THE CREDIT CHANNEL IN AN EMERGING ECONOMY

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Abstract

To date, there is no consensus about how frictions in the credit market affect the transmission of the monetary policy to the real economy. The traditional money channel states that when the Central Bank reduces its reserves, commercial banks are forced to reduce their demand for deposits. If prices are sticky, in the short-run a decrease in real monetary holdings should lead to higher real interest rates and should translate into a contraction of interest-sensitive components of aggregate spending. The most recent literature has focused on the role of the credit channel. This states that the direct effect of monetary policy on interest rates is amplified by changing the terms and availability of bank loans. Given that firms and consumers lack perfect substitutes for bank loans, they will be unable to offset the reduced supply of loans.

This article focuses on testing the existence of a credit channel in Chile. Our sample comprises 19 banks that operated in Chile over January 1999-December 2002. Over that period, banks primarily offered loans to firms in the manufacturing and the financial services sectors (13 and 26 percent of total loans, respectively), and to individuals through consumption and mortgage loans (9 and 10 percent of total loans, respectively). Our estimation results show that the loans supply and the deposits demand are affected by bank characteristics—such as liquidity, size, past-due loans share, and capitalization—economic activity, the level of interest rates, real exchange depreciation, and by the Santiago Stock Exchange trading. Our results support the existence of a credit channel in the Chilean economy.

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I Introduction

To date, there is no consensus among economists about how frictions in the credit market affect the transmission of the monetary policy to the real economy. Some believe that only the money channel matters, and that the financial sector is irrelevant. Under this hypothesis, when the Central Bank reduces its reserves, commercial banks are forced to reduce their demand for deposits due to higher costs of funds. If prices are sticky, in the short run a decrease in real monetary holdings should lead to higher real interest rates. This in turn translates into a contraction of interest-sensitive components of aggregate spending and, therefore, into lower economic growth.

Another existing stream refers to the credit market. Bernanke and Gertler (1995) suggest two channels by which monetary policy affects the credit market: the balance sheet channel and the credit channel. The former assumes that changes in monetary policy affect borrowers' balance sheets and income statement, including their net worth, cash flows and liquid assets. Due to asymmetric information, a reduced borrowers' net worth translates into an upward shift of the bank loan supply. The credit channel or bank lending channel states that the direct effect of monetary policy on interest rates is amplified by increases in the external finance premium—i.e., the spread between a firms' external funds (bonds, loans, and equity) and internal funds (retained earnings).

The size of the external fund premium reflects imperfections in the credit market that leads to the existence of a wedge between the expected return received by lenders and the cost faced by borrowers. As risk increases over a recession, and information asymmetries are sharpened, the size of the external finance premium increases and amplifies the effect of a restrictive monetary policy on aggregate spending and the real economy. Small firms, for instance, are probably in more need of bank loans. And, if they do not rely on alternative funding sources, they might be forced to reduce their investment and, possibly, their production when facing higher interest rates.

In particular, the external finance premium depends upon the firm's financial standing. The greater the firm's net worth (i.e., liquid assets and collateral), the lower the external finance premium. Intuitively, a stronger financial position makes it possible to reduce conflicts of interest between borrowers and lenders, by borrowers' financing a share of their investment or by offering more collateral. Therefore, fluctuations in borrowers' net worth will affect their investment and spending decisions. There is a rich body of literature about how procyclical fluctuations in firms' net worth might amplify and propagate economic cycles. This phenomenon is known as the financial accelerator. For instance, some studies link balance sheets and cash flows to investment on fixed capital and inventory among firms, and between net worth and durable goods and housing spending among consumers (e.g., Bernanke, Gertler and Gilchrist, 1996).

There is no much controversy in the literature about the balance sheet channel. However, this is not the case for the credit channel. In the first place, it is not evident that monetary policy affects the loans supply. Bernanke and Blinder (1988) state that the Federal Reserve's open-market operations reduce the financial system's reserves and, therefore, bank deposits. This translates into lower funds available to banks. However, a

key assumption for this result is that banks cannot offset reduced deposits with other sources of funds, such as certificates of deposit[2] and new stocks issues. Therefore, the loans supply shifts upwards.

Romer and Romer (1990) conclude that empirical evidence gives more support to the classical approach of the monetary channel than to the credit channel. First, the authors state that reserve requirements on certificates of deposit are low. Therefore, banks can obtain funds with little cost in terms of reserve holdings, and keep their ability to lend. However, reserve requirements on transaction balances are much higher. So the impact of a tight monetary policy on interest rates is most likely to operate through bank liabilities.

However, later work by Bernanke and Blinder (1992) finds that shocks in monetary policy affect bank portfolios systematically, which is not in accordance with the monetary channel.[3] Specifically, loans respond slowly to a restrictive monetary policy, but eventually they fluctuate considerably as the unemployment rate rises. Even though tighter credit could be a response to a slow-down in economic activity, Bernanke and Blinder believe that this is primarily due to a loans supply reduction.

The above discussion suggests that it is not a simple task to disentangle whether consumers and firms are affected by a slow-down in economic activity and a subsequent reduction in credit demand, or from a reduction in the loans supply as predicted by the credit channel. In order to solve this identification problem, Kashyap, Stein, and Wilcox (1993) show that firms issue more commercial paper in response to a restrictive monetary policy. The reason is that firms resort to a substitute of bank credit because the loans supply falls, and not because their loans demand is reduced by an economic slowdown.

Unfortunately, small firms do not issue commercial paper. That is why Nilsen (2002) uses an alternative measure of a bank credit substitute, which is also available to smaller firms: trade credit (TC). TC is a short-term loan a supplier provides to its customers in conjunction with product sales. In the United States, accounts payable are a significant component of balance sheets of manufacturing firms (13 percent of total liabilities). An important piece of information is that small firms resort to trade credit considerably. Indeed, according to the 1993 National Survey of Small Business Finances, 61 percent of the small firms used it. This rate was higher than that of any other financial service, except for checking. By contrast, Nilsen finds that large firms use commercial paper in the first place, followed by bank loans and TC.

Suppliers and customers make their TC decisions, but at different points in time. The supplier decides to give credit to the customer at the time of the purchase. The history of his/her relationship with the customer is critical to this decision. Then, the customer, who is creditworthy, decides to repay or delay when repayment is due. The first decision involves the transactions motive of TC (transactions TC). That is, the supplier provides a

[2]Fixed-maturity deposits that are negotiable depending on their face value.

[3] The monetary channel assumes that loans and other bank assets are perfect substitutes, and that money—banks liability—plays a preponderant role. Therefore, under this theory, banks' asset composition changes randomly following a monetary shock.

credit to his/her customer reducing his/her use of cash. The second decision involves the finance motive (finance TC): firms that rely on fewer alternatives sources of funding are more likely to postpone repayment when they lack funds. In this case, TC turns from a substitute for cash into a substitute for loans.

Nilsen uses the accounts payable (AP) to sales ratio as a proxy of the finance motive, given that a reduction in sales, following a contractive monetary policy, should induce a reduction in AP. The author argues that the ratio AP/sales is not affected systematically by the terms of the trade credit, that is, it is robust to the transaction motive. Indeed, Ng, Smith, and Smith (1999) conclude suppliers are reluctant to change the terms of the trade credit, in response to either a change in prices or to a change in interest rates. Therefore, the terms of the trade credit are stable over time.

In a previous study, Petersen and Rajan (1995) examine the TC in the context of banks-firms relationships. The authors conclude that, after controlling for firm age, profits, incorporation status and relationship characteristics, the value of total assets has a positive and significant impact on the share of trade credit a customer takes. This implies that small firms are less able to exploit more advantageous conditions of trade credit due to fewer alternative credit sources available to them.

Nilsen argues that based on this evidence we should look for a link between delays in TC repayments and credit constrains faced by firms over economic slowdowns. In general, firms should not resort to the finance motive as a substitute for bank loans. However, if bank loans fall in response to a tight monetary policy, those firms that heavily depend on them might be forced to use TC as a funding source. Given that the terms of TC are relatively constant over time, TC should become cheaper than loans, particularly over a restrictive monetary policy. Therefore, the ratio AP/sales should be a good indicator of credit constraints. In other words, if firms increase their AP/sales in response to an upward move in the loan supply, the credit channel would find support. Nilsen's estimation for the US over 1959-1992 show that not only small firms are affected by increases in interest rates, but also larger firms lacking bond ratings. Indeed, these firms tend to rely more heavily on TC under these circumstances.

An alternative method to test the existence of a credit channel is through banks balance sheets. Kashyap and Stein (2000) study the transmission of monetary policy with a data set that includes every insured U.S. commercial bank from 1976 to 1993. They conclude that, within the class of small banks, changes in monetary policy affect mostly to those banks with the least liquid assets. Overall, their results support the existence of a credit channel in the U.S., but the authors conclude that they are unable to make precise statements about its importance for aggregate economic activity.

Hernando and Martinez Pages (2001) conduct a similar study for Spain over 1991-1998.[4] Their estimation results show little evidence in favor of a credit channel due to the

[4] Recently, the Monetary Transmission Network (MTN) of the Euro system conducted a project in which each country of the Euro zone studied the transmission of monetary policy in its economy prior to the adoption of the Euro in 1999.

importance of small banks. They attract a substantial amount of savings and, therefore, they would count on sizeable resources to lend even following a restrictive monetary policy. Along the same lines, Worms (2003) studies the existence of a credit channel from individual balance sheets of German banks for 1992-1998. He finds that the average bank reduces its lending more sharply in reaction to a tight monetary policy the lower its ratio of short-term interbank deposits to total assets. Overall, this evidence supports the existence of a credit channel, but the results indicate that it is weakened by the network structure existing in the German economy.

Although there is an extensive literature on testing the existence of a credit channel for the United States and Europe, it is not the case for emerging economies. In general, emerging markets are subject to greater volatility and regime changes, reliable data is harder to get, and theory has been developed mostly for industrialized nations (see, for example, Kamin (2000)'s discussion). Although, Chile has stood out as one of the most stable Latin American economies in the last decade, its financial market is still relatively thin for industrialized-economies standards. Therefore, it is a contribution to quantify the extent of monetary transmission to the credit market in this particular case.

