Preliminary Draft

The Bank Lending Channel and the Monetary Transmission Mechanism: The Case of Chile[‡]

Rodrigo Alfaro[*], Helmut Franken[**], Carlos J. García[***], and Alejandro Jara[****]

December 2002

Abstract

[‡] This paper has been prepared to be presented at the Sixth Annual Conference of the Central Bank of Chile "Banking Industry and Monetary Policy Transmission" to be held in Santiago de Chile on December 12th and 13th, 2002. We thanks the comments by Pablo García and Alain Ize as well as the enlighten discussion with Andrés Vargas about actual monetary policy implementation in Chile. The points of view expressed throughout this document are of the authors own, and do not necessarily represent the institutions to which they are currently affiliated. The usual disclaimer applies.

[*] Central Bank of Chile-Macroeconomic Analysis Unit, Research Division (ralfaro@bcentral.cl).
[**] International Monetary Fund (hfranken@imf.org).
[***] Central Bank of Chile-Macroeconomic Analysis Unit, Research Division (cgarcia@bcentral.cl).
[****] Central Bank of Chile-Financial Analysis Unit, Financial Policies Division (ajara@bcentral.cl).

The Bank Lending Channel and the Monetary Transmission Mechanism: The Case of Chile

"It seems clear that... the market...will always try to game the Federal Reserve Bank and find ways of getting around restraint. ...Despite those efforts, a simple observation suggests that monetary policy is still pretty potent. ...There is a sense of conviction in the market that we can press a few monetary buttons and everything will be solved."

Paul A. Volker.

I. Introduction

The relationship between the availability of credit and economic development has been present in the academic debate for quite a long time[1]. Indeed, many economists emphasized that a credit crunch was one of the leading causes of the great depression[2]. In the sixties, however, the robust evidence about the strong correlation between money and real variables[3] undermined the enthusiasm about the role of credit[4]. Modigliani and Miller (1958) sunk it even more, by suggesting that the capital structure of the firm was mostly irrelevant[5]. But new winds came in the seventies, from the brand new field of the economics of information[6], putting back financial intermediaries in the economic debate. In such a context, the "credit view" emerges as a new way of understanding the monetary policy transmission mechanism. More recently, the literature has evolved to distinguish between the "bank lending channel" (BLC) and the "broad credit channel" (BCC)[7].

On the one hand, the BCC relates to the supply of credit by all financial intermediaries, emphasizing the role played by asymmetric information in the existence of

[1] See, for example, Gertler (1988).
[2] For example, Fisher (1933) claims that the negative shock came in a time in which American corporations were heavily indebted. As a consequence, many of them went bankrupt, which further reduced investment, employment, consumer confidence, and aggregate demand. Bernanke (1983) claims that, additionally, the financial sector was seriously affected by firms bankruptcy, increasing the real cost of financial intermediation and reinforcing the decline in output.
[3] Friedman and Schwarts (1963) in their monetary history of the United States emphasized the large correlation between money supply and output, particularly during the great depression.
[4] In that sense, banks were only important because they created money.
[5] Such an idea influenced a lot the early stages of the real business cycle literature, with financial issues largely ignored in those models.
[6] In a seminal paper Akerlof (1970) uses the market for used cars to illustrate the problem caused by asymmetric information between dealers and buyers. Some later references are Jaffee and Russell (1976), Townsend (1979), Stiglitz and Weiss (1981), Diamond (1984), among many others.
[7] Also known as the balance sheet channel.

an external financing premium[8]. Such a premium depends negatively on the net worth of a potential borrower and positively on the stance of monetary policy. Hence, it is a "financial accelerator" mechanism that amplifies the effects of monetary policy on the investment and consumption decisions.

On the other hand, the BLC emphasizes the role play by banks in the transmission of monetary policy. Thus, if the Central Bank follows a tight monetary policy, the interbank lending is restricted and supply of bank funds drops[9]. There might be some individual banks that succeed in lifting funds elsewhere, letting them insulate their loan portfolios against monetary policy. But some other banks are forced to restrict their supply of credit. If there is something "special" in the credit offered by these banks, meaning that borrowers are not able to find close substitutes for it, the lower availability of credit could have an independent impact in aggregate spending. Notice the role play by assymetric information: i) affecting the capacity of some banks to lift funds in situations of low market liquidity; ii) generating a set of bank's "captive" clients[10]. Due to their comparative advantage in information collection and processing, as well as to their capacity to establish long-term relationships with their clients, banks are the only ones able to offer credit to certain type of borrowers[11]. But banks serving clients without any other market alternative have to deal with an assymetric information problem as well, since it is difficult for the market to value

[8] This premium is defined as the difference in the costs of financing externally vis-à-vis financing internally.

[9] Some readers may consider this claim to be quite strong. We refer them to Franken and Jara (2002) for details about our interpretation on how monetary policy operates in the Chilean context, the differences with the interpretation found in much of the literature originated in industrialized countries, and the consequences in terms of testing the BLC hypothesis.

[10] For Example, Cole, Goldberg, and White (2002), using a survey of small firms conducted by the Federal Reserve, find that larger banks rely on standard techniques based in financial statements to take their commercial loans decisions. However, smaller banks deviate from these criteria, supporting their decisions with a much more personalized assessment about the entrepreneur (of a small firm). In practice, this group of banks is the unique provider of credit for most small enterprises.

[11] If these bank dependent borrowers are quantitatively important, the fall in the supply of loanable funds will have negative effects for the aggregate demand. In particular, the international empirical evidence shows that finding alternative sources of credit are quite difficult for small firms. Hence, shortages in the supply of bank credit push them to curtail their productive activities, which are usually, labor intensive. As a consequence, there is a strong impact in terms of job destruction, being those (lower qualified) workers difficult to absorb by other sectors in the economy. Since increasing unemployment rates are strongly correlated with consumer confidence (in the US and elsewhere), aggregate demand falls. In this line, Hancock and Wilcox (1998) find that small banks engage in "high power" credit activities, with one dollar drop in their credit supply having a large impact in economic activity, measured in terms of unemployment, real wages, GDP and number of bankruptcies.

their loan portfolios. Hence, those banks will experience difficulties in substituing their financial sources. The root of the BLC hypothesis is the existence of this type of banks[12].

Testing the BLC hypothesis relies on the ability to distinguish between movements of demand and supply of credit. Indeed, identification is "the main issue" for interpreting the evidence about the credit channel in general and the BLC in particular. We follow an "identification through heterogeneity strategy"[13]. In other words, we compare one class of firms/banks that are more likely to be affected by financial frictions with those that are less likely. If we find that some firms/banks do not seem to be affected by changes in monetary policy while others do, we have evidence in favor of the existence of the BLC. In words of Gilchrist and Zakrajsek (1995, GZ95 onwards): "*...because of the difficulties associated with formulating and estimating true structural models, empirical exercises seeking to establish the validity of either a credit channel or a financial accelerator must take comparisons against benchmarks where such credit effects are less likely to be relevant. By observing and measuring the differential behavior of economic agents under consideration, one can potentially attribute some, if not all, of the difference in behavior to frictions caused by credit markets.*" We mean that we should expect that our findings would be associated to an asymmetric impact of monetary policy. This is embedded in the asymmetric nature of financial frictions. Finally, notice also that we are considering different types of agents (firms/banks and consumers). This is because we have in mind empirical exercises that exploit two different datasets: quarterly financial statements from the corporate sector (FECUS) and monthly financial statements from the banking sector.

