatz, 2006).

5.1 Effects of financial constraints on the extensive margin

To study the change in exit probability, the dependent variable is a dummy that takes the value of 1 if the firm is not present in the sample in a given year, being present for the last time the previous year, and 0 otherwise. I use a probit model that includes the interaction of the financial constraints and the indicator for recessions and fixed effects. As it is a non-linear probability model, the marginal effects are also presented.

Panel B of table 2 shows that, regardless of the type of financial constraint considered, recessions do not have a statistically significant effect on the probability of exit.[7] These results are different from the previous literature: Hallward-Driemeier & Rijkers (2013) find that sectors more dependent on external financing and sectors with more liquidity needs have a greater probability of exiting the market during crises. It should also be noted that Spaliara & Tsoukas (2013) find that during crisis episodes, the relationship between the survival of firms and their financial situation, measured through leverage, profitability, and collateral, is much stronger than during more stable moments.

Table 2: Impact of financial constraints during recessions on firms' exit probability

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: Coefficients					
$FC * dRec$	-0.0618	-0.0382	0.201	0.0385	0.00904	-0.0514
	(0.0577)	(0.0615)	(0.254)	(0.0413)	(0.0382)	(0.0575)
	Panel B: Marginal Effects					
$FC * dRec$	-0.00990	-0.00606	0.0319	0.00616	0.00143	-0.00816
	(0.00924)	(0.00976)	(0.0403)	(0.00661)	(0.00607)	(0.00913)
N	43622	38139	38139	43622	38139	38139
Pseudo R^2	0.015	0.016	0.016	0.015	0.016	0.016

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

[7]ENIA does not include establishment with less than 10 employees, so closures or reductions in the number of employees are both considered as leaving the market. As a result, it is impossible to determine if my results are driven by problems with the identification of closures.

When studying the particular effect of the Asian crisis on the exit probability, column 3 of panel B of table 3 indicates that, compared to 2001-2003, marginally increasing liquidity needs during the Asian crisis increases the probability of exit by 17.6 percentage points, a result that is statistically significant at the 5% level. However, there is no effect if financial constraints are due to external financial dependence. This difference can be explained because external financial dependence measures long-term financial constraints, while liquidity needs are short-term. In effect, a small drop in the profits of a firm with financial constraints as a consequence of the change in macroeconomic conditions, may negatively affect the firm's liquidity position and its ability to pay interests. Thus, even though the firm may be economically viable in the future, because of current liquidity needs, it is forced to leave the market (Hunter & Isachenkova, 2006).

Table 3: Impact of financial constraints during the Asian crisis on firms' exit probability

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: Coefficients					
$FC * dRec * dAs$	-0.00544	0.0517	1.110**	0.0674	0.0171	0.0583
	(0.0970)	(0.130)	(0.496)	(0.0647)	(0.0654)	(0.0651)
	Panel B: Marginal Effects					
$FC * dRec * dAs$	-0.000870	0.00820	0.176**	0.0108	0.00272	0.00926
	(0.0155)	(0.0207)	(0.0787)	(0.0104)	(0.0104)	(0.0103)
N	43622	38139	38139	43622	38139	38139
Pseudo R^2	0.015	0.016	0.016	0.015	0.016	0.016

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

5.2 Effects of financial constraints on the intensive margin

To study the effect on the intensive margin, two approaches are considered. The first is a regression with fixed effects that includes the interest variable and industry and time fixed effects. The second approximation seeks to correct for a potential selection bias. Both models are not directly comparable since the Heckman-Lee correction does not allow for the inclusion of fixed effects. In order to determine the contribution of each methodology, I first present the results using OLS. As for the extensive margin, the results are first analyzed when there is no distinction between recessions and, later, it is determined if there is an additional impact of the Asian crisis compared to the 2001-2003 period, given the worst

financial conditions.[8]

Employment: number of workers

Panels A and B of table 4 show similar results: a firm in an industry with external financial dependence reduces, on average, 1.5 points the number of employees in times of recession in comparison to firms without funding restrictions. For liquidity needs, there is only a negative a significant coefficient when the estimation is carried out with the Heckman-Lee correction. A firm in an industry with liquidity needs will reduce the number of employees in times of recession by about 3 points compared to firms without short-term financing needs. However, with this methodology, there is no statistically significant effects when financial constraints are external financial dependence.