This paper is organized as follows. Section II describes the Chilean financial sector for 1999-2002, and gives some background information on the Chilean economy over that period. Section III briefly presents our econometric model, while Section IV shows our results. Finally, Section V presents our main conclusions.

II Description of the data

Panel (a) of Table 1 presents some figures for the whole Chilean banking sector over January 1999-December 2002. As the figures show, this was both healthy and profitable over the sample period. Past-due loans averaged only 1.83 percent of total loans, while the rate of return on equity (ROE) and the interest income on income-generating assets (IGA)[5] reached an average of 14 percent and 8.7 percent per year, respectively. Figure 1 shows that provisions have kept up with past-due loans. In turn Figure 2 shows that the loans rate[6] has been relatively stable over time as compared with ROE. Meanwhile, employment in the financial sector showed little dispersion over the sample period, representing about 7.94 percent of the total labor force (as of September-November 2002).

Figure 3 shows the concentration of the Chilean banking system measured by the Herfindhal index. This is computed as the square sum of the shares of income-generating assets. Panel (b) of Table 1 shows that the Herfindhal index for publicly and privately-owned banks has remained almost constant for the sample period.[7] On the other hand, the C4 index, which is calculated as the sum of the income-generating assets shares of the four

[5]Income-generating assets (IGA) are defined as non-contingent loans, credit-note loans (excluding leasing contracts), past-due loans, and investment on financial securities. This definition follows Fuentes and Guzman (2002)'s.

[6]Interest income from credit activities, trading portfolio and financial investments over IGA

[7]There is only one publicly-owned bank: *Banco Estado*.

largest banks, shows slightly more variation and stayed around 67.1 percent for the sample period. Figure 4 shows that concentration has not translated into more efficiency. Fuentes and Guzman (2002) reach the same conclusion for the 1990's.

But, is the Chilean banking system concentrated for international standards? According to a study by Levine (2000), the answer is no. Using data previously collected by Beck, Demirguc-Kunt, and Levine (1999), Levine finds that the sample median of concentration, which he defines as the share of total loans of the three largest banks, is 72 percent while Chile's is 67 percent.

Panel (c) of Table 1 shows macroeconomic indicators for the sample period under analysis. The monthly inflation rate only averaged 3.3 percent (annualized), and it was below 5 percent for the whole sample period. Meanwhile, the annualized growth of the economy—measured by the Monthly Indicator of Economic Activity (IMACEC)—was about 2.2 percent on average. The table also shows transactions of short-maturity debt notes on the Santiago Exchange (short-term indexed and Chilean peso-nominated notes) expressed in dollars and as a percentage of the income-generating assets of commercial banks. This is what it is known as the money market.[8]

The issuers that take part of the money market are the Central Bank of Chile, the Treasury, the Housing and Urbanization Ministry, and private institutions. On average, monthly trading reached US$9,689 million, which represented about 23 percent of the income-generating assets of commercial banks. The predominance of short-term debt notes over other exchange-traded assets is depicted in Figure 5. Indeed, the money market represented about 50 percent of all the Santiago Stock Exchange trading over 1999-2002.

Figure 6 shows in turn the evolution of the IMACEC annualized growth rate and the annualized real depreciation rate, both on a monthly basis. Over 1999, real depreciation and economic growth exhibited a high positive correlation. However, the year 2000 stands out for a period of high depreciation and negative economic growth. Overall, for the whole sample period, the correlation coefficient between the two series was only 0.03.

Table 2 shows loans shares by economic activity for all commercial banks operating over January 1999-December 2002. Banks primarily offered loans to firms in the manufacturing and the financial services sectors (13 and 26 percent, respectively), and to individuals through consumption and mortgage loans (9 and 10 percent, respectively). Those economic sectors that received least funding were: a) mining (1.6 percent), b) electricity, gas, and water (1.2 percent); and c) transportation, storage and communications (3.1 percent).

The data used for estimation include nineteen banks for the period 1999-2002 on a monthly frequency. We excluded from the sample very small foreign banks, foreign banks that only serve financial institutions, insurance, real estate and services companies, and domestic banks engaged mostly in providing consumption loans or consumption leasing. Two mergers took place over the sample period. *Banco de A. Edwards* merged with *Banco*

[8] The money market includes short-term, highly liquid and relatively low-risk debt instruments.

de Chile in December 2001, under the name of *Banco de Chile*. In addition, *Banco de Santiago* merged with *Banco Santander-Chile* in August 2002, under the name of the latter. Given that *Banco de A. Edwads* was small relative to *Banco de Chile*, the merged banks were reconstructed backwards as the sum of the two before the merger for estimation purposes. In the case of *Banco de Santiago* and *Banco Santander-Chile*, given that both banks were of similar size we reconstructed the series of each one as if they had continued separate from August through December 2002.[9]

Table 3 shows indicators of all commercial banks in the sample, controlling for size, liquidity, and capitalization. Panel (a) shows that largest banks exhibit lower credit risk[10], but lower capitalization than smaller banks. On the other hand, bank efficiency does not seem to be affected by size. For all sizes, the greatest share of loans correspond with firms loans, followed by mortgage loans. When controlling for liquidity, Panel (b) shows that more liquid banks are those both more capitalized and smallest sized. Both Panels (b) and (c) suggest that the cost of reserves[11] is increasing in both liquidity and capitalization. Again, efficiency does not seem to depend on either liquidity or capitalization, and the composition of loans is almost invariant to liquidity and capitalization.

III Econometric model

Our estimation procedure is based on dynamic panels. The basic structure of a dynamic panel is given by a model of the form (see, for example, Hsiao, 2003)

$$y_{it} = \gamma y_{i,t-1} + \boldsymbol{\delta}'\mathbf{z}_i + \boldsymbol{\beta}'\mathbf{x}_{it} + v_{it} \qquad i=1, 2.., N;\ t=1,\ldots,T \qquad (1)$$

where $|\gamma|<1$, $v_{it}=\alpha_i+u_{it}$

$$E(\alpha_i)=E(u_{it})=0 \qquad E(\alpha_i \mathbf{z}_i')=E(\alpha_i \mathbf{x}_{it}')=\mathbf{0}' \qquad E(\alpha_i u_{jt})=0$$

$$E(\alpha_i \alpha_j) = \begin{cases} \sigma_\alpha^2 \text{ if } i = j \\ 0 \text{ if } i \neq j \end{cases} \qquad E(u_{it} u_{js}) = \begin{cases} \sigma_u^2 \text{ if } i = j, t = s \\ 0 \text{ otherwise} \end{cases}$$

where $\mathbf{z}_i$ is a K_2 x 1 vector of time-invariant exogenous variables, such as a constant term, $\mathbf{x}_{it}$ is K_1 x 1 of time-varying exogenous variables, γ is 1 x 1, $\boldsymbol{\delta}$ and $\boldsymbol{\beta}$ are K_2 x 1 and K_1 x 1 vectors of parameters, respectively.

By taking the first difference of (1), we eliminate the individual effect α_i:

$$y_{it} - y_{i,t-1} = \gamma(y_{i,t-1} - y_{i,t-2}) + \boldsymbol{\beta}'(\mathbf{x}_{it} - \mathbf{x}_{i,t-1}) + u_{it} - u_{i,t-1} \qquad t=2, \ldots, T \qquad (2)$$

[9]In December 2001, the income-generating assets share of *Banco de A. Edwards*, with respect to all banks, was 7.4 percent, whereas that of *Banco de Chile* reached 19.6 percent. The income-generating assets shares of *Banco Santander-Chile* and *Banco de Santiago* were in turn 13.1 and 15.6 percent, respectively, in August 2002.

[10]Loans provisions/IGA.

[11](Cash+ deposits in the Central Bank of Chile)/IGA.

Given that $(y_{i,t-1} - y_{i,t-2})$ is correlated with $(u_{it} - u_{i,t-1})$, an instrument for $(y_{i,t-1} - y_{i,t-2})$ is needed. In fact, all $y_{i,t-2-j}$, j=0, 1,… satisfy the conditions $E[y_{i,t-2-j}(y_{i,t-1} - y_{i,t-2})] \neq 0$ and $E[y_{i,t-2-j}(u_{it} - u_{i,t-1})] = 0$. And, therefore, they all are valid instruments. Let $\mathbf{w}_{it} = (y_{i0}, y_{i1}, ..., y_{i,t-2}, \mathbf{x}_i')'$, with $\mathbf{x}_i' = (\mathbf{x}_{i1}', ..., \mathbf{x}_{iT}')$, and $\Delta = 1 - L$ where L is the lag operator. Then we have the following set of moment conditions

$$E(\mathbf{w}_{it}\Delta u_{it}) = 0 \qquad t = 2, \ldots, T. \tag{3}$$

The (T−1) first-differenced equations of (1) stacked in matrix form are

$$\Delta \mathbf{y}_i = \Delta y_{i,-1}\gamma + \Delta X_i \boldsymbol{\beta} + \Delta \mathbf{u}_i \qquad i = 1, \ldots, N \tag{4}$$

where $\Delta \mathbf{y}_i$, $\Delta \mathbf{y}_{i,-1}$, and $\Delta \mathbf{u}_i$ are (T−1) x 1 vectors of the form $(y_{i2} - y_{i1}, ..., y_{iT} - y_{i,T-1})'$, $(y_{i1} - y_{i0}, ..., y_{i,T-1} - y_{i,T-2})'$, $(u_{i2} - u_{i1}, ..., u_{iT} - u_{i,T-1})'$, respectively, and $\Delta \mathbf{X}_i$ is a (T−1) x K_1 matrix whose elements are $(\mathbf{x}_{i2} - \mathbf{x}_{i1}, ..., \mathbf{x}_{iT} - \mathbf{x}_{i,T-1})'$. In total, there are $T(T-1)(K_1+1/2)$ moment conditions, which in matrix form can be represented as

$$E(\mathbf{W}_i \Delta \mathbf{u}_i) = \mathbf{0} \tag{5}$$

where

$$\mathbf{W}_i = \begin{pmatrix} \mathbf{w}_{i2} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \mathbf{w}_{i3} & \cdots & \mathbf{0} \\ \vdots & \vdots & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \mathbf{w}_{iT} \end{pmatrix}$$

is of dimension $[T(T-1)(K_1+1/2)]$ x (T−1). Given that the dimension of $\mathbf{W}_i$ (i.e., number of moment conditions) exceeds the number of parameters to be estimated, K_1+1, the generalized method moment (GMM) is utilized.