Bank data is used in a first step to test for the existence of the BLC. Our main empirical strategy consists of testing the relevance of bank characteristics that account for information problems (such as size, liquidity, and capitalization) in explaining the behavior

[12] See appendix A for a global overview on how both the BCC and the BLC are related to the whole set of monetary transmission mechanisms.

[13] Other studies reinforce the latter with an analysis of how banks respond to certain exogenous shocks to the supply of funds (e.g. Hernando and Martínez-Pagés, 2001). On the other hand, there are authors that take a more extreme position regarding the identification problem, arguing that recurring to panel data, although helpful to avoid a potential bias for not accounting data heterogeneity, does not solve the basic problem of identification embedded in a reduced form. In this line, we have Farinha and Robalo (2001), whom proposed a structural approach to estimate the supply of bank loans. Their results are in favor of the existence of the BLC in Portugal that affects mainly banks with lower level of capitalization. These authors still use a panel data approach. An alternative strategy is to use aggregate data and to impose as much structure as necessary to identify the supply and demand for loans (see, for example, Hülsewig, Winker and Worms, 2002).

of loan supply after a change in monetary policy. Our approach is closely related to Hernando and Martinez-Pagés (2001, HM2001 onwards), and to a lesser extent to Kashyap and Stein (1995 and 2000) and Kishan and Opiela (2000)[14]. In a second step, we make an assessment on the macroeconomic relevance of the BLC for Chile. For that purpose we use both firm and bank data, and we follow an approach mainly related to GZ95 and to a lesser extent to Kashyap, Stein and Wilcox (1993 and 1996), Oliner and Rudebusch (1995, 1996a, and 1996b), and Gertler and Gilchrist (1993).

We find evidence in favor of the BLC, both in terms of banks and firms data. Moreover, the BLC amplifies the effects of a tight monetary policy, having a significant impact on macroeconomic activity. This amplification feature comes along different dimensions: consumption, investment, unemployment, and production.

The rest of the paper is organized as follows: section II describes the results of a dynamic panel data of banks focus on the differential effects of monetary policy for a set of bank characteristics. Section III describes the results of an SVAR aim to disentangle the macroeconomic relevance of the BLC. Section IV concludes. Figures, tables and any other technical material are left to the appendix.

II. Bank Lending Channel: Identification Through Micro Data on Banks

Our main goal in this section is to analyze whether or not the BLC plays any role in the transmission mechanism for the monetary policy in the Chilean economy. As discussed in the introduction, the BLC operates through shifts in the loan supply curve in response to changes in monetary policy. Our interpretation in the way monetary policy operates in Chile implies that a tighter monetary policy reduces the amount of funds available for the banking system and some banks are unable to offset the reduction on interbank funds. In this context, our main empirical strategy consists of testing the relevance of bank characteristics that account for information problems (such as size, liquidity and capitalization) in explaining the behavior of loan supply after a change in monetary policy.

[14] See Cavieres (2002) for a study about the BLC in Chile that follows closely Kishan and Opiela (2000).

The data used in this section comes mainly from bank statements published in the statistical bulletin of the *Superintendencia de Bancos e Instituciones Financieras* (SBIF). Our dataset expands from the first quarter of 1990 to the second half of 2002. Given the aim of this section, we focus on banks that actively participate in the credit market, excluding branches of foreign banks that are mainly devoted to other activities[15]. This restricted sample accounts for more than 90% of the total loans at any point in time (see Figure B.1).

As a first approach we focus in total loans. However, as shown by Table B.1, there is evidence that indicates a differential behavior of distinct segments of credit during the business cycle[16]. Therefore, in order to identify better the changes in the supply of credit, we also separate loans in terms of commercial and consumer loans. Following the literature, our indicators of potential asymmetric information problems are size, liquidity, and capitalization. Size is defined as the log of total assets, liquidity as the ratio of liquid assets to total assets, and capitalization as the (seasonally adjusted) ratio of capital and reserves to total assets[17].

The original dataset is slightly modified to take into account mergers occurred during the sample period. We follow the intermediate strategy proposed by HM2001, generating a new bank once a merger of banks of similar sizes takes place. If the merger is between banks of significantly different sizes, the data of the merged bank is considered as data of the largest merging institution and no new bank appears.

Our monetary policy variable is constructed from the difference between the monetary policy rate and the PRC8[18]. To provide an intuition on how to read this variable, suppose that the difference is initially negative and as a consequence of some action taken by the Central Bank it moves to the positive side. Hence, monetary policy is getting tighter, since there are expectations of a drop in the short term interest rate in the near future (see

[15] We also exclude banks with very few observations. The sample considered is an unbalanced panel with 959 quarterly observations corresponding to 23 banks. The list of banks considered in our sample is shown in the appendix.
[16] While average growth of commercial loans is 9% during the sample period, consumer and mortgage loans growth is 17% and 13%, respectively (see Figure B.3).
[17] A more appropriate measure of solvency are Basel capital ratios, however they are not available for the entire sample period considered here.
[18] These are short-term and long-term indexed bonds issue by the Central Bank of Chile, respectively.

Figure B.2). Adittionaly, to control for demand effects, we consider the log of real GDP and the log of real exchange rate.

The dynamic structure is adequately handled by introducing one lag of endogenous variable and four lags for the macroeconomic and bank characteristics regressors. Although including a lag of the dependent variable is trivial in the time-series context, the Fixed-Effects estimator in a dynamic context is severely biased. Instead of following the traditional approach to deal with such a problem, i.e. the Arellano and Bond GMM procedure[19], we use the bias-corrected estimator[20] proposed by Hahn and Kuersteiner (2002)[21].

We can summarize the empirical approach as follows:

$$\Delta y_{it} = \rho \Delta y_{it-1} + \sum_{j=1}^{k} \beta_{1j} \Delta x'_{t-j} + \beta_2 c'_{it-1} + \sum_{n=1}^{3} \sum_{j=0}^{k} \beta^{n}{}_{3j} c^{n}{}_{it-1} \Delta x'_{t-j} + \sum_{s=1}^{4} \beta_4 D_{st} + u_{it}$$

where y_{it} represents the log of total loans, commercial loans and consumer loans; x_{it} is a vector of macroeconomic variables aimed to control demand side shocks —log of GDP and real exchange rate— in addition to the monetary policy indicator; c denotes a vector of bank-specific variables —liquidity, size and capitalization—, D is a set of seasonal dummies, u_{it} is i.i.d, i=1,...,N represents the number of banks included in the dataset, and t=1,...,T is the time index that goes from the 1990:1 to 2002:2. Notice that the bank-specific explanatory variables c are included with one lag to account for potential endogeneity.

This general specification is used to test whether there are differences in the impact of monetary policy shocks on the supply of loans. To disentangle loan supply from loan demand effects, the basic idea is to look at cross-sectional differences in the response of bank loans to a monetary policy shock. Where these differences to be related to indicators of the degree of informational asymmetries (size, liquidity or capitalization), there would be

[19] This procedure is subject to substantial finite sample bias as shown by Alonso-Borrego and Arellano (1999) and Hahn, Hausman and Kuersteiner (2002).
[20] The bias correction methodology works if the dependent variables are stationary. We are going to run the unit roots tests proposed by Choi (2001a and 2001b) for an updated version of this document. In this regard, our results in this section should be considered preliminary.
[21] For a more technical discussion about this methodological issues see Brock and Franken (2003).

evidence to support the existence of the BLC. More specifically, if the BLC holds, we should expect a positive and significant cross-coefficient between monetary policy and bank characteristics.