This result is consistent with those found by Hallward-Driemeier & Rijkers (2013), who observe that firms which dependent on external financing reduce their number of workers, even though they also find an effect in firms with liquidity needs. Using data for the Great Recession, Chodorow-Reich (2014) shows that the reduction in credit explains between one-third and one-half of the decline in the number of employees in small and medium-sized firms, between September 2008 and September 2009.

[8]In this case, I will only present the coefficients of the third difference. However, the results for $FC * dRec$ are available upon request.

Table 4: Impact of financial constraints during the Asian crisis on number of workers

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec$	-0.0121	-0.0176	-0.0719	-0.0144**	-0.0153**	-0.00157
	(0.00917)	(0.0134)	(0.0505)	(0.00571)	(0.00566)	(0.00629)
	Panel B: Fixed Effects					
$FC * dRec$	-0.00738	-0.00690	-0.0553	-0.0117*	-0.0105**	-0.00326
	(0.0105)	(0.0114)	(0.0357)	(0.00608)	(0.00437)	(0.00441)
	Panel C: Heckman-Lee					
$FC * dRec$	0.0144	-0.0197	-0.105	-0.00394	-0.0151	-0.0305*
	(0.0207)	(0.0219)	(0.134)	(0.0121)	(0.0126)	(0.0167)
IMR	-0.0220	0.0747	0.0843	0.00734	0.0708	0.0569
	(0.0723)	(0.0665)	(0.0778)	(0.0656)	(0.0663)	(0.0876)
P-value HI	0.003	0.000	0.008	0.002	0.000	0.002
P-value MES	0.000	0.000	0.000	0.000	0.000	0.001
N	31477	27706	27706	31477	27706	27706

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Table 5 studies the change in the number of employees when the Asian crisis is distinguished from the period that is identified as a recession in 2001-2003. In panels A and B of column 3, I find that even firms in the 1% with the least liquidity needs reduced their number of employees by 1 point while a firm in the top 99% reduced them by 6 points during the Asian crisis compared to 2001-2003. In addition, columns 4 and 5 show that, according to both measures of external financial dependence, the most restricted firms reduced their number of employees on average 4 points more during the Asian crisis compared to 2001-2003, considering the coefficient in panel C. This result is in line with Álvarez & Gorg (2007), who found that the interaction between liquidity needs and the Asian crisis variable is negative and significant at the 5% level when they study employment growth.

Table 5: Impact of financial constraints during the Asian crisis on number of workers

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec * dAs$	-0.00149	-0.00885	-0.198**	-0.0127	-0.0137*	-0.00855
	(0.00932)	(0.0171)	(0.0754)	(0.00839)	(0.00694)	(0.00844)
	Panel B: Fixed Effects					
$FC * dRec * dAs$	-0.00332	-0.00992	-0.198**	-0.0143*	-0.0146**	-0.00870
	(0.00908)	(0.0170)	(0.0753)	(0.00821)	(0.00676)	(0.00844)
	Panel C: Heckman-Lee					
$FC * dRec * dAs$	-0.0282	-0.0840**	-0.283	-0.0355**	-0.0402**	-0.00654
	(0.0327)	(0.0376)	(0.184)	(0.0179)	(0.0197)	(0.0214)
IMR	0.00407	0.0896	0.104	0.00820	0.0882	0.0761
	(0.0651)	(0.0625)	(0.0718)	(0.0691)	(0.0622)	(0.0669)
P-value HI	0.001	0.000	0.003	0.003	0.000	0.004
P-value MES	0.000	0.000	0.000	0.000	0.000	0.000
N	31477	27706	27706	31477	27706	27706