Specifically, the Arellano-Bond GMM estimator of $\boldsymbol{\theta} = (\gamma, \boldsymbol{\beta}')'$ is obtained by minimizing

$$\left(\frac{1}{N}\sum_{i=1}^{N} \Delta \mathbf{u}_i' \mathbf{W}_i'\right) \boldsymbol{\Psi}^{-1} \left(\frac{1}{N}\sum_{i=1}^{N} \mathbf{W}_i \Delta \mathbf{u}_i\right) \tag{6}$$

where $\boldsymbol{\Psi} = E\left(\frac{1}{N^2}\sum_{i=1}^{N} \mathbf{W}_i \Delta \mathbf{u}_i \Delta \mathbf{u}_i' \mathbf{W}_i'\right)$.

IV Estimation Results

In this section, we concentrate on testing the existence of a credit channel by looking at aggregate loans and deposits, loans by type (firms, consumption, mortgage), and

loans by main economic sectors (manufacturing, commerce, and financial services). Descriptive statistics of these variables for the whole banking sector over January 1999-December 2002 are given in Table 4. In particular, the coefficient of variation shows that commerce loans were relatively the most volatile, followed by mortgage loans. In turn deposits displayed less relative dispersion than loans.

It is also illustrative to look at the growth rate of the above variables. Figure 7, Panels (a) through (c), depicts the evolution of the 12-month growth rate of the above series over the sample period.[12] Panel (a) shows that loans have grown at a much smaller rate than deposits. However, both series present a declining growth rate since mid-2001 onwards approximately. Panel (b) in turn shows that mortgage and consumption loans have grown at the expense of firms loans. Furthermore, the 12-month growth rate of firms loans was negative over September-December 2002. Finally Panel (c) shows that the growth rate in financial services loans was negative throughout 2002, while commerce loans experienced a high expansion between March 2001 and June 2002. On the other hand, manufacturing experienced the major loans contraction over the sample period, among these three economic sectors.

The explanatory variables in our econometric specification include four lags of the dependent variable, the contemporaneous value and four lags of the inflation rate, of the nominal 30-90 day loans rate, of the stock-exchange market activity, and of the real-exchange rate devaluation, and the first lag of bank characteristics: capitalization, size, liquidity, past-due loans to total loans and efficiency. The stock-exchange market activity is defined as debt-notes trading over income-generating bank assets, as reported in Table 1 (c). As instruments, we used the fifth through the ninth lag of the dependent variable, of the bank characteristics, and of the stock-exchange activity. All computations were carried out with the GMM-routine of TSP/GiveWin 4.5.

In order to distinguish demand from supply of loans, we use our estimate of domestic stock-exchange market activity. The intuition goes as follows: if a more active stock exchange constitutes an exogenous deposit-reducing shock, then if a credit channel exists, the loan supply should shift upwards. In particular, Hernando and Pages (2001) use a tax-induced shift from deposits to mutual funds during 1991 and 1996 in Spain for identification of the loans supply.[13] Given that our measure of stock market activity only involves the money market, corporate bonds and any other long-term securities (e.g., preferred and common stock) are left out. If the latter were included, we would not certainly be solving the identification problem. The reason is that long-maturity assets issued by firms are substitutes for bank loans. Therefore, they affect the loans demand.

Panel (a) and (b) of Table 5 show our estimation results for total deposits and loans. By looking at bank characteristics, we see that both size and liquidity affect positive and

[12] For instance, the 12-month growth rate in January 2000 is computed as the growth rate between January 1999 and January 2000.

[13] They find that such tax reduction affected the demand for deposits but not the supply of loans. Therefore, they conclude that, at least for the period 1991-1998, there is no evidence of the existence of a credit channel in Spain.

significantly bank deposits. For example, an increment of 1 percent in bank size will lead to an increase of 6.2 percent of deposits next period (month), while an increase of one unit in liquidity will lead to an increase of 0.96 percent in deposits next period. By contrast, more capitalized banks will count on fewer deposits: an increase of 1 percent in capitalization will lead to a decrease of 0.53 percent next period. Finally, bank efficiency does not have a statistically significant impact on deposits.

Long-run coefficients measure the marginal impact of each regressor on the dependent variable after a four-month period. For example, for the deposits equation, we have that an 1-percent increase in the annualized rate of economic activity will translate into an 3.5-percent increase of deposits after four periods (months). An interest rate increase, a depreciation of the real exchange rate, and a more active stock exchange will have a contractive effect on deposits. For example, after controlling for inflation, a 1-percent increase of the (real) short interest rate will lead to a decrease of 3.2 percent in deposits after four months. The effect of stock-exchange market activity on deposits is explained by the fact that exchange-traded assets are good substitutes for bank deposits in investment decisions. On the other hand, an appreciation of the real exchange rate will make domestic currency-denominated deposits less attractive than foreign currency-denominated deposits, unless domestic interest rates fully adjust.

The specification tests of the deposits equation indicate that the model is appropriate to the data. First, the Sargan test does not reject the null hypothesis that the moment equations are correctly specified. Second, there is no lingering correlation in the residuals of the moment equations.

In the loans equation, we have included as an additional explanatory variable past-due loans to total loans. As expected, loans are negatively correlated with this variable. Specifically, a 1-percent-increase in past-due loans today will reduce the total supply of loans by 3.7 percent next period. The relationship between loans and size, liquidity, and capitalization is similar to that found in deposits. However, in this case efficiency has a statistically significant impact on total loans: a 1-percent increase in it will translate into a 1.38 percent-increase in total loans next period. Regarding the long-run elasticities, we see they have the same sign as those for deposits, but loans appear to be slightly more inelastic with respect to IMACEC, the interest rate, the stock-exchange market activity and real depreciation. Again, all specification tests do not reject that the model is correctly specified.

Table 6 shows estimation results for consumption, firms and mortgage loans. All categories are highly sensitive to bank size. For instance, a 1-percent increment in bank size translates into a 9-percent increase in consumption loans next period. In all cases, capitalization is both statistically significant and negatively correlated with loans, whereas bank efficiency does not have much explanatory power. The past-due loans/total loans ratio has the strongest negative impact on mortgage loans: a 1-percent increase in past-due loans leads to a 4-percent decrease in mortgage loans next period. Long-run elasticities are, in general, close in magnitude for all categories, except for real depreciation, and have the expect sign. In particular, consumption loans appear to be the most sensitive to this variable: a 1-percent increase in real depreciation leads to a 1.8-percent decrease in

consumption loans within four months. All three equations are correctly specified according to the Sargan and autocorrelation tests.

We also looked at the existence of a credit channel by economic sectors. We took the three economic sectors with highest loans shares according to Table 2: manufacturing (13.4 percent), commerce (14.9 percent), and financial services (25.5 percent). Table 7 shows our results. In all cases, the most relevant bank characteristics are liquidity, efficiency, and past-due loans. For instance, the latter has a particularly detrimental effect on loans to the financial sector. Indeed, a 1-percent increase in past-due loans reduces by 4.6 percent loans to this sector next period.

It is interest to see that by looking at economic sectors, we are able to detect more dispersion in the response to changes in macroeconomic factors. In particular, the manufacturing sector appears as the most sensitive to economic activity—measured by percent variations in IMACEC, the real interest rate, the stock-exchange market economic activity, and real depreciation. To illustrate, a 1-percent increase in IMACEC today would translate into a 4.3 percent-increase in loans to manufacturing within four months, whereas a 1-percent increase in the real interest rate would lead to a 5.7 percent-decrease within the same time span. The long-run elasticity with respect to the stock market is also relatively large when compared with the other two sectors: −3.4 percent.

The commerce sector is also highly sensitive to the real interest rate: a 1-percent increase in this variable today would lead to a 3.7-percent decrease in loans within four months. By contrast, the least sensitive sector to the real interest rate is financial services, where a 1-percent increase in the real interest rate today would lead to a 1.93-percent decrease in loans within four months.

Again, the Sargan test does not reject the validity of the moment equations for any sector, and the autocorrelation tests are not statistically significant at levels of 6 percent or lower.

We also looked at the interaction of the interest rate with bank characteristics. Table 8 reports our results. Panel (a) shows the interaction effects for total deposits and loans. Except for past-due loans, all other characteristics show a positive interaction with the interest rate. For example for loans, a 1-percent increase in bank size would reduce the long-run real interest rate elasticity by 0.67 percent points. By contrast, an increase of a 1-percent in past-due loans will increase, in absolute value, this long-run elasticity by 0.092 percent points. Bank efficiency appears to be the least relevant hedge factor against a tight monetary policy. Similar conclusions can be drawn for deposits.

When looking at loans by type, the interaction terms of liquidity and capitalization with the real interest rate are the ones that have the most significant impact on the long-run interest rate elasticity. For instance, for consumption loans, a 1-percent increase in bank capitalization would reduce this long-run elasticity by 0.57 percent points. By contrast, an increase in the past-due loans share makes consumption and firms loans particularly more vulnerable to the variation in the interest rate.

For economic sectors, we see that the interaction between liquidity and the interest rate is particularly important to the financial sector: if liquidity increases by one, the long-run interest rate elasticity is reduced by 1 percent point. This figure halves for manufacturing and commerce loans. On the other hand, the interaction effect of capitalization and the interest rate is relatively high for the manufacturing sector, but not for the commerce and financial services sectors. Finally, the interaction term with past-due loans affects by a similar magnitude the long-run interest rate elasticity of each economic sector, being this slightly higher for manufacturing.