The long-run coefficients for each of the explanatory variables are presented in the Table B.2 and the overall effects of monetary policy in the rate of growth of the loan supply are presented in Table B.3. In the latter table, we can see that a tighter monetary policy results in a larger drop in the rate of growth of total loans for smaller banks as well as in a larger drop in the rate of growth of all type of loans for less liquid banks. Finally, the bank-lending channel operates through less capitalized banks only in the case of consumer credit, which may be associated to capitalization standards imposed by the current legislation. These results are consistent with the long-run coefficients shown in the former table where liquidity has a positive and significant coefficient when is interrelated with the monetary policy indicator. On the other hand, the interaction parameters of size and monetary policy are positive and significant only for total loans, while capitalization is positive and significant only for commercial loans. Summing up, our preliminary results support the idea that the BLC operates in Chile.

III. From Micro Data to Macroeconomic Effects

In this section, we focus on the macroeconomic relevance of the bank-lending channel (BLC). We ask the following question regarding the impact of monetary policy on output growth, investment, consumption, and unemployment: Does the BLC play any significant macroeconomic role as a transmission mechanism? To address this question, we analyze whether or not the composition of corporate bank financing displays a differential behavior among distinct type of firms. The same question is raised for the amount of bank loans from the household and small firms sectors and the large corporate sector, respectively.

To analyze the differential behavior among firms we make use of corporate balance sheet data collected for publicly traded companies in the Chilean stock market[22]. Our dataset expands from the first quarter of 1990 to the second half of 2002. As a first

[22] The data is taken from the FECUS (Ficha Estadística Codificada Uniforme), and it is available in a quarterly basis.

approach, we concentrate on comparing the behavior of debt composition by size of firm, by using the ratio of short-term bank debt of small firms relative to all firms (small/all mix ratio, onwards[23]). Now, if the small/all mix ratio change following a monetary policy shock and the latter does have marginal predictive power over a set of macroeconomic variables, we conclude that the BLC is operating as a transmission mechanism of the monetary policy and that this mechanism has a significative impact on macroeconomic activity. In a similar fashion, we construct a household-small firms to large corporate sector short-term bank debt mix ratio (low/high quality mix ratio onwards), where the numerator taken from the Superintendence of Banks and Financial Institutions over a similar period.

The machinery used in this section consists of estimating a set of VAR models, each one of them including one variable that accounts for the existence of the BLC, i.e. either the small/all mix ratio or the low/high quality mix ratio. Additionally, four endogenous variables are also included, namely a proxy for macroeconomic activity (in logs and detrended), the CPI (in logs and detrended), the monetary policy rate (MPR), and real exchange rate (in logs). As a proxy for macroeconomic activity we use six different alternatives: real GDP, industrial production, business investment, durable goods consumption, unemployment rate, and residential investment. Finally, every model includes a set of exogenous variables: terms of trade, inflation target, external output, and a time trend[24],[25].

First, in order to make an assessment on the macroeconomic importance of the BLC, we test for the predictive power of the credit variable. In doing so, we carry out a Granger causality test to exclude (null hypothesis) the credit variable from the VAR system. Hence, we report the *p*-values for the corresponding Granger Causality test, being rejection of the null hypothesis one piece of evidence in favor of the BLC. However, this evidence has to be complemented simultaneously with two additional conditions: (i) rejection of the null hypothesis that the MPR is irrelevant to predict the credit variable and

[23] See Gilchrist and Zakrajsek (1995).
[24] This is justified on the grounds that Chile is a small open economy with an inflation target regime operating since the early 1990s.
[25] The latter specification follows closely Bravo and García (2002). To define the optimal lag structure we use a two step procedure (Johansen 1995). The first step uses the Schwarz-Bayesian criterion (SC). The second step add additional lags for eliminating any evidence of serial correlation detected by the multivariate LM test statistics for residual serial correlation. .

(ii) no rejection of the null hypothesis that the proxy for macroeconomic activity is useless predicting the credit variable. In other words, the BLC requires lagged values of the MPR to be significant in predicting the credit variable, which in turn must be significant in predicting either macroeconomic activity or other macroeconomic variable.

Second, in order to study the dynamics of the BLC, we estimate a structural vector autoregression (SVAR) and report impulse-responses to a monetary policy shock. The set of identifying assumptions is borrowed from the vast literature about the identification of monetary policy shocks[26], which focuses in the Central Bank's reaction function. Thus, variables are divided in three recursive sets[27]: (1) non-policy variables that are not contemporaneously affected by the policy variables, (2) policy variables, and (3) non-policy variables that are contemporaneously affected by the policy variables. In other words, the Central Bank's feedback rule is identified by dividing the set of non-policy variables into variables that cause a policy reaction and variables that are impacted by the policy reaction. To illustrate this assumption, assume that the Central Bank contemporaneously knows the inflation rate but it is not able to affect it. If the economy faces an inflationary shock, the Central Bank could respond with a change in the MPR. This in turn will immediately impact other variables such as the small/all mix ratio, which in turn may affect a variable such as GDP, investment, and/or consumption.

Between the two policy variables, we assume the following sequence of events: the Central Bank sets an inflation target, which is an exogenous variable, and it sets the MPR after that. This assumption is consistent with the fact that the MPR is used as a fine-tuning policy given a known inflation target. In the case of non-policy variables, we assume a recursive causal relationship ordered as follows: price level, output, and the credit variable. The assumption behind this order is that the price level is stickier than output, a fact that is consistent with the high level of backward indexation in the Chilean economy[28]. The credit variable being in the last place contains the implicit assumption that the Central Bank is able to affect it contemporaneously through the MPR, since capital markets tends to respond faster than good and labor markets.

[26] See, for example, Bernanke (1986), Sims (1986) Bernanke and Blinder (1992), and Bernanke and Mihov (1998).
[27] See Christiano, Eichenbaum and Evans (1999).
[28] Jadresic (1996).

Using the empirical strategy described above, we estimate the impulse-responses to a monetary policy shock with the credit variable being endogenous vis-à-vis the credit variable being exogenous. The idea is the following: if we consider this variable as exogenous, we are shutting down its effect on other macroeconomic variables following a monetary policy shock. Therefore, the difference between both impulse-responses provides a measure of the macroeconomic relevance of the BLC. To determine whether or not this difference is statistically significant, we display the graph dashed lines that represent a 66% confidence interval for each impulse response function when the BLC is endogenous. As a consequence, if the impulse response functions calculated under the assumption that the credit variable is exogenous are outside this confidence interval, we interpret this as evidence in favor of the BLC.

In relation to the results, Table C.1 shows the Granger causality test for each VAR. The top panel reports probability values across different macro variables and the small/all mix ratio. The results support the hypothesis that the small/all mix ratio predicts macro variables in five out of six cases. These results also indicate that the lags of the MPR are significant to predict macro variables in all cases and the small/all mix ratio in four cases[29]. On the other hand, macro variables are not helpful to predict the small/all mix ratio for each case. The bottom panel of Table C.1 shows the same results but this time using the low/high quality mix ratio as the variable that accounts for the BLC. Again, the credit variable predicts macro variables in all cases as well as the lags of the MPR are significant to predict this ratio in all cases. Hence, these results support that a credit channel is relevant as a transmission mechanism for the monetary policy.