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Employment: wage-bill

Analyzing the impact of recessions on wage-bill is interesting since firms may prefer to reduce their expenditures on workers by reducing their wage-bill but not necessarily the number of workers, i.e., they may choose to reduce spending in employment by reducing the intensive margin but not the extensive margin. Columns 1 and 2 of panels A and B of table 6 show the expected result, the coefficient of interest is negative and significant. For example, firms in the top 75% of external financial dependence measured as Raddatz (2006) reduce their wage-bill by 0.7 percentage points, while firms in the bottom 25% do not show changes during recessions. This result is consistent with column 5 of panel B: firms that belong to industries that are more dependent on external financing reduce their labor costs by 1.7 percentage points on average. However, Panel C provides results that are not statistically significant. Campello et al. (2010) carried out a survey of CFOs all over the world to measure the impact of financial constraints during the Great Recession. They found that restricted

firms planned to reduce their spending on workers in a larger magnitude compared to less restricted firms.

The result for Chile seems intuitive if we consider that, for many manufacturing workers, wages are composed by a fixed component and a variable component, the latter is mainly associated with different performance measures at the worker level and at the firm level. Therefore, firms with lower sales, for example, will pay lower wages because the variable component will fall. Furthermore, in times of crisis, when the labor market is thigh, workers' bargaining power to negotiate wage increases is reduced and, despite the fact that the law forbids to reduce the nominal fixed component of wages, wages may fall in real terms if they are not indexed to inflation. Furthermore, Fernandes & Ferreira (2015) find that firms that depend the most on external financing in times of crisis increase their fixed-term contracts and reduce permanent contracts, which generally receive lower salaries and obtain less benefits and royalties, which implies a reduction in wage-bill.

Table 6: Impact of financial constraints during the Asian crisis on wage-bill

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec$	-0.0265***	-0.0372**	-0.0785	-0.0189**	-0.0225***	-0.00460
	(0.00929)	(0.0145)	(0.0681)	(0.00744)	(0.00706)	(0.00772)
	Panel B: Fixed Effects					
$FC * dRec$	-0.0184*	-0.0225*	-0.0281	-0.0134	-0.0168***	-0.00221
	(0.0101)	(0.0117)	(0.0506)	(0.00815)	(0.00472)	(0.00670)
	Panel C: Heckman-Lee					
$FC * dRec$	0.0312	-0.0162	-0.221	0.0136	0.0173	-0.0206
	(0.0325)	(0.0333)	(0.227)	(0.0193)	(0.0196)	(0.0260)
IMR	0.218*	0.207*	0.297*	0.231**	0.216*	0.218
	(0.130)	(0.125)	(0.159)	(0.116)	(0.126)	(0.179)
P-value HI	0.036	0.001	0.107	0.018	0.001	0.022
P-value MES	0.000	0.001	0.000	0.000	0.001	0.008
N	31481	27685	27685	31481	27685	27685

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Table 7 analyzes the change in wage-bill when the Asian crisis is distinguished from the slowdown of 2001-2003. Column 3 of panel B shows that the variable of interest has

a coefficient with the expected sign and is highly significant. Indeed, when the financial constraint variable corresponds to liquidity needs, the Asian crisis has an additional relevant effect compared to the deceleration of 2001-2003: even firms in the lower 1% of liquidity needs reduce their wage-bill during the Asian crisis by 2 percentage points more than between 2001 and 2003. Column 5 shows that, regardless of the specification considered, belonging to an industry that relies on external financing according to Raddatz (2006) implies a more profound reduction during the Asian crisis, coefficients are statistically significant at the 5 or 10% level. In particular, panel C shows that the most restricted firms reduce on average 5.4 points more their wage-bill during the Asian crisis than in the deceleration of 2001 - 2003.