In sum, our estimation results strongly support the existence of a credit channel in Chile. The exchange stock market activity allows us to identify the supply from the demand for loans. Indeed, we find that the money market can be a good investment alternative to deposits. This in turn leads to a contraction of all loans categories following a tight monetary policy.

V Conclusions

To date, there is no consensus about how frictions in the credit market affect the transmission of the monetary policy to the real economy. The traditional money channel states that when the Central Bank reduces its reserves, commercial banks are forced to reduce their demand for deposits. If prices are sticky, in the short-run a decrease in real monetary holdings should lead to higher real interest rates. This in turn translates into a contraction of interest-sensitive components of aggregate spending and, therefore, into lower economic growth.

Another existing stream refers to the credit market. Bernanke and Gertler suggest two channels by which monetary policy affects the credit market: the balance sheet channel and the credit channel. The former assumes that changes in monetary policy affect borrowers' balance sheets and income statement. Due to asymmetric information, a reduced borrowers' net worth translates into an upward shift of the bank loan supply. The credit channel or bank lending channel states that the direct effect of monetary policy on interest rates is amplified by increases in the external finance premium—i.e., the spread between a firms' external funds (bonds, loans, and equity) and internal funds (retained earnings). As risk increases over a recession, and information asymmetries are sharpened, the size of the external finance premium increases and amplifies the effect of a restrictive monetary policy on aggregate spending and the real economy.

This article focuses on testing the existence of a credit channel in Chile. Our sample comprises 19 banks that operated in Chile over January 1999-December 2002. Over that period, banks primarily offered loans to firms in the Manufacturing and the financial services sectors (13 and 26 percent of total loans, respectively), and to individuals through consumption and mortgage loans (9 and 10 percent of total loans, respectively). Our estimation results show that the loans supply and the deposits demand are affected by bank characteristics—such as liquidity, size, past-due loans proportion, and capitalization—economic activity, the level of interest rates, real exchange depreciation, and by the Santiago Stock Exchange trading. Our results support the existence of a credit channel in the Chilean economy.

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Table 1 Indicators of the Chilean Financial Sector: January 1999-December 2002

(a) Performance indicators of commercial banks

	Income-generating assets [1]	Global efficiency[2]	Operating efficiency[3]	Personnel costs[4]	Past-due loans/loans	Provisions /loans	ROE[5]	Loans rate[6]	Personnel[7]
Observations	48	48	48	48	48	48	48	48	48
Mean	42,858	0.10%	0.50%	0.28%	1.83%	2.26%	1.11%	0.70%	39,896
Median	42,773	0.09%	0.49%	0.27%	1.87%	2.27%	1.12%	0.70%	40,484
Std. dev.	1,876	0.05%	0.11%	0.04%	0.12%	0.17%	0.59%	0.12%	1,546
25%-quantile	41,283	0.07%	0.48%	0.26%	1.74%	2.21%	0.80%	0.65%	38,531
50%-quantile	42,773	0.09%	0.49%	0.27%	1.87%	2.27%	1.12%	0.70%	40,484
75%-quantile	44,092	0.13%	0.53%	0.29%	1.91%	2.35%	1.48%	0.74%	40,986
Minimum	39,981	0.00%	-0.05%	0.24%	1.46%	1.68%	-0.01%	0.23%	36,701
Maximum	48,202	0.24%	0.91%	0.51%	1.99%	2.50%	2.88%	1.20%	42,426

Source: own elaboration based on information from the Superintendence of Banks and Financial Institutions. Figures are expressed in million US$ dollars of December 2002. [1]Income-generating assets include non-contingent loans, credit-note loans (excluding leasing contracts), past-due loans, and investment on financial securities [2]Net income over income-generating assets (IGA). [3] Gross operating revenue over IGA. [4] Operating personnel costs over IGA.[5] Net profit over equity (monthly rate). [6] Interest income from credit activities, trading portfolio and financial investments over IGA (monthly rate). [7] Number of employees.

(b) Concentration indicators of commercial banks

	Herfindahl all banks	Herfindahl private banks	C4 all banks	C4 private banks
Observations	48	48	48	48
Mean	0.13	0.10	67.17%	59.44%
Median	0.13	0.10	67.47%	59.50%
Std. dev.	0.00	0.00	1.01%	0.86%
25%-quantile	0.13	0.10	66.99%	58.84%
50%-quantile	0.13	0.10	67.47%	59.50%
75%-quantile	0.13	0.10	67.83%	60.06%
Minimum	0.12	0.09	63.68%	57.30%
Maximum	0.13	0.11	68.42%	60.99%

Source: own elaboration based on information from the Superintendence of Banks and Financial Institutions.

(c) Macroeconomic indicators

	Monthly inflation (annualized)	% variation IMACEC[1]	30-90 day loans rate (annualized)	Money market [2]	Money market/IGA	Real exchange rate [3]
Observations	48	48	48	48	48	48
Mean	3.29%	2.18%	11.15%	9,689	22.68%	5.35%
Median	3.41%	2.77%	11.16%	9,560	22.32%	4.50%
Std. dev.	0.72%	2.62%	2.79%	1,239	3.30%	6.03%
25%-quantile	2.61%	1.02%	9.42%	8,882	20.78%	1.45%
50%-quantile	3.41%	2.77%	11.16%	9,560	22.32%	4.50%
75%-quantile	3.77%	3.74%	12.99%	10,516	24.34%	9.50%
Minimum	1.91%	-6.91%	6.12%	7,004	16.29%	–8.20%
Maximum	4.63%	5.96%	16.32%	13,222	30.97%	18.60%

Source: own elaboration based on information from the Superintendence of Banks and Financial Institutions, the Central Bank of Chile, and from the Santiago Stock Exchange. [1]IMACEC stands for Monthly Economic Activity Indicator. Percent variations are calculated over a 12-month horizon. [2] It comprises nominal and indexed short-maturity debt notes traded on the Santiago Stock Exchange. Figures are in million US$ dollars of December 2002. [3]The real exchange rate is defined as the nominal US$/Chilean Peso exchange rate times the ratio of foreign inflation and domestic inflation. Foreign inflation is computed as the monthly percent variation in the Producer Price Index—or, alternatively, if not available, as the monthly percent variation in the Consumer Price Index—expressed in U.S. dollars, of trade partners corresponding with industrialized nations (The United States, Japan, The United Kingdom, and Canada), and Euro-zone countries (Germany, France, Spain, Italy, The Netherlands, and Belgium). Percent variations are calculated over a 12-month horizon.

Table 2 Average Loans Share by Economic Activity classified by Bank: January 1999-December 2002

	Economic Sector											
BANK	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**1**	**2**	**Total**
ABN AMRO BANK *	3.8%	2.9%	24.1%	0.7%	2.2%	12.8%	3.5%	34.3%	4.2%	1.9%	9.4%	100%
BANCO BICE	9.0%	0.9%	17.2%	2.7%	7.3%	8.4%	3.3%	18.0%	26.7%	1.0%	5.6%	100%
BANCO DE A. EDWARDS(1)	5.4%	1.1%	10.2%	1.1%	8.9%	13.4%	1.9%	20.3%	21.7%	7.1%	9.0%	100%
BANCO DE CHILE	10.3%	2.3%	11.6%	1.6%	7.5%	11.7%	2.8%	18.1%	3.2%	12.5%	18.3%	100%
BANCO DE CREDITO E INVERSIONES	5.9%	1.0%	11.4%	1.6%	5.6%	14.0%	3.7%	21.4%	11.6%	6.8%	17.0%	100%
BANCO DE LA NACION ARGENTINA *	3.7%	7.2%	19.3%	0.1%	2.6%	19.0%	4.0%	42.8%	0.0%	1.4%	0.0%	100%
BANCO DEL DESARROLLO	7.6%	0.8%	5.2%	0.7%	17.9%	12.6%	3.9%	13.8%	12.9%	4.2%	20.5%	100%
BANCO DEL ESTADO DE CHILE	4.5%	0.2%	4.7%	1.2%	6.1%	12.3%	0.9%	18.3%	3.9%	5.8%	42.2%	100%
BANCO DO BRASIL *	17.1%	7.5%	15.7%	0.0%	1.4%	17.2%	17.4%	23.5%	0.2%	0.1%	0.0%	100%
BANCO FALABELLA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	88.2%	9.2%	100%
BANCO INTERNACIONAL	1.8%	0.9%	15.8%	0.1%	11.1%	26.3%	2.9%	32.0%	0.9%	0.7%	7.5%	100%
BANCO SANTANDER-CHILE *	4.4%	0.9%	6.4%	1.8%	2.2%	7.9%	1.5%	11.4%	28.1%	15.4%	19.9%	100%
BANCO SANTIAGO(2)	3.3%	0.9%	21.3%	0.5%	2.6%	12.9%	3.8%	16.0%	14.6%	7.2%	16.9%	100%
BANCO SECURITY	7.8%	0.2%	14.5%	2.6%	11.1%	9.5%	4.5%	30.6%	15.8%	0.5%	3.0%	100%
BANCO SUDAMERIS *	10.3%	1.1%	31.6%	0.8%	2.6%	25.4%	2.7%	19.6%	5.7%	0.1%	0.0%	100%
BANKBOSTON *	3.5%	0.1%	10.0%	1.8%	1.5%	9.4%	2.9%	13.9%	29.1%	11.9%	16.0%	100%
BBVA BANCO BHIF *	1.4%	0.0%	0.6%	0.0%	6.0%	17.7%	0.6%	24.4%	13.4%	9.8%	26.1%	100%
CITIBANK N.A.*	4.3%	0.3%	13.7%	1.4%	1.5%	5.6%	3.7%	10.1%	9.6%	31.1%	18.6%	100%
CORPBANCA	7.6%	2.8%	10.3%	1.4%	7.1%	13.9%	2.9%	17.4%	17.9%	14.1%	4.7%	100%
DRESDNER BANQUE *	17.8%	2.2%	31.7%	0.6%	3.9%	13.9%	3.1%	24.5%	1.8%	0.1%	0.3%	100%
HSBC BANK USA *	4.4%	3.1%	14.2%	1.2%	2.1%	26.2%	1.8%	45.6%	1.2%	0.1%	0.0%	100%
JP MORGAN CHASE BANK *	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100%
SCOTIABANK *SUD AMERICANO*	2.2%	0.9%	4.4%	0.9%	1.9%	47.4%	1.2%	20.7%	1.8%	5.2%	13.5%	100%
THE BANK OF TOKYO-MITSUBISHI *	13.8%	0.5%	27.5%	4.7%	0.0%	19.4%	0.5%	33.4%	0.1%	0.1%	0.0%	100%
Mean	**6.3%**	**1.6%**	**13.4%**	**1.2%**	**4.7%**	**14.9%**	**3.1%**	**25.5%**	**9.3%**	**9.4%**	**10.7%**	
Min	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**2.6%**	**0.0%**	**0.0%**	**0.0%**	
Max	**17.8%**	**7.5%**	**31.7%**	**4.7%**	**17.9%**	**47.4%**	**17.4%**	**100.0%**	**29.1%**	**88.2%**	**42.2%**	