Figure C.1 displays the estimated impulse-responses when the credit variable is the small/all mix ratio. GDP begins to decline about one quarter after a tightening of monetary policy. The maximum decline occurs about one year after the shock. We have a similar pattern when GDP is substituted by industrial production or unemployment rate. The price level is relatively sticky in the first year and it begins to decline moderately along the second year. Also, the real exchange rate observes a tiny appreciation which tends to die out over the time. The small/all mix ratio decreases following the monetary policy shock, a

[29] Using a 10% significance level.

result that is consistent with the evidence in other countries where small firms are more bank dependent than large firms. When both investment and consumption replace GDP, these two components of aggregate output decline at the same time. Such a result differs from the international empirical evidence. For example, Bernanke and Gertler (1995) find evidence that in the US the decline of consumer goods and residential investment precede business fixed investment. Their interpretation is against the conventional monetary policy transmission mechanism that operates through an earlier decline in investment. Even more, the downturn occurs because banks cut credit to borrowers, which in turn depresses aggregate demand for consumer good and residential investment as well. However, in the Chilean case, the impulse-responses indicate that there seems to be evidence for both the traditional and BLC monetary transmission mechanisms.

Figure C.1 shows with a gray line the impulse-responses when the BLC is considered exogenous. The BLC seems to be important almost for every variable, but for the price level and the real exchange rate. However, the impulse-responses are not markedly different, suggesting that the contribution of the BLC as an amplification mechanism of monetary policy is rather marginal. This may be the result of using a credit variable that is constructed based on corporate data only. In other words, the small firms that we are considering in our sample are also high-quality firms and, hence, they are not very much affected by a contraction in the supply of loans.

To account for larger differences in terms of the quality of the borrower, and therefore, in terms of the probability of being pushed out as a client given a relatively scarce supply of funds, we replace the credit variable by the low/high quality bank debt ratio previously described. As shown in Figure C.2 these results provide much stronger evidence that the BLC matters for macroeconomic activity. Important to highlight is the fact that the gray line is clearly outside the confidence interval in all cases.

Further evidence that the access to bank credit is affected for some but not all group of agents following a monetary policy shock is provided in Figure C.3, which shows the impulse-responses of total, business, real estate, and consumer loans to a one standard deviation increase in the MPR. Thus, the MPR shock has a substantially larger effect on consumer loans, which drops quickly and reaches a maximum of 3% at the fifth quarter. On

the other hand, real estate and business loans fall rapidly, but they decrease only 0.5% and 1%, respectively.

IV. Concluding Remarks and Directions for Future Research

To be completed.

We found that the BLC is an influential force that profoundly affects the transmission of monetary policy in Chile at an aggregate level. By pushing toward a better understanding of this mechanism and the way it operates in Chile, our paper contributes to an improvement of the monetary policy decision framework. Directions for future research should be directed towards constructing better datasets at the micro level, in order to deepen our knowledge of the bank lending channel as well as to being able to empirically assess the broad credit channel in the Chilean economy.

References

Akerlof, G., (1970). "The Market for Lemons: Qualitative Uncertainty and the Market Mechanism." *Quarterly Journal of Economics*, 84, 488-500.

Alonso-Borrego, C., and M. Arellano (1999). "Symmetrically Normalized Instrumental-Variable Estimation Using Panel Data." *Journal of Business and Economic Statistics*, 17, 36-49.

Bernanke, B., (1983). "Non-monetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review*, 73, 257-76.

_____, (1986). "Alternative Explanations of the Money-income Correlations." Carnegie-Rochester Conference Series on Public Policy, 25, 49-99.

_____, and A. Blinder, (1992). "The Federal Funds Rate and the Channels of Monetary Transmission". *American Economic Review,* 82, 901-21.

_____, and M. Gertler, (1989). "Agency Costs, Net Worth, and Business Cycles", *American Economic Review*, 79, 14-31.

_____, (1995). "Inside the Black Box: The Credit Channel of Monetary Policy Transmission" *Journal of Economic Perspectives*, 9(4), 27-48.

_____, and S. Gilchrist, (1999). "Financial Accelerator in a Quantitative Business Cycle Framework." *Handbook of Macroeconomics*, Elsevier Science B. V. (Chapter 21).

_____, and I. Mihov, (1998). "Measuring Monetary Policy". *Quarterly Journal of Economics*, 113(3), 869-902.

Bravo H. and C. García, (2002). "Medición de la Política Monetaria y el Coeficiente de Traspaso (Pass-Through) en Chile." *Revista Economía Chilena*, 5 (3) Diciembre 2002.

Brock, P., and H. Franken (2003). "Bank Interest Margins Meet Interest Rate Spreads: How Good is Balance Sheet Data for Analyzing the Cost of Financial Intermediation?" *Revista de Economía Chilena* (forthcoming).

Cavieres, L., (2002). "Transmisión Monetaria: Un Estudio del Canal del Crédito Bancario en Chile." *Manuscript*, Tesis de Magister, Universidad de Chile.

Choi, I. (2001a). "Unit Root Tests for Cross-Sectionally Correlated Panels." *Manuscript,* Kookmin University, Seoul.

_____ (2001b). "Unit Root Tests for Panel Data." *Journal of International Money and Finance*, 20, 249-72.

Christiano, L.J., M. Eichenbaum, and C. Evans, (1999). "Monetary Policy Shocks: What Have We Learned and to What End?" *Handbook of Macroeconomics*, Vol. 1A. Elsevier Science B.V.

Cole, R., L. Goldberg and L. White "Cookie-Cutter Versus Character: The Micro Structure of Small Business Lending by Large and Small Banks". *Banking and Financial Institutions Working Paper Series*, 9 (32).

Dale, S., and A. Haldane, (1994). "Interest Rates and the Channels of Monetary Transmission: Some Sectorial Estimates." *European Economic Review*, 39, 1611-26.

Diamond, D., (1984). "Financial Intermediation and Delegated Monitoring." *Review of Economic Studies*, 51, 393-414.

Farinha, L., and C. Robalo, (2001). "The Bank Lending Channel of Monetary Policy: Identification and Estimation Using Portuguese Micro Bank Data" *ECB Working Paper Series*, 102, December.

Farmer, R. (1984). "The New Theory of Aggregate Supply", *American Economic Review*, 74, 920-30.

Fisher, I. (1933). "The Debt-Deflation Theory of Great Depressions." *Econometrica*, 1, 337-59.

Franken, H., and A. Jara (2002). "El Canal del Crédito Bancario y la Transmisión de la Política Monetaria en Chile". *Manuscript*, Central Bank of Chile.

Friedman, M. and A. Schwarts (1963). "The Monetary History of the United States, 1867-1960." Princeton, NJ: Priceton University Press.

Gertler, M. (1988). "Financial Structure and Aggregate Activity: An Overview", *Journal of Money, Credit, and Banking*, 20, 559-588.

_____, and G. Hubbard (1988). "Financial Factors in Business Fluctuations", *Scandinavian Journal of Economics*, 95(1), 33-71.

_____, and S. Gilchrist, (1993). "The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence." *Scandinavian Journal of Economics*, 95(1), 43-64.