Table 7: Impact of financial constraints during the Asian crisis on wage-bill

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec * dAs$	-0.00401	-0.0137	-0.376***	-0.0173	-0.0270**	-0.0239
	(0.0149)	(0.0269)	(0.111)	(0.0130)	(0.0121)	(0.0144)
	Panel B: Fixed Effects					
$FC * dRec * dAs$	-0.00697	-0.0148	-0.380***	-0.0195	-0.0281**	-0.0245
	(0.0153)	(0.0273)	(0.111)	(0.0127)	(0.0119)	(0.0144)
	Panel C: Heckman-Lee					
$FC * dRec * dAs$	-0.0671	-0.0899	-0.246	-0.0499*	-0.0536*	-0.0357
	(0.0487)	(0.0555)	(0.295)	(0.0284)	(0.0294)	(0.0337)
IMR	0.221*	0.210*	0.287**	0.242*	0.206*	0.271**
	(0.117)	(0.116)	(0.142)	(0.128)	(0.116)	(0.131)
P-value HI	0.018	0.000	0.066	0.035	0.000	0.079
P-value MEE	0.000	0.000	0.000	0.000	0.000	0.000
N	31481	27685	27685	31481	27685	27685

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Total income

Table 8 studies the change in total income. In panels A and B of column 3, the coefficients of interest are negative and significant at the 1% level, indicating that increasing financing restrictions in recessive periods reduces total income. For example, in a recession, according to panel B, firms in industries in the top 5% of liquidity needs, reduce their total income

by 2.9 percentage points more than firms in industries in the lower 5%. These results are consistent with columns 5 and 6 of panel B, where firms in industries with high external financial dependence reduce their total revenues by 1.7 percentage points on average, while firms in industries with liquidity needs reduce them by about 1.3 points on average. Probably, these firms face several problems to maintain a level of working capital that allows them to operate correctly, so they must reduce their production scale, which translates into in a drop in total revenue. Unlike Kim et al. (2015), who find that conditional on survival, the most restricted firms are the ones that see their income fall more noticeably, I obtain results that are not statistically significant when correcting for selection bias. Kroszner et al. (2007) document, unlike what I observe for Chilean manufactures, that firms dependent on external financing have a stronger drop in sales and income during recessions, but they do not find effects in firms with liquidity needs.

Table 8: Impact of financial constraints during the Asian crisis on total income

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec$	-0.0201	-0.0315*	-0.241***	-0.0251*	-0.0273**	-0.0188**
	(0.0154)	(0.0178)	(0.0594)	(0.0128)	(0.0107)	(0.00698)
	Panel B: Fixed Effects					
$FC * dRec$	-0.0107	-0.0110	-0.150***	-0.0188	-0.0168*	-0.0134**
	(0.0162)	(0.0133)	(0.0423)	(0.0137)	(0.00828)	(0.00637)
	Panel C: Heckman-Lee					
$FC * dRec$	0.0267	0.0178	-0.273	-0.00327	-0.00445	-0.0197
	(0.0269)	(0.0301)	(0.181)	(0.0156)	(0.0168)	(0.0212)
IMR	0.0287	0.145	0.202*	0.0636	0.141	0.175
	(0.0866)	(0.0890)	(0.112)	(0.0816)	(0.0888)	(0.119)
P-value HI	0.001	0.000	0.005	0.000	0.000	0.001
P-value MES	0.000	0.000	0.000	0.000	0.000	0.003
N	31477	27738	27738	31477	27738	27738

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Table 9, on the other hand, shows the additional effect of the Asian crisis on the change in total income. In this case, a firm that belongs to a median industry in terms of liquidity needs, reduces its total income by about 3.6 percentage points more during the Asian crisis

than during the years 2001-2003, according to the coefficient in panel B of column 3. In addition, columns 4 and 5 of panel B indicate that, regardless of the measure of external financial dependence, during the Asian crisis, firms in restricted industries reduce more their income than in 2001-2003. For example, as measured by Rajan & Zingales (1998), a firm in a more restricted industry reduces its total revenue 2.9 points more during the Asian crisis.