Source: own elaboration based on information from the Superintendence of Banks and Financial Institutions. * indicates foreign bank; '10'=agriculture, livestock farming and foresting; 20=mining; 30: manufacturing; 40=electricity, gas, and water; 50=construction; 60=commerce; 70=transportation, storage, and communications; 80=financial institutions, insurance, real estate and services; 90=community, social and personal services; 1=consumption loans or consumption leasing; 2=mortgage loans or housing leasing. (1) It merged with *Banco de Chile* in December 2001. (2) It merged with *Banco Santander-Chile* in August 2002.

Table 3 Indicators of Commercial Banks in the sample classified by Size, Liquidity and Capitalization: January 1999-December 2002

(a) Size

	<50%				50-75%				>75%			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Credit risk[1]	2.3%	1.7%	0.6%	10.3%	2.7%	1.0%	1.5%	5.1%	1.6%	0.5%	1.2%	3.1%
Liquidity[2]	1.1	0.4	0.6	2.8	0.8	0.1	0.6	1.3	0.7	0.2	0.3	1.0
Capitalization[3]	15.9%	10.8%	6.2%	56.4%	10.6%	3.6%	5.5%	20.3%	8.2%	1.3%	5.8%	10.9%
Past-due loans[4]	1.7%	1.7%	0.3%	10.1%	2.4%	0.8%	1.1%	4.9%	1.6%	0.3%	1.1%	2.7%
Reserves cost[5]	3.3%	2.8%	0.5%	23.3%	2.7%	1.1%	0.8%	8.1%	2.4%	1.1%	0.8%	11.2%
Size[6]	1.5%	1.2%	0.1%	3.8%	5.2%	1.5%	3.8%	9.1%	16.0%	3.5%	9.1%	22.3%
Efficiency[7]	0.5%	0.5%	–2.5%	7.2%	0.6%	0.2%	0.2%	1.2%	0.5%	0.1%	0.2%	0.8%
Personnel[8]	486	506	44	2,820	2,113	709	1,185	3,752	5,309	1,673	3,183	7,827
IGA	656	511	52	1,733	2,200	645	1,578	3,938	6,904	1,513	3,752	10,210
Firms loans	45.9%	15.2%	15.8%	73.8%	40.8%	4.9%	29.5%	49.9%	40.0%	3.7%	31.3%	49.9%
Consumer loans	2.4%	4.0%	0.0%	22.3%	11.4%	7.4%	3.5%	28.9%	6.9%	1.9%	4.0%	11.6%
Mortgage loans	5.8%	6.4%	0.0%	21.7%	14.0%	5.9%	3.8%	23.1%	20.1%	9.3%	9.9%	39.0%
Observations	435				212				217			

(b) Liquidity

	<50%				50-75%				>75%			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Credit risk	2.0%	0.8%	0.7%	4.3%	2.1%	1.1%	0.6%	9.9%	2.7%	2.2%	0.6%	10.3%
Liquidity	0.7	0.1	0.3	0.9	1.0	0.1	0.9	1.1	1.4	0.4	1.1	2.8
Capitalization	9.3%	3.2%	5.5%	29.9%	11.9%	4.2%	6.8%	26.4%	20.2%	13.3%	8.5%	56.4%
Past-due loans	2.0%	0.9%	0.4%	5.2%	1.7%	1.1%	0.3%	3.9%	1.9%	2.1%	0.3%	10.1%
Reserves cost	2.6%	1.4%	0.7%	12.2%	3.0%	1.8%	0.6%	14.0%	3.4%	3.3%	0.5%	23.3%
Size	9.4%	6.7%	0.3%	22.3%	4.0%	4.6%	0.3%	16.8%	1.5%	1.2%	0.1%	4.7%
Efficiency	0.5%	0.1%	0.1%	1.3%	0.5%	0.2%	-0.3%	1.4%	0.5%	0.7%	-2.5%	7.2%
Personnel	3,239	2,372	86	7,827	1,354	1,436	94	4,717	553	760	44	2,924
IGA	4,043	2,891	132	10,210	1,686	196	125	7,364	643	542	52	2,014
Firms loans	39.5%	6.9%	16.4%	60.6%	46.9%	12.5%	15.8%	73.8%	46.9%	15.2%	25.8%	73.6%
Consumer loans	6.4%	3.7%	0.1%	17.9%	5.3%	7.8%	0.0%	28.9%	4.8%	7.7%	0.0%	28.6%
Mortgage loans	15.6%	10.0%	0.0%	39.0%	8.9%	6.0%	0.0%	18.3%	5.5%	6.2%	0.0%	18.0%
Observations	432				216				216			

(c) Capitalization

	<50%				50-75%				>75%			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Credit risk	2.0%	0.9%	0.7%	4.4%	1.9%	0.7%	0.9%	9.9%	2.9%	2.2%	0.6%	10.3%
Liquidity	0.8	0.2	0.3	1.4	1.0	0.2	0.6	1.4	1.3	0.5	0.6	2.8
Capitalization	8.1%	1.2%	5.5%	9.9%	11.1%	0.7%	9.9%	12.7%	23.4%	11.5%	12.7%	56.4%
Past-due loans	1.9%	1.1%	0.3%	5.2%	1.6%	0.8%	0.3%	3.1%	2.2%	2.0%	0.4%	10.1%
Reserves cost	2.4%	1.5%	0.7%	14.0%	2.9%	1.2%	0.7%	9.9%	3.9%	3.3%	0.5%	23.3%
Size	9.5%	6.6%	0.8%	22.3%	3.5%	4.2%	0.4%	21.0%	1.6%	1.7%	0.1%	6.4%
Efficiency	0.5%	0.1%	-0.3%	1.3%	0.5%	0.2%	0.1%	1.4%	0.6%	0.7%	–2.5%	7.2%
Personnel	3,246	2,397	122	7,827	1,098	1,210	92	6,779	805	1,094	44	3,222
IGA	4,116	2,872	371	10,210	1,507	1,784	168	8,480	685	733	52	2,731
Firms loans	44.1%	8.7%	27.7%	71.7%	47.9%	13.6%	23.5%	73.8%	36.5%	11.4%	15.8%	67.0%
Consumer loans	5.5%	3.5%	0.1%	17.9%	5.0%	5.0%	0.1%	16.8%	6.9%	9.8%	0.0%	28.9%
Mortgage loans	15.5%	9.2%	0.3%	39.0%	8.5%	8.1%	0.0%	23.1%	6.0%	6.7%	0.0%	22.9%
Observations	431				218				215			

Source: own elaboration based on information from the Superintendence of Banks and Financial Institutions [1] Loans provisions over income-generating assets (IGA). [2] (1-year maturity loans +liquid assets)/1-year maturity deposits. [3] Equity over IGA.[4] Past-due loans in dollars to total loans. [5] (Cash+ deposits in the Central Bank of Chile)/IGA. [6] IGA bank i over IGA for all banks. [7] Operating efficiency. [8] Number of employees.

Table 4 Descriptive Statistics of Loans and Deposits for the Chilean Banking Sector: January 1999-December 2002

	Loans by economic sector			Loans by type				
	Manufacturing	**Commerce**	**Financial services**	**Firms**	**Consumption**	**Mortgage**	**Total loans**	**Total deposits**
Observations	48	48	48	48	48	48	48	48
Mean	4,011	4,986	6,687	16,881,414	2,926,929	6,842,173	40,696,064	35,461,386
Median	4,097	4,539	6,672	16,992,582	2,886,223	6,919,605	40,301,074	34,886,390
Std. dev.	244	724	339	983,876	204,173	482,839	2,292,901	2,463,666
25%-quantile	3,944	4,353	6,401	15,943,818	2,815,679	6,611,702	38,837,660	33,727,509
50%-quantile	4,097	4,539	6,672	16,992,582	2,886,223	6,919,605	40,301,074	34,886,390
75%-quantile	4,180	5,691	6,988	17,798,176	3,033,907	7,220,767	43,020,829	37,623,192
Minimum	3,344	3,945	6,104	15,578,141	2,464,050	5,856,969	37,317,971	30,363,185
Maximum	4,307	6,169	7,414	18,492,861	3,409,566	7,648,830	44,098,375	39,477,417
Coefficient of variation	6.08%	14.53%	5.08%	5.83%	6.98%	7.06%	5.63%	6.95%

Source: Own elaboration based on information from the Superintendence of Banks and Financial Institutions. Figures are expressed in US million dollars of December 2002.

Table 5 Testing the existence of a credit channel

(a) First difference of total deposits

Bank characteristics				
Variable	Coefficient	Standard deviation	t-test	p-value
Size (%)	6.208	2.499	2.484	0.013
Liquidity	0.962	0.034	27.703	0.000
Capitalization (%)	–0.526	0.186	–2.829	0.005
Efficiency (%)	0.293	0.460	0.637	0.524
Long-run coefficients				
Variable	Coefficient	Standard deviation	t-test	p-value
IMACEC (%)	3.498	0.289	12.118	0.000
Inflation (%)	1.562	0.998	1.566	0.117
Interest rate (%)	–3.180	0.413	–7.698	0.000
Stock exchange (%)	–3.573	0.259	–13.782	2.000
Real depreciation (%)	–2.067	0.082	–25.197	0.000
Specification tests				
	Value	P-value		
Sargan	142.974	0.856		
Autocorrelation Lag 4	–0.600	0.548		
Lag 8	–0.234	0.815		
Lag 14	–1.498	0.134		
Lag 18	0.339	0.734		

(b) First difference of total loans

Bank characteristics				
Variable	Coefficient	Standard deviation	t-test	p-value
Size (%)	4.644	1.761	2.637	0.008
Liquidity	0.863	0.029	28.977	0.000
Capitalization (%)	–0.214	0.109	–1.966	0.049
Efficiency (%)	1.375	0.245	5.604	0.000
Past-due loans (%)	–3.702	0.278	–13.324	0.000
Long-run coefficients				
Variable	Coefficient	Standard deviation	t-test	p-value
IMACEC (%)	3.056	0.391	7.823	0.000
Inflation (%)	2.503	0.587	4.266	0.000
Interest rate (%)	–2.748	0.499	–5.498	0.000
Stock exchange (%)	–3.063	0.394	–7.786	0.000
Real depreciation (%)	–1.574	0.220	–7.148	0.000
Specification tests				
	Value	P-value		
Over-identifying restrictions (Sargan)	145.989	0.966		
Autocorrelation Lag 4	–0.445	0.658		
Lag 8	–0.384	0.701		
Lag 14	–1.065	0.287		
Lag 18	–0.031	0.975		

Note: The explanatory variables include four lags of the dependent variable, the contemporaneous value and four lags of the inflation rate, of the nominal 30-90 day loans rate, of the stock-exchange market activity, and of the real-exchange rate depreciation, and the first lag of capitalization, size, liquidity, past-due loans to total loans and efficiency. The instruments are the fifth through the ninth lag of the dependent variable, of the bank characteristics, and of the stock-exchange market activity.

Table 6 The credit channel: Loans by type

(a) First difference of consumption loans

Bank characteristics				
Variable	Coefficient	Standard deviation	t-test	p-value
Size (%)	8.978	2.721	3.299	0.000
Liquidity	0.992	0.026	38.566	0.000
Capitalization (%)	–0.532	0.122	–4.367	0.000
Efficiency (%)	0.766	0.419	1.829	0.067
Past-due loans (%)	–1.646	0.319	–5.162	0.000
Long-run coefficients				
Variable	Coefficient	Standard deviation	t-test	p-value
IMACEC (%)	3.003	0.552	5.441	0.000
Inflation (%)	0.858	1.082	0.793	0.428
Interest rate (%)	–2.575	0.643	–4.004	0.000
Stock exchange (%)	–3.428	0.232	–14.788	0.000
Real depreciation (%)	–1.799	0.169	–10.662	0.000
Specification tests				
	Value	P-value		
Over-identifying restrictions (Sargan)	156.994	0.909		
Autocorrelation Lag 4	0.758	0.448		
Lag 8	0.903	0.367		
Lag 14	–1.722	0.085		
Lag 18	–0.596	0.551		

(b) First difference of firms loans

Bank characteristics				
Variable	Coefficient	Standard deviation	t-test	p-value
Size (%)	8.814	1.038	8.492	0.000
Liquidity	0.937	0.031	29.995	0.000
Capitalization (%)	–0.919	0.119	–7.703	0.000
Efficiency (%)	0.362	0.299	1.206	0.228
Past-due loans (%)	–3.419	0.284	–12.014	0.000
Long-run coefficients				
Variable	Coefficient	Standard deviation	t-test	p-value
IMACEC (%)	3.178	0.280	11.331	0.000
Inflation (%)	1.471	0.521	2.825	0.005
Interest rate (%)	–2.592	0.322	–8.040	0.000
Stock exchange (%)	–3.438	0.261	–13.182	0.000
Real depreciation (%)	–1.673	0.156	–10.743	0.000
Specification tests				
	Value	P-value		
Over-identifying restrictions (Sargan)	148.340	0.954		
Autocorrelation Lag 4	–0.547	0.584		
Lag 8	–0.360	0.719		
Lag 14	–1.535	0.125		
Lag 18	–0.067	0.946		

(c) First difference of mortgage loans

Bank characteristics					
Variable		Coefficient	Standard deviation	t-test	p-value
Size (%)		7.712	2.010	3.836	0.000
Liquidity		0.846	0.051	16.560	0.000
Capitalization (%)		–0.610	0.124	–4.904	0.000
Efficiency (%)		1.214	0.840	1.444	0.149
Past-due loans (%)		–3.936	0.502	–7.836	0.000
Long-run coefficients					
Variable		Coefficient	Standard deviation	t-test	p-value
IMACEC (%)		3.159	0.670	4.722	0.000
Inflation (%)		3.694	1.134	3.257	0.001
Interest rate (%)		–2.327	0.849	–2.738	0.006
Stock exchange (%)		–3.301	0.432	–7.644	0.000
Real depreciation (%)		–1.367	0.295	–4.631	0.000
Specification tests					
		Value	P-value		
Over-identifying restrictions (Sargan)		138.832	0.988		
Autocorrelation	Lag 4	–0.762	0.446		
	Lag 8	0.259	0.795		
	Lag 14	–1.375	0.169		
	Lag 18	–0.862	0.389		

Note: The explanatory variables include four lags of the dependent variable, the contemporaneous value and four lags of the inflation rate, of the nominal 30-90 day loans rate, of the stock-exchange market activity, and of the real-exchange rate depreciation, and the first lag of capitalization, size, liquidity, past-due loans to total loans and efficiency. The instruments are the fifth through the ninth lag of the dependent variable, of the bank characteristics, and of the stock-exchange market activity.

Table 7 The credit channel: Loans by economic sector

(a) First difference of manufacturing loans

Bank characteristics					
Variable		Coefficient	Standard deviation	t-test	p-value
Size (%)		1.290	1.644	0.785	0.432
Liquidity		0.632	0.039	16.054	0.000
Capitalization (%)		–0.296	0.185	–1.599	0.110
Efficiency (%)		1.718	0.575	2.989	0.003
Past-due loans (%)		–1.062	0.458	–2.317	0.021
Long-run coefficients					
Variable		Coefficient	Standard deviation	t-test	p-value
IMACEC (%)		4.262	0.641	6.650	0.000
Inflation (%)		3.642	1.130	3.221	0.001
Interest rate (%)		–5.691	0.879	–6.475	0.000
Stock exchange (%)		–3.396	0.449	–7.559	0.000
Real depreciation (%)		–2.481	0.229	–10.834	0.000
Specification tests					
		Value	P-value		
Over-identifying restrictions (Sargan)		155.082	0.901		
Autocorrelation	Lag 4	0.374	0.708		
	Lag 8	0.304	0.761		
	Lag 14	1.895	0.058		
	Lag 18	–0.929	0.352		

(b) First difference of commerce loans

Bank characteristics					
Variable		Coefficient	Standard deviation	t-test	p-value
Size (%)		2.239	1.524	1.470	0.142
Liquidity		0.820	0.039	20.766	0.000
Capitalization (%)		–0.963	0.182	–5.294	0.000
Efficiency (%)		1.030	0.041	25.632	0.000
Past-due loans (%)		–0.963	0.181	–5.294	0.000
Long-run coefficients					
Variable		Coefficient	Standard deviation	t-test	p-value
IMACEC (%)		2.881	0.268	10.745	0.000
Inflation (%)		2.649	0.685	3.867	0.000
Interest rate (%)		–3.659	0.363	–10.079	0.000
Stock exchange (%)		–1.712	0.566	–3.028	0.002
Real depreciation (%)		–1.773	0.173	–10.230	0.000
Specification tests					
		Value	P-value		
Over-identifying restrictions (Sargan)		144.666	0.972		
Autocorrelation	Lag 4	–0.168	0.866		
	Lag 8	–1.915	0.060		
	Lag 14	–1.807	0.071		
	Lag 18	–0.265	0.791		

(c) First difference of financial sector loans

Bank characteristics					
Variable		Coefficient	Standard deviation	t-test	p-value
Size (%)		4.496	3.244	1.386	0.166
Liquidity		1.094	0.046	23.739	0.000
Capitalization (%)		–0.661	0.300	–2.202	0.028
Efficiency (%)		1.565	0.734	2.133	0.033
Past-due loans (%)		–4.557	0.699	–6.519	0.000
Long-run coefficients					
Variable		Coefficient	Standard deviation	t-test	p-value
IMACEC (%)		2.089	0.817	2.556	0.011
Inflation (%)		3.230	0.533	6.063	0.000
Interest rate (%)		–1.938	0.722	–2.683	0.007
Stock exchange (%)		–2.535	0.665	–3.811	0.000
Real depreciation (%)		–1.409	0.320	–4.403	0.000
Specification tests					
		Value	P-value		
Over-identifying restrictions (Sargan)		158.797	0.859		
Autocorrelation	Lag 4	–0.122	0.902		
	Lag 8	0.527	0.598		
	Lag 14	–1.501	0.133		
	Lag 18	–0.610	0.542		

Note: The explanatory variables include four lags of the dependent variable, the contemporaneous value and four lags of the inflation rate, of the nominal 30-90 day loans rate, of the stock-exchange market activity, and of the real-exchange rate depreciation, and the first lag of capitalization, size, liquidity, past-due loans to total loans and efficiency. The instruments are the fifth through the ninth lag of the dependent variable, of the bank characteristics, and of the stock-exchange market activity.