_____, (1994). "Monetary Policy, Business Cycles and the Behavior of Small Manufacturing Firms." *Quarterly Journal of Economics* 109, 309-340.

Gilchrist, S. and E. Zakrajsek, (1995). "The Importance of Credit for Macroeconomic Activity: Identification through Heterogeneity." *Federal Reserve Bank of Boston Conference Series*, 39, 129-58.

Hahn, J., J. Hausman, and G. Kuersteiner (2002). "Biased-Corrected Instrumental Variables Estimation for Dynamic Panel Models with Fixed Effects." *Manuscript*, MIT University.

Hancock, D., and J. Wilcox, (1998). "The 'Credit Crunch' and the Availability of Credit to Small Businesses." *Journal of Banking and Finance* 22, 983-1014.

Hernando, I., and J. Martínez-Pagés, (2001). "Is There a Bank Lending Channel of Monetary Policy in Spain" *ECB Working Paper Series*, 99, December.

Hülsewig, O., P. Winker and A. Worms, (2002). "Bank Lending in the Transmission of Monetary Policy: A VECM Analysis for Germany." *Manuscript - ECB*.

Jadresic, E. , (1996). "Wage Indexation and the Cost of Disinflation". *IMF Staff Paper,* 43.

Jaffee, D., and T. Russell, (1976). "Imperfect Information, Uncertainty, and Credit Rationing." *Quarterly Journal of Economics*, 90, 651-66.

Johansen, S., (1995). "Likelihood-based Inference in Cointegrated Vector Autoregressive Models". Oxford University Press.

Kashyap, A., and J. Stein, (1995). "The Impact of Monetary Policy on Bank Balance Sheets" *Carnegie-Rochester Conference Series on Public Policy*, 42, 151-95.

_____, (2000). What Do a Million Observations on Banks Say About the Transmission of Monetary Policy?" *American Economic Review*, 90(3), 407-428.

_____and D. Wilcox, (1993). "Monetary Policy and Credit Constraints: Evidence From the Composition of External Finance." *American Economic Review*, 86(1), 300-309.

_____, (1996). "Monetary Policy and Credit Constraints: Evidence from the Composition of External Finance: Reply", *American Economic Review*, 86, 310-314.

Kishan and Opiela (2000), "Bank Size, Bank Capital, and the Bank Lending Channel*." Journal of Money, Credit and Banking*, 32(1), 121-41.

Kuttner and Mosser (2002). "The Monetary Transmission Mechanism: Some Answers and Further Questions" *Economic Policy Review - Federal Reserve Bank of New York*, 8 (1), 15-26.

Modigliani, F., and M. Miller (1958). "The Cost of Capital, Corporation Finance, and the Theory of Investment." American Economic Review 48, 261-97.

Oliner, S., and G. Rudebusch, (1995). "Is there a Bank Lending Channel for Monetary Policy?" *Economic Review - Federal Reserve Bank of San Francisco*, 2, 3-20.

_____, (1996a). "Is there a Broad Credit Channel for Monetary Policy?" *Economic Review - Federal Reserve Bank of San Francisco*, 1, 3-13.

_____, (1996b). "Monetary Policy and Credit Constraints: Evidence From the Composition of External Finance: Comment", *American Economic Review*, 86, 300-309.

Sims, C., (1986). "Are Forecasting Models usable for Policy Analysis'" *Federal Reserve Bank of Minneapolis Quarterly Review*, 10(1), 2-16.

Stiglitz, J. and A. Weiss (1981). "Credit Rationing in Markets with Imperfect Information." *American Economic Review*, 71(3), 393-410.

Townsend, R. (1979). "Optimal Contracts and Competitive Markets with Costly State Verification." *Journal of Economic Theory*, 21, 265-93.

Volker, P. (2002). "Monetary Policy transmission: Past and Future Challenges." *Economic Policy Review - Federal Reserve Bank of New York*, 8 (1), 7-11.

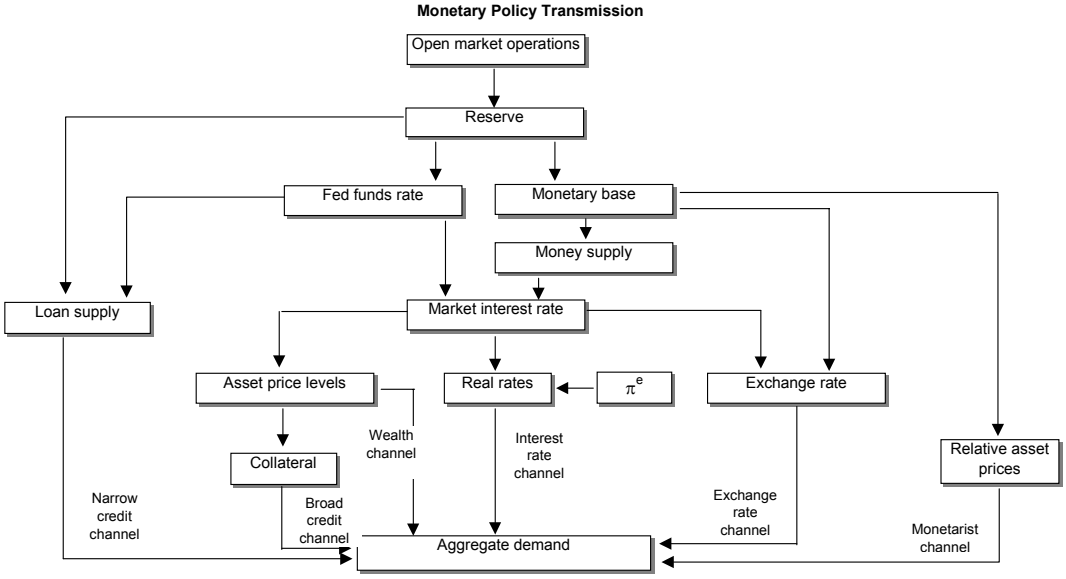
Walsh, C. (1998). "Monetary Theory and Policy". MIT Press. Cambridge.

APPENDIX

A. Sub-channels of Monetary Transmission

In the real economy, there are different transmission mechanisms through which monetary policy operates. Kuttner y Mosser (2002), for example, shows a scheme for the monetary transmission as follows (figure A.1)

Figure A.1: Channels of Monetary Policy Transmission



This figure illustrates that the transmission mechanism of monetary policy is complex, since there is not one, but many channels through which monetary policy may affect the economy. The transmission mechanism process begins with the Central Bank's definition of a monetary policy rate (MPR). Then, the interbank rate converges to this objective through the regulation of the liquidity (or reserves) of the financial system. The Central Bank uses different instruments for such a purpose, illustrated in the diagram by open market operations, but including also, in more general terms, *repos*, *anti-repos* and credit lines. Indeed, if the Central Bank decides to reduce the interbank interest rate, it is enough to adjust the reference interest rate and to announce that its willingness to buy or sell overnight documents (repos). This is enough to create the sense of increase liquidity in the financial system, leading to a fall in the interbank rate. In Paul Volker's own words,

"...you have to wonder whether anything more is necessary these days than a pronouncement that the Federal Reserve would like to change the federal funds rate by x percent. The Fed does not actually have to do anything. The rate will immediately change by x percent." Under normal conditions, the bid period that follows the pre-announced schedule is not modified upon liquidity needs, but responds to other types of policy decisions (such as the nominalization of the monetary policy introduced in August 2001) and/or portfolio management decisions (such as a liability restructure).