Table 9: Impact of financial constraints during the Asian crisis on total income

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec * dAs$	-0.00658	-0.0196	-0.227**	-0.0265**	-0.0372***	-0.0107
	(0.0166)	(0.0274)	(0.0912)	(0.0127)	(0.00878)	(0.0130)
	Panel B: Fixed Effects					
$FC * dRec * dAs$	-0.00918	-0.0204	-0.227**	-0.0288**	-0.0390***	-0.0108
	(0.0165)	(0.0274)	(0.0937)	(0.0125)	(0.00865)	(0.0133)
	Panel C: Heckman-Lee					
$FC * dRec * dAs$	0.0261	-0.0646	0.0800	0.00346	-0.0158	0.0221
	(0.0431)	(0.0509)	(0.254)	(0.0236)	(0.0266)	(0.0294)
IMR	0.0293	0.142*	0.195*	0.0341	0.145*	0.178*
	(0.0813)	(0.0843)	(0.103)	(0.0857)	(0.0844)	(0.0981)
P-value HI	0.000	0.000	0.002	0.001	0.000	0.003
P-value MES	0.000	0.000	0.000	0.000	0.000	0.000
N	31477	27738	27738	31477	27738	27738

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Value added

Table 10 presents the effects that financing restrictions have in recessive periods in value added.[9] When estimated by fixed effects, results are not statistically significant. However, in columns 3 and 6 of panel C, coefficients are negative and statistically significant at the 5% level. This implies that, conditional on survival, a firm that belongs to an industry with liquidity needs, reduces on average near 10 percentage points the creation of value added in times of recession, compared to firms in industries without significant liquidity needs.

[9]I use the variable of value added computed by INE. As they change the questionnaire along the sample period, the definition of value added changed, so changes in the definition may be affecting the results.

Kroszner et al. (2007) obtained that firms more dependent on external financing in countries with less developed financial systems experience deeper drops in value-added production than restricted firms in countries with more developed systems.

Table 10: Impact of financial constraints during the Asian crisis on value-added

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec$	0.000590	-0.0247	-0.0304	-0.0107	-0.0202**	-0.00133
	(0.0115)	(0.0200)	(0.0537)	(0.00826)	(0.00757)	(0.00744)
	Panel B: Fixed Effects					
$FC * dRec$	0.00844	-0.00210	0.0397	-0.00439	-0.00987	-0.000152
	(0.0135)	(0.0157)	(0.0583)	(0.00954)	(0.00674)	(0.00903)
	Panel C: Heckman-Lee					
$FC * dRec$	-0.0130	-0.0250	-0.934**	0.0623	0.0142	-0.0990**
	(0.0720)	(0.0772)	(0.410)	(0.0422)	(0.0449)	(0.0489)
IMR	0.0255	0.154	0.234	0.0664	0.146	0.152
	(0.175)	(0.167)	(0.210)	(0.163)	(0.168)	(0.223)
P-value HI	0.003	0.000	0.009	0.002	0.000	0.002
P-value MES	0.000	0.001	0.001	0.000	0.001	0.008
N	31485	27759	27759	31485	27759	27759

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Table 11 analyzes whether the Asian crisis has an additional effect on value added. Columns 4 and 5 of panels A and B have coefficients indicating that firms with high external financial dependence experienced a greater reduction in value added during the Asian crisis compared to the slowdown of 2001-2003 For example, column 5 of panel B indicates that belonging to an industry with greater external financial dependence according to Raddatz (2006), implies an average reduction of 4.7 points in the production of value added, which is statistically significant at the 1% level. Both columns 3 and 6 do not have statistically significant results, so, in terms of value added, financially restricted firms were not more affect by the Asian crisis than the posterior deceleration.

Table 11: Impact of financial constraints during the Asian crisis on value-added

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec * dAs$	-0.00413	-0.0278	-0.107	-0.0339**	-0.0450***	-0.0108
	(0.0199)	(0.0355)	(0.138)	(0.0145)	(0.0117)	(0.0193)
	Panel B: Fixed Effects					
$FC * dRec * dAs$	-0.00702	-0.0281	-0.105	-0.0363**	-0.0465***	-0.0111
	(0.0201)	(0.0348)	(0.144)	(0.0143)	(0.0118)	(0.0200)
	Panel C: Heckman-Lee					
$FC * dRec * dAs$	-0.0268	-0.0347	-0.235	-0.0550	-0.0727	-0.0718
	(0.0785)	(0.0889)	(0.463)	(0.0419)	(0.0457)	(0.0529)
IMR	0.0379	0.160	0.237	0.0685	0.156	0.234
	(0.164)	(0.159)	(0.194)	(0.176)	(0.158)	(0.187)
P-value HI	0.002	0.000	0.004	0.004	0.000	0.006
P-value MES	0.000	0.000	0.000	0.000	0.001	0.000
N	31485	27759	27759	31485	27759	27759

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Investment

In the case of fixed capital investment, the dependent variable considered is $\frac{Investment_{i,s,t}}{Assets_{i,s,t}}$, where $Investment$ corresponds to the sum of investment in land, buildings, machines and vehicles and $Assets$ corresponds to the sum of the stock of each one of these types of capital.

Table 12 provides the results without distinguishing between recessions. Almost all coefficients are not statistically significant, except for panel A of column 2, which indicates that according to the measurement of external financial dependence of Raddatz (2006), a firm in an industry in the top 99% reduces its investment 1.8 points more than a firm in an industry in the lower 1%, this result is statistically significant at the 10% level. These results differ from the previous literature that has documented significant effects of recessions on corporate investment decisions in financially constrained firms (Crnigoj & Verbic (2014); Duchin et al. (2010), among others).

Table 12: Impact of financial constraints during the Asian crisis on investment

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dRec$	-0.00236	-0.00610*	0.00286	-0.00245	-0.00222	-0.00140
	(0.00279)	(0.00354)	(0.0178)	(0.00255)	(0.00222)	(0.00313)
	Panel B: Fixed Effects					
$FC * dRec$	0.000811	0.000584	0.0373	-0.00129	0.000417	-5.88e-08
	(0.00276)	(0.00609)	(0.0243)	(0.00230)	(0.00298)	(0.00413)
	Panel C: Heckman-Lee					
$FC * dRec$	0.0182	0.0199	-0.164	0.0214	0.0111	-0.0261
	(0.0210)	(0.0236)	(0.225)	(0.0132)	(0.0141)	(0.0249)
IMR	0.237***	0.266***	0.424***	0.251***	0.270***	0.380**
	(0.0745)	(0.0789)	(0.153)	(0.0699)	(0.0803)	(0.155)
P-value HI	0.004	0.000	0.027	0.002	0.000	0.004
P-value MES	0.000	0.001	0.000	0.000	0.000	0.006
N	30856	27088	27088	30856	27088	27088

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

Table 13 studies the particular effect of the Asian crisis and it also provides coefficients that are not statistically significant. It is important to mention that both in table 12 and table 13, the coefficients for the Inverse of the Mill Ratio (IRM) are positive and significant at the 1% level, so there is a positive correlation between errors of the selection equation and change in fixed capital investment Thus, unobservable variables that increase the probability of leaving the market are associated with larger changes in investment.

Given the difference between my results and the previous literature, I consider a new dependent variable to study investment, $\frac{Assets_{i,s,t} - Assets_{i,s,t-1}}{Assets_{i,s,t-1}}$. Both when I do not distinguish between recessions and when I study the additional effect of the Asian crisis, most of the coefficients are not statistically significant. Therefore, there is not evidence to support the hypothesis of a negative effect of financial constraints during recessions on fixed capital investment.

Table 13: Impact of financial constraints during the Asian crisis on investment

	FC continuous			FC dummy		
	(1)	(2)	(3)	(4)	(5)	(6)
	RZ	Raddatz	LN	RZ	Raddatz	LN
	Panel A: OLS					
$FC * dReC * dAs$	-0.00358	-0.000376	-0.0225	-0.00136	0.000724	0.00228
	(0.00321)	(0.00436)	(0.0263)	(0.00264)	(0.00292)	(0.00354)
	Panel B: Fixed Effects					
$FC * dRec * dAs$	-0.00587*	-0.000327	-0.0198	-0.00270	0.000463	0.00249
	(0.00301)	(0.00466)	(0.0265)	(0.00272)	(0.00307)	(0.00351)
	Panel C: Heckman-Lee					
$FC * dRec * dAs$	-0.00789	0.00203	0.225	-0.00147	-0.00723	0.0232
	(0.0303)	(0.0363)	(0.292)	(0.0180)	(0.0199)	(0.0317)
IMR	0.218***	0.254***	0.384***	0.235***	0.250***	0.370***
	(0.0657)	(0.0715)	(0.125)	(0.0725)	(0.0706)	(0.115)
P-value HI	0.002	0.000	0.012	0.004	0.000	0.015
P-value MES	0.000	0.000	0.000	0.000	0.000	0.000
N	30856	27088	27088	30856	27088	27088

Note: Standard errors in parentheses - * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations based on the data from Annual National Survey of Industries.

First stage of the Heckmann-Lee correction

All tables show that the instruments used in the first stage of the Heckman-Lee correction are highly significant. Furthermore, even if it is not reported, the coefficient for the Herfindahl Index (HI) is always positive, supporting the idea that competition is tough in manufacturing, which increases the exit probability. The coefficient for the Minimum Efficient Scale (MES) is negative, supporting the idea that industries with a greater number of workers are generally associated with higher mark-ups, which reduces the probability of exit. Cerda & Saravia (2009) find that the HI increases the probability of participation as does the MES. The authors construct both variables defining industry as classes (4 digits of ISIC), but in this study, I define industry as groups (3 digits) since Rajan & Zingales (1998) define industry aggregating at 3 digits in most cases.

6 Conclusion

This paper studies the credit channel as a mechanism for the propagation of foreign shocks in Chile between 1995 and 2005. It analyzes the impact of financial constraints during recessions on the extensive and intensive margins, particularly during the Asian crisis, as a result of its tightened financial conditions.

The results of this work indicate that in episodes of recessions, which are defined according to the methodology of Braun & Larraín (2005), there is no relationship between financial constraints and firms' probability of exiting the market. However, the worsened financial conditions during the Asian crisis meant that firms with greater liquidity needs were less likely to survive compared to the period 2001-2003. On the intensive margin side, during recessions, firms that rely on external financing reduce more sharply their number of workers, the remunerations paid to the workers, and the income obtained, while firms with liquidity needs are the ones that mostly reduce their value-added, compared to unconstrained firms. Furthermore, the deteriorated financial conditions in the country during the Asian crisis compared to the 2001-2003 slowdown implied that firms with short-term and long-term constraints were negatively affected, they reduced the number of workers, wage-bill, and income, while value added was only affected in firms with external financial dependence. Nevertheless, in the case of fixed capital investment, there is no evidence to support the hypotheses raised.

These results have important public policy implications, as they provide empirical evidence to explain how the effects of foreign shocks that translate into worse financial conditions can be amplified as a result of the financial constraints affecting certain Chilean industries. Therefore, policies aimed at alleviating financing constraints in times of crisis, such as those currently being implemented, may be favorable to prevent the spread of shocks, and thus avoid a deeper fall in real economic activity and an increase in unemployment. In particular, since it has been observed that financial constraints are related to technological aspects, it is possible to define ex-ante of a recession which industries will possibly require more support, in order to be better prepared to deal with the shocks.

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