Table 8 Interaction between Bank Characteristics and the Interest Rate

(a) Total deposits and total loans

	Deposits			Loans		
	Coefficient	p-value	% point effect*	Coefficient	p-value	% point effect*
Size	10.054	0.038	0.603	11.194	0.000	0.672
Liquidity	1.391	0.000	1.328	1.279	0.000	1.221
Capitalization	3.331	0.004	0.423	3.589	0.000	0.456
Efficiency	0.469	0.878	0.002	2.056	0.021	0.010
Past-due loans				-4.845	0.000	–0.092

(b) Loans by type

	Consumption			Firms			Mortgage		
	Coefficient	p-value	% point effect*	Coefficient	p-value	% point effect*	Coefficient	p-value	% point effect*
Size	2.283	0.000	0.137	0.272	0.678	0.016	3.239	0.001	0.194
Liquidity	1.221	0.000	1.166	1.320	0.000	1.261	0.923	0.000	0.881
Capitalization	4.460	0.000	0.566	2.221	0.000	0.282	2.906	0.000	0.369
Efficiency	4.835	0.001	0.024	1.420	0.104	0.007	4.502	0.055	0.023
Past-due loans	–6.855	0.000	–0.130	–5.534	0.000	–0.105	–2.509	0.004	–0.048

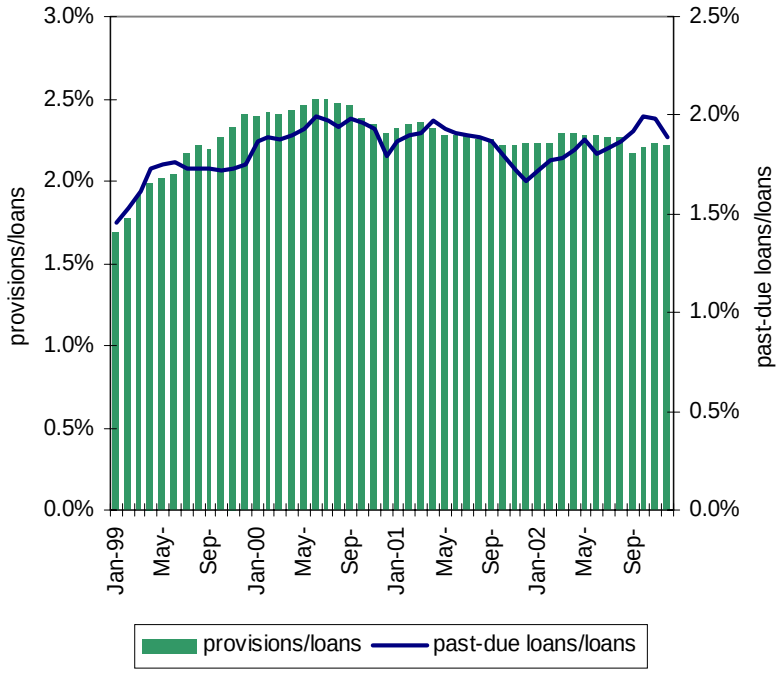
(c) Loans by economic sector

	Manufacturing			Commerce			Financial services		
	Coefficient	p-value	% point effect*	Coefficient	p-value	% point effect*	Coefficient	p-value	% point effect*
Size	3.953	0.391	0.237	-0.958	0.462	–0.057	6.094	0.007	0.366
Liquidity	0.508	0.013	0.485	0.518	0.000	0.495	1.087	0.000	1.038
Capitalization	6.168	0.000	0.783	1.695	0.039	0.215	1.251	0.480	0.159
Efficiency	–5.550	0.297	–0.028	2.085	0.404	0.010	–0.991	0.843	–0.005
Past-due loans	–8.354	0.088	–0.159	–5.329	0.060	–0.101	–7.112	0.102	–0.135

Notes: *: evaluated at sample means. The explanatory variables include four lags of the dependent variable, the contemporaneous value and four lags of the inflation rate, of the nominal 30-90 day loans rate, of the stock-exchange market activity, and of the real-exchange rate depreciation, the first lag of capitalization, size, liquidity, past-due loans to total loans and efficiency, and the first lag of the interaction term of the nominal interest rate with bank characteristics. The instruments are the fifth through the ninth lag of the dependent variable, of the bank characteristics, and of the stock-exchange market activity.

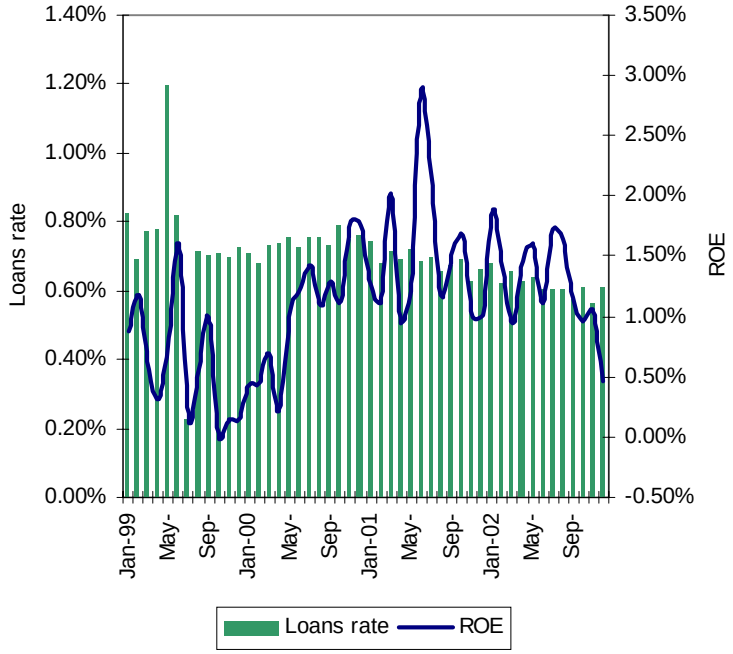
Figures

Figure 1 Provisions and past-due loans



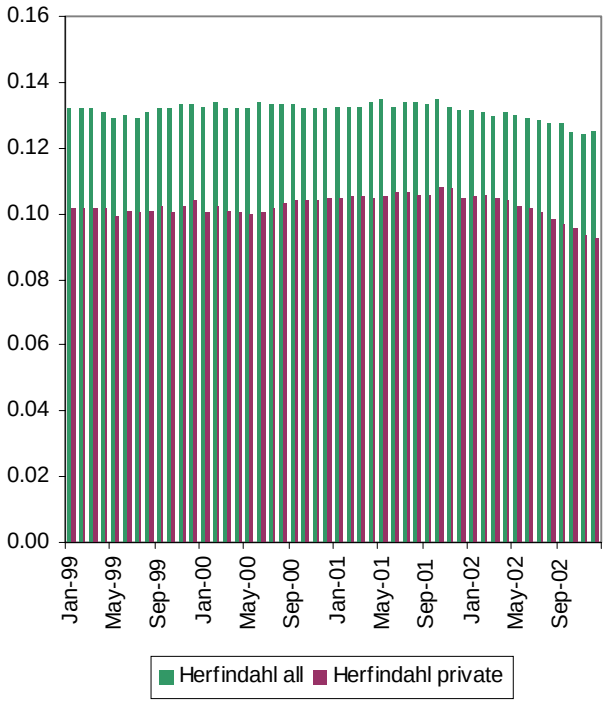
Source: Own elaboration based on information from the Superintendence of Banks and Financial Institutions.

Figure 2 Loans Rate and ROE



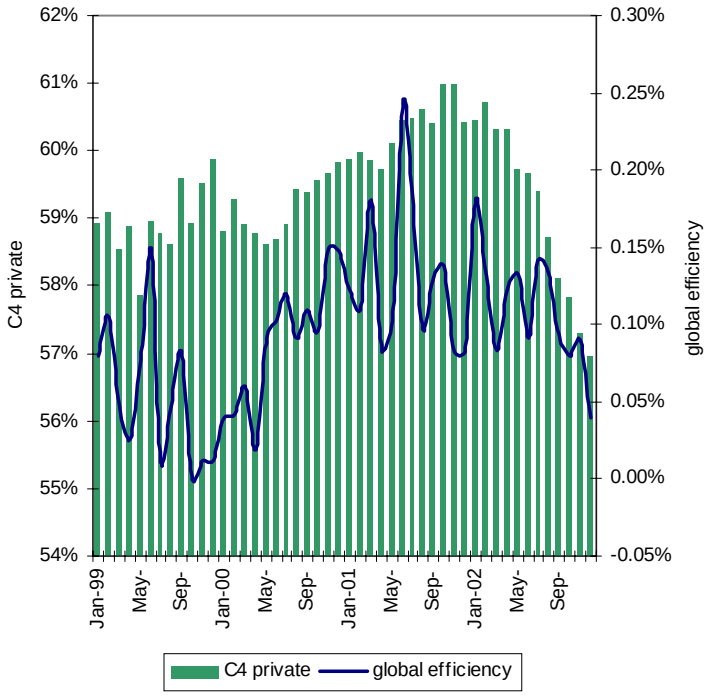
Source: Own elaboration based on information from the Superintendence of Banks and Financial Institutions.