After the fine-tuning of liquidity of the financial system, different mechanisms start playing in the transmission channel. Four of them are activated through by the market interest rates moving in tandem with the interbank interest rate. These are the interest rate channel, in which an increase in the cost of capital reduces the domestic aggregate demand through a fall in investment and consumption of durable goods; the exchange rate channel (in open economies) which operates through the uncovered interest rate parity affecting net imports; the asset price channel (stocks, bonds and real states) that generates a wealth effect that impact consumer's decisions; and also related to the market value of assets, we have the broad credit channel (BCC) described in the introduction.. However, the transmission mechanism of monetary policy does not end there, being possible to distinguish two additional channels, namely the monetarist channel related to changes in relative prices of assets and the bank lending channel, the main issue of our paper.

B. Figures and Tables Section II

Figure B.1: Share in the Loans Market of Banks included in the Sample

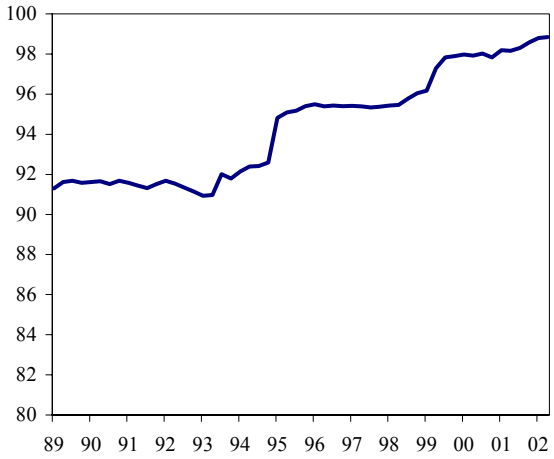


Figure B.2: Monetary Policy Indicator
(basis points)

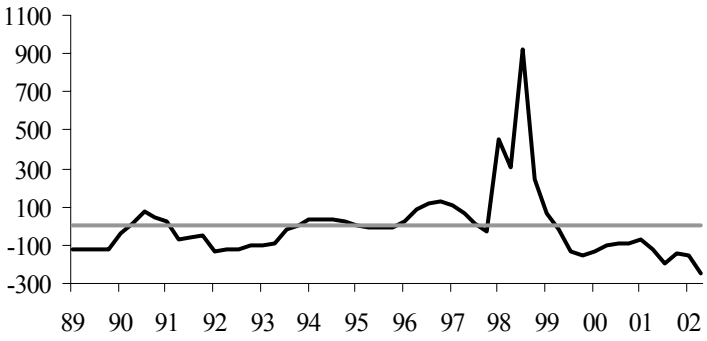


Figure B.3: Annual Growth of TotalLoans
(percentages, all banks)

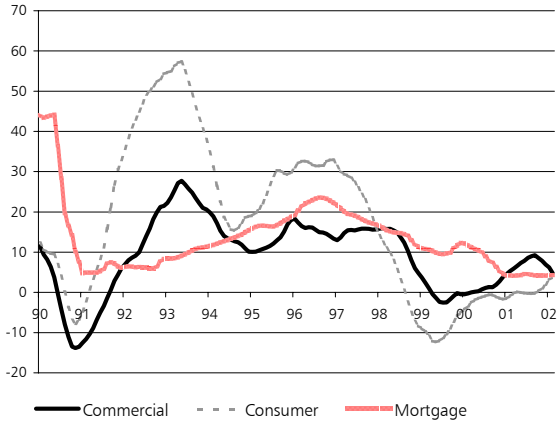


Table B.1: Characteristics of the Banking System

	Size				***Capitalisation***			
	<p25	p25-50	p50-75	>p75	<p25	p25-50	p50-75	>p75
Market share (%) of								
Total assets	3.9	10.0	23.1	63.0	29.5	40.0	22.8	7.7
Loans	1.1	4.5	20.5	73.9	36.6	46.2	16.5	0.8
Deposits	1.4	5.2	20.6	72.8	35.5	46.0	17.2	1.3
Size indicator								
Average number of bank-branches	2.7	12.5	31.3	113.6	78.7	87.3	29.3	1.2
Average total assets	12,134	32,117	71,944	205,512	122,428	180,964	97,110	34,403
Asset composition	12.9	20.3	40.2	53.1	55.4	51.6	32.2	4.7
Loans	11.6	18.9	38.9	50.7	53.5	49.3	30.0	3.1
Loans to firms	*44.3*	*44.7*	*57.4*	*57.0*	*59.4*	*58.9*	*53.4*	*48.3*
Consumer loans	*13.6*	*27.0*	*10.3*	*6.1*	*11.7*	*7.8*	*8.7*	*5.5*
Mortgage loans	*0.5*	*2.6*	*12.3*	*16.4*	*11.6*	*17.6*	*20.3*	*0.1*
Other loans	*41.7*	*25.7*	*19.9*	*20.5*	*17.3*	*15.8*	*17.6*	*46.1*
Securities	6.8	7.8	9.6	14.7	8.8	12.8	10.6	4.6
Other assets	81.6	73.3	51.5	34.6	37.7	38.0	59.3	92.3
Liabilities composition								
Deposits	51.2	68.4	63.9	62.5	66.3	64.3	61.1	52.0
Overnight Deposits	7.5	4.8	8.6	14.1	11.4	12.7	13.4	7.2
Time Deposits	43.8	63.6	55.3	48.4	54.9	51.6	47.7	44.8
Morgage Bonds	0.4	2.0	14.7	16.9	17.1	18.4	18.1	0.1
Foreign Loans	8.0	9.5	6.7	7.7	4.6	4.2	5.7	2.8
Subordinate Bonds	0.0	0.2	1.8	1.7	2.3	2.3	1.2	0.0
Stock of Provisions	1.4	2.6	2.4	2.6	2.1	1.9	2.0	1.0
Capital and reserves	38.9	17.3	10.4	8.6	7.6	8.9	12.0	44.0

Table B.2: Long Run Coefficients

Dependent variable	Coefficient		S. Error
1. Total loans growth			
Real GDP growth	0.58	*	0.13
Real Exchange Rate Devaluation	-0.93	*	0.07
Monetary Policy	-4.31	*	0.32
Bank Characteristic and Monetary Policy:			
Liquidity	7.82	*	1.09
Size	13.96	*	2.10
Capitalization	-1.36		2.70
2. Consumer loans growth			
Real GDP growth	1.11	*	0.19
Real Exchange Rate Devaluation	-0.20	***	0.10
Monetary Policy	-2.64	*	0.59
Bank Characteristic and Monetary Policy:			
Liquidity	6.63	*	1.68
Size	2.94		4.26
Capitalization	5.25	**	1.39
3. Commercial loans growth			
Real GDP growth	-0.02		0.37
Real Exchange Rate Devaluation	-1.71	*	0.21
Monetary Policy	-6.86	*	0.99
Bank Characteristic and Monetary Policy:			
Liquidity	13.61	**	4.00
Size	2.41		4.48
Capitalization	-3.93		6.28

Table B.3: Overall Effect of a Monetary Policy Shock on the Rate of Growth of Loans

	Size			*Capitalisation*			*Liquidity*		
	p25	p50	p75	p25	p50	p75	p25	p50	p75
Total	-4.2	-3.9	-3.5	---	---	---	-3.3	-2.8	-2.2
Consumer	---	---	---	-2.4	-2.3	-2.2	-1.7	-1.3	-0.8
Commercial	---	---	---	---	---	---	-5.0	-4.2	-3.2

C. Figures and Tables Section III

Table C.1

Short-term Debt and Aggregate Economic Activity: Results from a Multivariate VAR System 1990.I-2002.II

P-values from Exclusion Tests

Model		Small/All Mix[1] [2] Macroeconomic Activity Equation		Credit Variable Equation
GDP [3]	MPR	0.00%	GDP	12.87%
	Small/All Mix	2.40%	MPR	1.77%
Industrial Production [3]	MPR	3.87%	Industrial Production	13.27%
	Small/All Mix	0.00%	MPR	2.18%
Business Investment [3]	MPR	4.41%	Business Investment	97.94%
	Small/All Mix	3.50%	MPR	11.12%
Durable Consumption [3]	MPR	0.00%	Durable Consumption	73.87%
	Small/All Mix	17.10%	MPR	6.04%
Unemployment rate [4]	MPR	0.00%	Unemployment	95.59%
	Small/All Mix	0.01%	MPR	14.18%
Residential Investment [3]	MPR	0.00%	Residential Investment	12.87%
	Small/All Mix	2.40%	MPR	1.77%

[1] Ratio of short-term debt for firms below the 25th percentile in sales relative to short-term debt of all firms
[2] Exogenous Variables: Time trend, Inflation target, terms of trade and external output
[3] Endogenous variables 3 lags, exogenous variables 2 lags
[4] Endogenous variables 4 lags, exogenous variables 2 lags

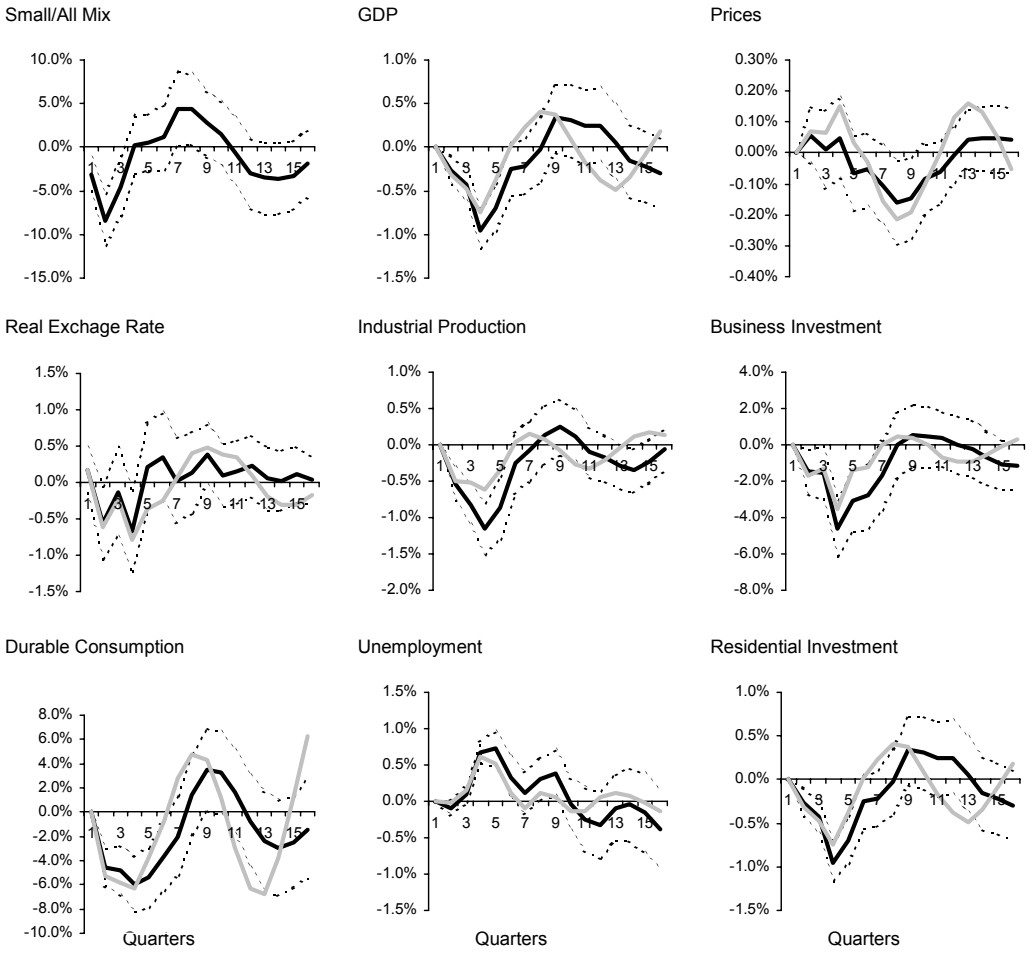
Model		Low/high quality mix ratio [1] [2] Macroeconomic Activity Equation		Credit Variable Equation
GDP [3]	MPR	0.08%	GDP	56.13%
	Low/high quality mix ratio	0.86%	MPR	1.65%
Industrial Production [3]	MPR	7.19%	Industrial Production	95.31%
	Low/high quality mix ratio	2.46%	MPR	0.04%
Business Investment [3]	MPR	13.59%	Business Investment	54.55%
	Low/high quality mix ratio	0.08%	MPR	3.28%
Durable Consumption [3]	MPR	0.00%	Durable Consumption	12.82%
	Low/high quality mix ratio	2.00%	MPR	0.11%
Unemployment rate [3]	MPR	4.81%	Unemployment	47.02%
	Low/high quality mix ratio	0.04%	MPR	0.82%
Residential Investment [4]	MPR	0.78%	Residential Investment	28.49%
	Low/high quality mix ratio	38.25%	MPR	0.45%

[1] Ratio of credit bank loans for consumer and small firms to short-term bank debt of all firms from FECUS dataset
[2] Exogenous Variables: Time trend, Inflation target, terms of trade and external output
[3] Endogenous variables 3 lags, exogenous variables 2 lags
[4] Endogenous variables 2 lags, exogenous variables 2 lags

Figure C.1

Impulse responses to an interest rate shock

when the credit variable is the small/all mix ratio [1,2,3,4]



Notes:

[1] This figure shows the results from various VAR models. Each model uses a different option for measuring macroeconomic activity: industrial production, business investment, durable consumption, unemployment rate, and residential investment. Each proxy is added one at time to the base VAR.

[2] The base model is comprised of five macroeconomic variables: real GDP, prices, monetary policy rate, small/all mix ratio, and real exchange rate. The exogenous variables are terms of trade, inflation target, external output, and a time trend. The lag structure is described in Table 1.