Figure 3 Concentration of the Chilean banking system



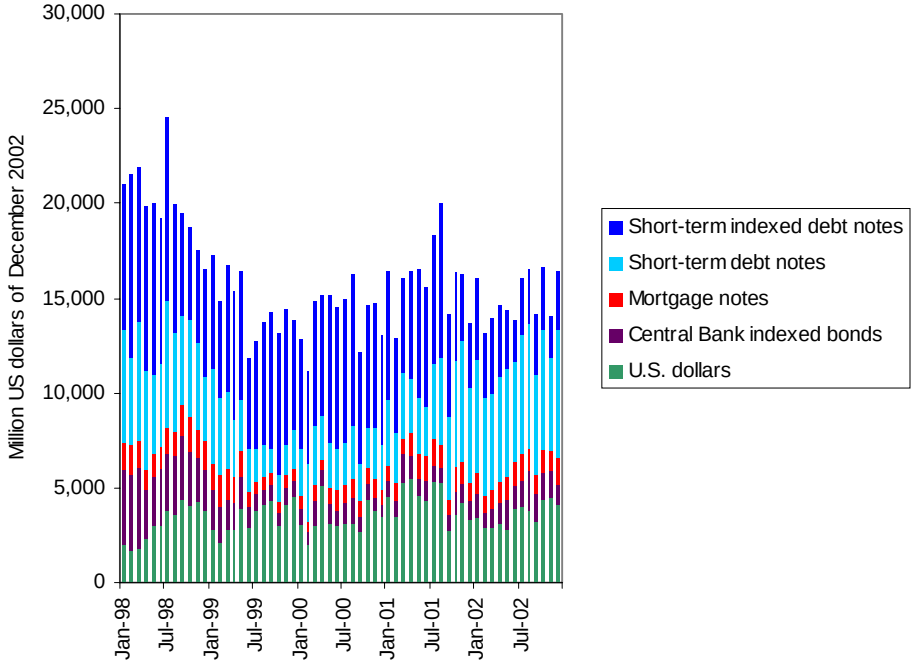
Source: Own elaboration based on information from the Superintendence of Banks and Financial Institutions.

Figure 4 Concentration and efficiency of the Chilean banking system



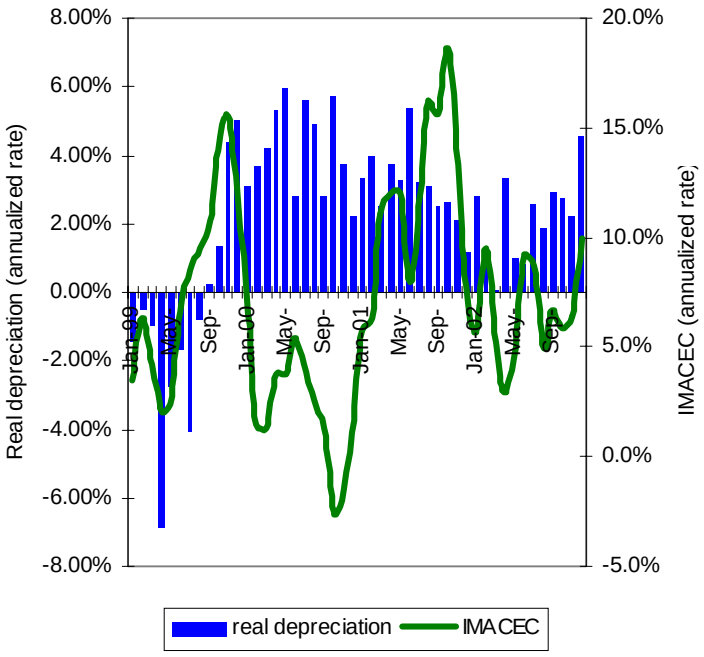
Source: Own elaboration based on information from the Superintendence of Banks and Financial Institutions.

Figure 5 Most traded assets on the Santiago Stock Exchange: 1998-2002



Source: Own elaboration based on information from the Santiago Stock Exchange.

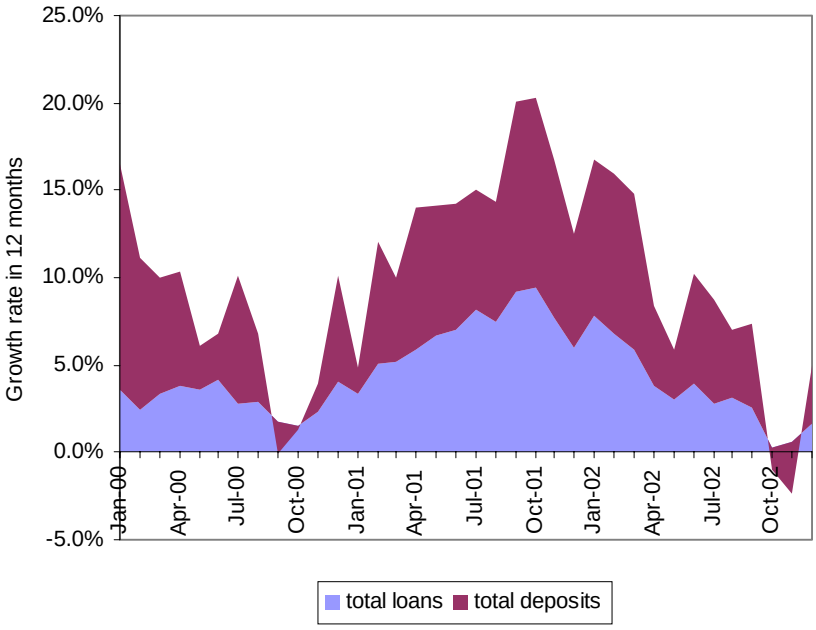
Figure 6 Evolution of the growth rates of IMACEC and the Real Exchange Rate



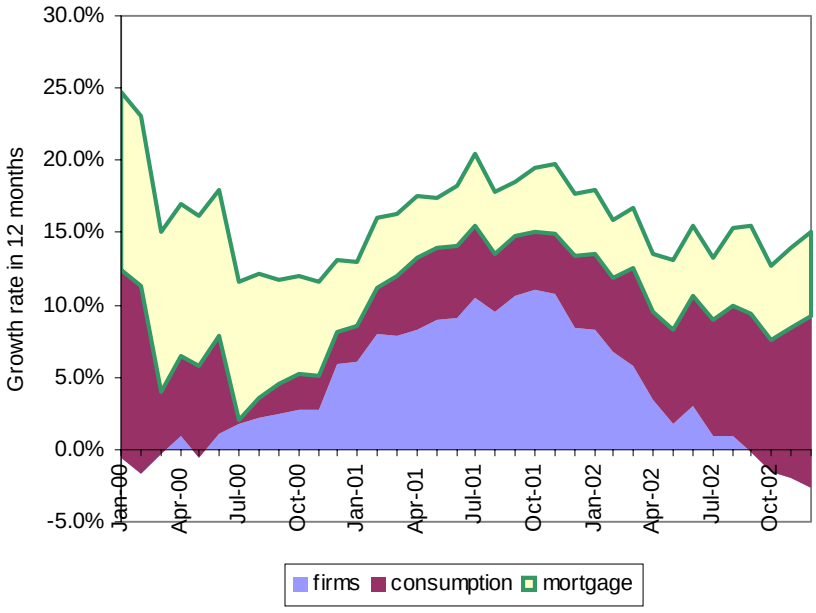
Source: Own elaboration based on information from the Central Bank of Chile. IMACEC stands for Monthly Indicator of Economic Activity.

Figure 7 Growth Rate in 12 Months in Deposits and Loans: January 1999-December 2002

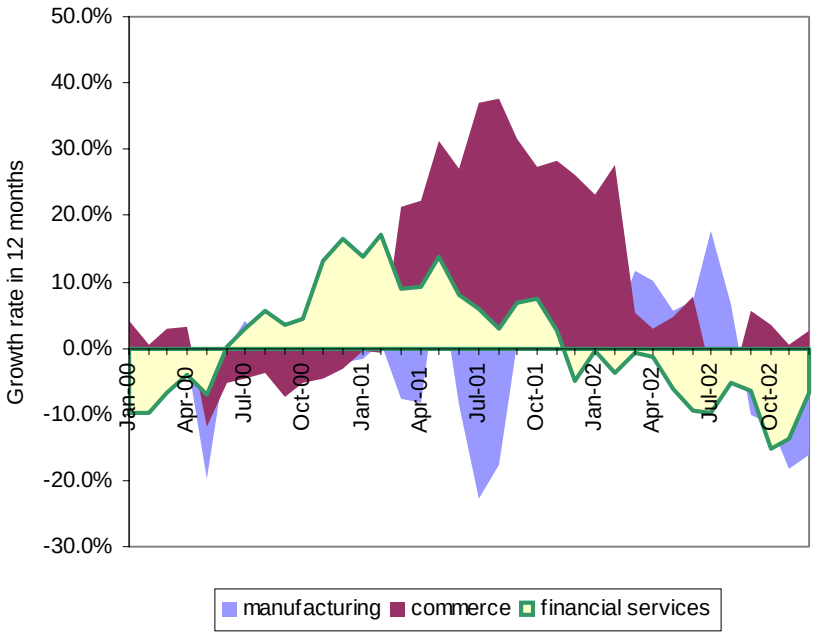
(a) Total deposits and loans



(b) Loans by Type



(c) Loans by Economic Sector



Source: Own elaboration based on information from the Superintendence of Banks and Financial Institutions.

APPENDIX

BANKS IN THE SAMPLE

IFI code		
1	*BANCO DE CHILE*	
9	*BANCO INTERNACIONAL*	
11	*DRESNER BANQUE NATIONALE DE PARIS*	*
12	*BANCO DEL ESTADO DE ESTADO*	
14	*SCOTIABANK SUD AMERICANO*	*
16	*BANCO DE CREDITOS E INVERSIONES*	
17	*BANCO DO BRASIL S.A.*	*
27	*CORPBANCA*	
28	*BANCO BICE*	
29	*BANCO DE A. EDWARDS*[1]	
33	CITIBANK N.A	*
35	*BANCO SANTIAGO*	
37	*BANCO SANTANDER-CHILE*	*
39	*BANKBOSTON, NATIONAL ASSOCIATION*	*
40	*BANCO SUDAMERIS*	*
46	ABN AMRO BANK	*
49	*BANCO SECURITY*	*
504	*BBVA BANCO BHIF*	*
507	*BANCO DEL DESARROLLO*	

Notes: *: foreign bank. [1]It merged with *Banco de Chile* in December 2001. Given that *Banco de A. Edwards* was small relative to *Banco de Chile*, the merged banks were reconstructed backwards as the sum of the two before the merger [2]It merged with *Banco Santander-Chile* in August 2002. Given that both banks were of similar size we reconstructed the series of each one as if they had continued separate from August through December 2002.