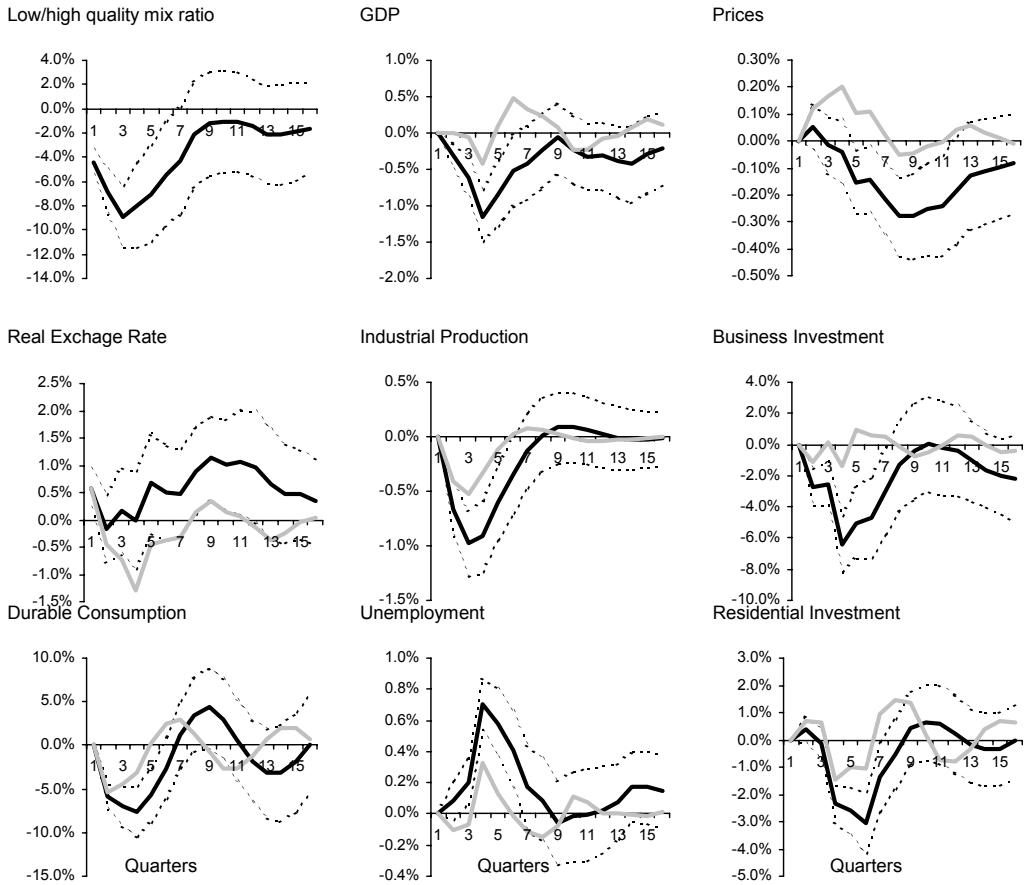
[3] The responses of small/all mix ratio, prices, and real exchange rate come from the base VAR.

[4] The grey lines represent impulse responses when the credit variable is considered exogenous.

Figure C.2

Responses to an interest rate shock

when the credit variable is the low/high quality mix ratio[1,2,3,4]



Notes:

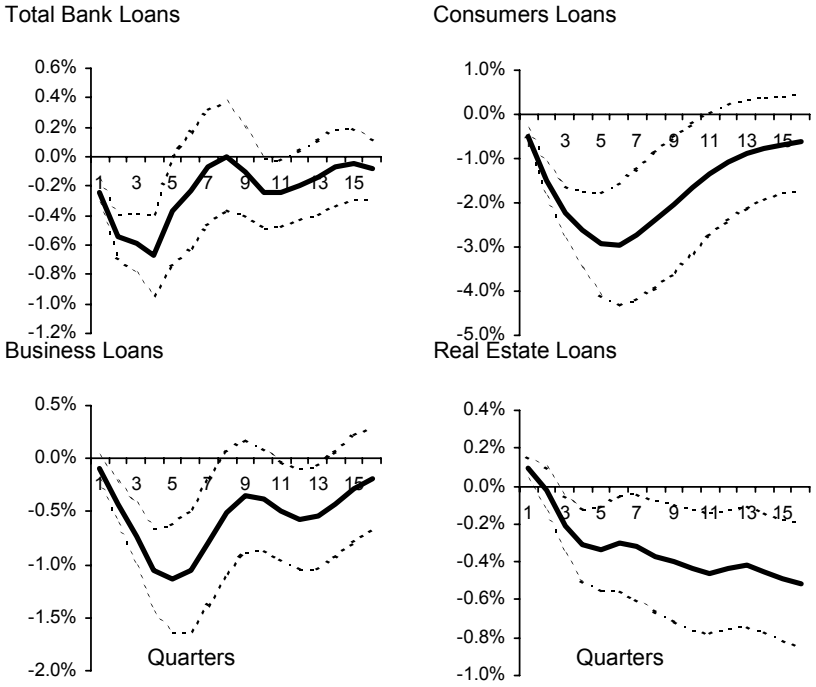
[1] This figure shows the results from various VAR models. Each model uses a different option for measuring macroeconomic activity: industrial production, business investment, durable consumption, unemployment rate, and residential investment. Each proxy is added one at time to the base VAR.

[2] The base model is comprised of five macroeconomic variables: real GDP, prices, monetary policy rate, low/high quality mix ratio, and real exchange rate. The exogenous variables are terms of trade, inflation target, external output, and a time trend. The lag structure is described in Table 1.

[3] The responses of low/high quality mix ratio, prices, and real exchange rate come from the base VAR.
[4] The grey lines represent impulse responses when the credit variable is considered exogenous.

Figure C.3

Responses to an interest rate shock [1,2,3]



Notes:
[1] This figure shows the results from various VAR models. Each model uses a different option for measuring bank loans. Each proxy is added one at time to the base VAR.
[2] The base model is comprised of five macroeconomic variables: real GDP, prices, monetary policy rate, loan, and real exchange rate. The exogenous variables are terms of trade, inflation target, external output, and a time trend.
[3] The VAR models that use total, consumer, and real estate loans have three lags for the endogenous variables and two lags for the exogenous variables. Instead, the VAR model with business loans has two lags for the endogenous variable and one lag for the exogenous variable.

D. Banks included in the Sample[30]

1	BANCO DE CHILE
2	BANCO OHIGGINS
3	BANCO INTERNACIONAL
4	BANCO OSORNO Y LA UNION
5	DRESDNER BANK LATEINAMERIKA
6	BANCO DEL ESTADO DE CHILE
7	SCOTIABANK SUD AMERICANO
8	BANCO DE CREDITO E INVERSIONES
9	BANCO DO BRASIL
10	CORPBANCA
11	BANCO BICE
12	BANCO DE A.EDWARDS
13	CITIBANK N.A.
14	BANCO SANTIAGO
15	BANCO SANTANDER-CHILE
16	BANKBOSTON N.A.
17	BANCO SUDAMERIS
18	BANCO DE LA NACION ARGENTINA
19	ABN AMRO BANK (CHILE)
20	BANCO SECURITY
21	BBVA BANCO BHIF
22	BANCO DEL DESARROLLO

[30] The banks excluded from the dataset are: Banesto Chile Bank, HSBC Bank USA, Bank of America, National Association, Banco Real S.A., Banco Do Estado Do SAO PAULO S.A., Banco Exterior (CHILE), JP Morgan Chanse Bank, American Express Bank Ltd (CHILE), Chicago Continental Bank, The Bank of Tokyo-Mitsubishi Ltd, Centrohispano Banco, The Hongkong and Shangai Banking CO., Banco Falabella, Deutsche Bank (CHILE) and Banco RIPLEY.

E. Definitions of variables

(TO BE COMPLETED)

Liquidity.

Size:

Capitalization: