Banco Central de Chile
Documentos de Trabajo

Central Bank of Chile
Working Papers

N° 456

Diciembre 2007

IS OWNERSHIP STRUCTURE A DETERMINANT OF BANK EFFICIENCY?

Rodrigo Fuentes Marcos Vergara

BANCO CENTRAL DE CHILE

CENTRAL BANK OF CHILE

Documentos de Trabajo del Banco Central de Chile
Working Papers of the Central Bank of Chile
Agustinas 1180
Teléfono: (56-2) 6702475; Fax: (56-2) 6702231

Documento de Trabajo
N° 456

Working Paper
N° 456

IS OWNERSHIP STRUCTURE A DETERMINANT OF BANK EFFICIENCY?

Rodrigo Fuentes
Gerencia de Investigación Económica
Banco Central de Chile

Marcos Vergara
Universidad Adolfo Ibañez

Resumen

El hecho que los dueños de una empresa puedan vender fácilmente una empresa en caso que su desempeño sea deficiente provee un incentivo adicional para que la gerencia esté alineada con los intereses de los accionistas, dado que en un proceso de fusión los gerentes pierden su empleo (Jensen y Ruback, 1983; Schranz, 1993). Es difícil testear esta hipótesis en forma empírica dado que algunos de estos conceptos son difíciles de medir. Este artículo utiliza funciones de costo y utilidad para estimar la eficiencia de la banca en Chile. Basándonos en estas medidas, explicamos las diferencias entre bancos a través del tiempo, las que se asocian con el tamaño del banco, la estructura de propiedad y otras variables. Presentamos dos conclusiones principales. La primera es que los bancos que están establecidos como sociedades anónimas abiertas en Chile tienden a ser más eficientes que aquellos que son sociedades cerradas. Este resultado se sostiene incluso al controlar por el mix de productos del banco y por el origen de la propiedad (local o extranjero). Nuestra interpretación de este resultado es que los bancos que son sociedades abiertas tienen una probabilidad relativamente alta de traspaso en Chile, dado que la estructura de propiedad es conocida. Por lo tanto, sus gerentes actúan en el mejor interés de los accionistas. Nuestra segunda conclusión es que los bancos cuya propiedad es altamente concentrada muestran un alto nivel de eficiencia. Los dos resultados juntos sugieren que la mitigación del problema agente-principal es clave para explicar la eficiencia de los bancos.

Abstract

When owners could easily sell a company if it is not performing well enough provide additional incentive to the administration to act in the best interest of the stockholders, since in the merger process the actual administration will lose their job (Jensen and Ruback, 1983; Schranz, 1993). It is difficult to test this hypothesis empirically due to the difficulty in measuring some of these concepts. This paper uses cost and profit functions to estimate efficiency at the bank level in Chile. Based on these measures, we explain cross-bank differences over time, which are related to bank size, ownership structure, and other relevant variables. We report two main findings. First, banks that are established as listed companies in Chile tend to show a higher level of efficiency than those established as closed companies. This result holds even after controlling for the bank's product mix and property origin (domestic versus foreign). Our interpretation of this result is that listed banks have a relatively high probability of takeover in Chile, since the ownership structure is known. Managers therefore act in the best interest of stockholders. Second, banks that have a high property concentration demonstrate a high level of efficiency. The two results together suggest that mitigation of the principal-agent problem is key to explaining bank efficiency.

We thank Antonio Ahumada, Solange Berstein, Gino Loyola, Rolf Luders, Rómulo Chumacero, Andrés Gómez–Lobos, Verónica Mies, Ricardo Paredes, María Josefina Rouillet, and José Miguel Sanchez for useful comments on an earlier version of this work, and also to the participants in the LACEA meeting 2003 and the workshop in the Central Bank of Chile, Department of Economics at Universidad de Chile and Alberto Hurtado University. Corresponding author: Rodrigo Fuentes. Address: Central Bank of Chile, Agustinas 1180, Santiago, Chile. Tel.: (56-2) 670-2386. Fax: (56-2) 670-2853. E-mail: rfuentes@bcentral.cl.

1. Introduction

The literature on principal agent has largely study the relationship between stockholders and managers. It suggests different compensation scheme and other actions to alienate incentives. For instance higher ownership concentration ameliorates the principal-agent problem between stockholders and managers (Jensen and Meckling, 1976; Brickley and James, 1987) since it provides more incentives for the controller stockholder to monitor the actions of the agent. Another example is how active threat of takeovers can provide additional discipline to managers who do not act in the owners' best interest (Jensen and Ruback, 1983; Schranz, 1993). The idea is when the owners could easily sell a company if it is not performing good enough provide additional incentive to the administration to act in the best interest of the stockholders, since in the merger process the actual administration will lose their job. Schranz (1993) has tested this hypothesis for the US and it cannot be rejected.

It is difficult to measure many of these concepts in practice. The management quality or the threat of takeover may not be observables. The Chilean banking industry provides a natural experiment to measure and subsequently to test these hypotheses[1]. First we estimate a measure of performance based on measuring cost and profit efficiency frontiers. Then we analyze how ownership structure affects these measures of efficiency.

The Chilean banking industry experienced a deep crisis in the early 1980s. After the bailout by the Central Bank, the property of the banks became dispersed due to the process of re privatization. Since the mid 90s an increasing concentration, through mergers of large and medium-sized banks, has taken place. Several banks were intervened during the crisis, but they were privatized later that decade, spreading the banks' property among a large number of small stockholders. Bank ownership then became highly concentrated again in the late 1990s. As mentioned this is consistent with the idea that higher ownership concentration ameliorates the principal-agent problem between stockholders and managers. These processes of market and ownership concentration raise the question of how these variables have affected the level of bank efficiency. Owners will always be concerned with the level of efficiency achieved by their banks, and one of the reasons owners opt to merge two banks is to raise efficiency.

As of 2004, the industry included five large banks (with a market share of 10 percent or more), nine medium-sized banks (with a market share between 2 and 6 percent), and thirteen small banks (with a market share below 1 percent). Several banks are listed on the Chilean stock exchange (59 percent of total banks), while others operate as closed companies, which mostly act as branches of international banks.

[1] It is important to notice that the data for the banking industry is very reliable since this sector is under a tight supervision of the Superintendence of Banks and Financial Institutions (SBIF).

Moreover, some banks could be more active takeovers providing additional discipline to managers who do not act in the owners' best interest (Jensen and Ruback, 1983; Schranz, 1993). On that respect some of the Chilean banks are listed companies in the stock exchange market, while others are closed companies. This is another difference in ownership type of control. We argue that the former group is subject to take over more easily than the second one. However it is important to control for the origin of ownership, domestic or international, since the latter tend to act as closed companies in Chile.

Now we have to advocate to measure performance and as mention we look for some measures of efficiency. Several papers indirectly analyze different concepts of bank efficiency for Chile. Basch and Fuentes (1998) and Brock and Franken (2002) study the determinants of banking spreads as a measure of the social efficiency of the banking industry. Budnevich, Franken, and Paredes (2001) use data on individual banks to investigate the existence of economies of scale and scope. They find that there is little space to gain scale economies through mergers; such scale economies are achieved only when small banks merge, and not when large banks are involved. Loyola (2000) analyzes the effects of bank mergers on bank efficiency and finds some evidence of a relation between these two variables. Finally, Chumacero and Langoni (2001) study the relation between risk, size, and market concentration in the banking sector; they report that systemic risk does not increase with bank size or bank concentration.

This paper searches for the determinants of bank efficiency. Specifically, it explores how the ownership structure affects bank efficiency, controlling for size, credit risk, type of business, and macroeconomic variables. In our study, ownership is characterized using three different variables: a dummy variable for whether the bank is an open or closed corporation; another dummy for whether it is a domestic enterprise or a foreign branch or subsidiary; and a variable identifying the degree of property concentration. We expect ownership structure to be an important determinant of bank efficiency—even after controlling for other variables that could explain the level of efficiency—because ownership structure can mitigate the principal-agent problem of managers and stockholders.

To test our hypothesis, we use stochastic cost and profit frontiers to estimate efficiency at the bank level in the 1990-2004 period for Chile. We use these measures to explain cross-bank differences over time, which are related to bank size, ownership structure, and other relevant variables. We find evidence that banks that are listed on the Chilean stock exchange tend to show a higher level of efficiency than closed corporations. We interpret this finding in two ways. Our first interpretation is related to a principal-agent problem. Listed banks face a relatively high probability of takeover in Chile since the ownership structure is known, and managers therefore act in the best interest of stockholders.[2] In other

2. An open corporation in Chile is subject to supervision by the Superintendency of Securities and Insurance (SVS), and it has to disclose information such as property structure and the identity of stockholders. A bank that is an open

words, the market disciplines the managers. Our second explanation is that the two groups of banks generate different product mixes. Branches of international banks are involved mostly in financial instrument intermediation (that is, portfolio investment or narrow banking) and do not act as loan-deposit institutions, whereas listed banks operate primarily in the latter area, functioning as universal banks that provide all the services allowed by law (universal banking). In other words, universal banks take higher risk than portfolio investment type of banks. We control for this in our estimations.

We perform a second exercise to explore the relation between ownership and efficiency based on data available for listed banks, as these are the only banks that report ownership structure. We find that banks characterized by highly concentrated ownership display a higher level of efficiency than banks whose ownership structure is more disperse. The two results suggest that mitigation of the principal-agent problem is one of the keys to explaining bank efficiency.

The paper continues as follows. The next section presents some stylized facts that motivate our empirical investigation. Section 2 then covers the methodology and data used. In section 3, we outline our empirical results, and section 4 concludes.

2 Stylized Facts of the Chilean Banking Industry

One of the characteristics mentioned in the introduction is the increasing concentration of the Chilean banking system. At the beginning of the 1990s there were thirty-six banks (thirty-five private and one state-owned), but there were only twenty-eight in 2000 and thirty two in 2004. While different indexes of concentration show little difference between 1990 and 2004 using the entire sample of banks, when we drop the state-owned bank both the Herfindhal index and the C4 index (which measures the market share of the four largest banks using earning assets) indicate that concentration has increased over the time period (see table 1).

Table 2 provides data on ownership concentration and the number of banks that are listed companies. The data point to a clear tendency toward increasing ownership concentration among the banks in this group. The four major bank stockholders owned, on average, 71 percent of bank property in 1990, but this figure reached 94 percent in 2004. The dispersion of property concentration across banks has decreased over time, indicating that most banks have tended to concentrate their property. According to our hypothesis, this evidence suggests that banks are trying to solve the principal-agent problem between stockholders and managers.

---

corporation is thus subject to supervision by both the SVS and the Superintendence of Banks and Financial Institutions, being predominant the rules of the latter.

This property concentration[3] has been especially important for large banks, while small banks have always exhibited a highly concentrated ownership (see figure 1). The reason for this movement lies in the solution of the 1982 banking crisis, when several banks were intervened and others liquidated. Intervened banks were later privatized using so-called popular capitalism, which consisted in selling a bank's property to a large number of small new owners. Large investors generally bought out smaller investors within a few years, probably because that was the most efficient way to manage the organizations.

The question is how this increased market and property concentration affects the return for banks' stockholders. To address this issue, we analyze the relation between market concentration and return on equity. Concentration increased slightly over the decade, while the return on equity fluctuated with no apparent trend (see table 3). However, the average return on equity in the 1990–95 period is 9.7 percent, which is substantial smaller than the average for the 1996–2000 period (13.5 percent) and for the 2001-2004 period (15.9%). Table 3 also shows the relation between ownership concentration (measured by the C4 index) and return on equity. The steady increase in concentration noted earlier has been accompanied by an increase in the average return on equity.

3 Empirical Model and Data

The concept of efficiency applied in this paper is economic efficiency. We estimate cost efficiency and standard profit efficiency and analyze how different macroeconomic and bank-specific variables affect these measures. The two measures do not necessarily yield the same result.[4] Berger and Mester (1997) find that cost efficiency and profit efficiency are negatively correlated. Akhavein, Berger, and Humphrey (1997) report that mergers improve profit efficiency but not cost efficiency. Cost efficiency refers to the minimum cost to produce a certain mix of product; it does not take into account whether this product mix is appropriate given the market prices of products. In contrast, profit efficiency does take the product mix into account as a decision variable.

The measure of efficiency is the actual level of cost (profit) relative to an efficient cost (profit) frontier. The efficiency frontier can be estimated using parametric and nonparametric techniques. The former includes the stochastic frontier approach, the distribution-free approach, and the thick frontier approach, while the traditional nonparametric technique is data envelopment analysis. Each approach has

[3] This is done using data of listed banks, since the property structure for the rest of the banks is not known.

advantages and disadvantages for analyzing bank data.[5] Berger and Humphrey (1997) and Bauer and others (1997) compare the different approaches for analyzing bank data using frontier methods. They find no large differences in the average inefficiency of parametric and nonparametric techniques. The ranking of inefficiency across institutions varies widely depending on the method used, but the ranking is relatively similar within each group of techniques (parametric and nonparametric). Given the nature of our hypothesis, we use the stochastic frontier approach to estimate cost and profit efficiency.

31 The Model

Cost efficiency relates a bank's actual costs with the minimum costs that will allow the bank to produce its output mix under current conditions. The measure of efficiency is the bank's actual cost relative to the frontier. Following Berger and Mester (1997), this cost function for bank *j* can be written as follows:

$$\ln C_j = f\left(\mathbf{w}_j, \mathbf{y}_j, \mathbf{z}_j, \mathbf{h}_j\right) + u_{jc} + v_{jc}, \tag{1}$$

where *C* represents cost, *f* is a certain functional form, $\mathbf{w}_j$ is an input price vector, $\mathbf{y}_j$ is the variable output vector, $\mathbf{z}_j$ is the fixed netputs vector, $\mathbf{h}_j$ is a vector of market variables that affect efficiency, v_{jc} is a random variable that denotes inefficiency that increases costs, and u_{jc} is the traditional random error term. In this case, the random term $v_{jc} + u_{jc}$ is treated as an error component.

The cost efficiency (CE) of bank *j* is defined as the ratio between the minimum costs, given by a bank in the frontier (we assume $v_j^{\min} = 0$), and the actual costs of bank *j*, given the same exogenous variables (**w**, **y**, **z**, **h**), where **h** represents a set of variables that affect the distribution of *v*.

$$CE = \frac{C^{\min}}{C} = \frac{\exp\left[f\left(\mathbf{w}_j, \mathbf{y}_j, \mathbf{z}_j, \mathbf{h}_j\right)\right] * \exp\left(u_{jc}\right)}{\exp\left[f\left(\mathbf{w}_j, \mathbf{y}_j, \mathbf{z}_j, \mathbf{h}_j\right)\right] * \exp\left(u_{jc}\right) * \exp\left(v_{jc}\right)}$$

which reduces to

---

4. See Berger and Humphrey (1997).
5. See Berger and Humphrey (1997) and Bauer and others (1997) for a summary of the main caveats and general quality of each approach. For a general review of the stochastic frontier analysis, see Kumbhakar and Lovell (2000).

$$CE = \exp\left(-v_{jc}\right). \tag{2}$$

The range for the CE index is [0,1]. CE = 1 implies that the bank is 100 percent efficient.

The profit frontier for estimating profit inefficiency is defined in the usual way, as a function of input and output prices:

$$\ln \pi_j = g\left(\mathbf{w}_j, \mathbf{p}_j, \mathbf{z}_j, \mathbf{h}_j\right) + u_{j\pi} - v_{j\pi} \tag{3}$$

where π represents variable profits, **p** is an output price vector, v_π is a random variable that denotes inefficiency that reduces profits, and u_π is the traditional random error term. Output price replaces output level in the profit function. Standard profit efficiency (PE) is defined as the ratio of actual profits to profits predicted by the efficiency frontier. In other words, the number represents the percentage of maximum profits that bank *j* is earning:

$$PE = \frac{\pi}{\pi^{\max}} = \frac{\exp\left[g\left(\mathbf{w}_j, \mathbf{p}_j, \mathbf{z}_j, \mathbf{h}_j\right)\right] * \exp\left(u_{j\pi}\right) * \exp\left(-v_{j\pi}\right)}{\exp\left[g\left(\mathbf{w}_j, \mathbf{p}_j, \mathbf{z}_j, \mathbf{h}_j\right)\right] * \exp\left(u_{j\pi}\right)}$$

which reduces to

$$PE = \exp\left(-v_{j\pi}\right). \tag{4}$$

Thus, a value for PE_j equal to 0.85 means that a bank is losing 15 percent relative to the bank of best practice. This ratio may be positive or negative, since a bank can give away more than 100 percent of its profits.

3.2 Data

The data set used is generated from the balance sheets that banks report to the Superintendency of Banks. We construct a panel of data for the 1990–2004 period for all the banks in the system. The dependent variables are variable costs, which include interest paid and labor costs, and profits, which is defined as interest earned minus variable costs. The input prices are interest paid for deposits and other domestic and foreign obligations ($\mathbf{w}_1$) and the wage bill ($\mathbf{w}_2$). Outputs are defined as loans ($\mathbf{y}_1$) and investments ($\mathbf{y}_2$). Netputs are fixed assets ($\mathbf{z}_1$) and equity ($\mathbf{z}_2$). The output prices are interest earned over total loans ($\mathbf{p}_1$) and interest earned over investment ($\mathbf{p}_2$).

The variables used as determinants of inefficiency are size, market concentration, bank ownership, a dummy variable for the state-owned bank, economic activity, and risk. These variables are defined as follows. Size is the log of interest-earning assets, or the market share of each bank. Market concentration is measured through the Herfindhal-Hirschman and C4 indices. Ownership is captured through three variables: open corporation is a dummy variable that takes a value of 1 if the bank is listed on a stock exchange and zero otherwise; foreign bank is a dummy variable that takes a value of 1 if the bank is a foreign branch or subsidiary and zero otherwise; and ownership concentration corresponds to the C12 index of property calculated over the entire group of stockholders for each bank, which could only be estimated for banks that are listed firms. Economic activity is the log of real GDP. Finally, risk is represented by two variables: the ratio of total loans to investment captures the type of business that a bank pursues (a higher ratio means that the bank is taking higher risk, since investment is placed in Central Bank papers), and credit risk is measured as loan losses over interest earning assets. All of these variables—size, market concentration, ownership, economic activity, and risk—are part of the vector $\mathbf{h}_{jt}$, as determinants of average inefficiency.

3.3 Estimation Method

We need to make two important assumptions—namely, the probability distribution of inefficiency and the functional forms *f* and *g*. Inefficiency could be estimated using the stochastic frontier approach (SFA) and a fixed effect model. The choice of the model could be seen as joint test of the distributional assumption of the stochastic frontier and the no correlation between the individual effects and the exogenous variables. Under the null hypothesis both estimators are consistent, but the fixed effect is inefficient, under the alternative the SFA estimator is inconsistent. First we will choose the functional form and later we will decide which model for that functional form works better.

Following Battese and Coelli (1995), this paper assumes that inefficiency is a sequence of random variables with a zero-truncated normal distribution, $\mathcal{N}(\mu_{jt},\sigma_v^2)$. The mean of this distribution

depends on the factors that affect inefficiency, that is, $\mu_{jt} = \mathbf{h}_{jt}\boldsymbol{\delta}$, where $\mathbf{h}_{jt}$ is a vector of the determinants of inefficiency and $\boldsymbol{\delta}$ is a vector of the parameters to be estimated.

The functional form for the cost and profit functions could correspond to a Cobb-Douglas, translog or a Fourier flexible function. Some authors find that a Fourier form provides better fit, since it adds trigonometric terms to the traditional translog terms. In the case of frontier estimation, however, Berger and Mester (1997) find that the difference in the average efficiency is less than 1 percent between the standard translog and the Fourier form. They argue that there is no theoretical reason to choose one form over the other. Here we follow a more eclectic approach. We estimate equations (1) and (3), assuming that the mean of the truncated normal distribution is constant, by maximum likelihood for the three functional form specifications.[6] We use the likelihood ratio test to decide the best functional form to fit the data.

Table 4 exhibits the hypothesis testing for the functional form of *f* and *g* in equations (1) and (3). We test Cobb-Douglas and translog functional forms against the alternative hypothesis of a Fourier form. For both the cost and profit functions, we reject the null hypothesis in favor of the alternative. Therefore, from now on, all our estimations are based on a Fourier form.

Table 5 presents the Hausman test to check whether SFA or fixed effect is more appropriated. For the cost function the test does not reject the null, i.e. the assumptions of SFA are valid. Table 5 also shows the results for the profit function, where the value of the statistic is negative. Greene (1998) shows that the variance-covariance matrix from the maximum likelihood estimation could be larger for the unrestricted model than for the alternative one, in such case the matrix may not be positive definitive, given that the inverse of the matrix appears in the calculated statistic. If that is the case, the chi square statistic take the value equal to zero, i.e. the assumptions made by the SFA cannot be rejected for the case of the profit function. Therefore the assumption that the estimator of SFA is consistent and more efficient cannot be rejected, solving the eventual correlation between the input prices and the error term. In the rest of the paper we work with the SFA.

4. Analysis of the Results

In this section, we present our estimated results for inefficiency and explain the observed differences in inefficiency across banks. Table 6 reports the average efficiency across banks (both private banks and the state owned bank) per year, assuming that the mean of the truncated normal distribution is

6. We estimate using the Frontier 4.1 software program; see Coelli (2000).

constant. Cost efficiency and decreased over the period while profit efficiency increased. The average cost efficiency indicates that private banks spend 10% percent more resources than a bank on the cost frontier for the same level of output. The average profit efficiency, in turn, implies that banks are earning 22 percent less than the bank of best practice. What is interesting is that the owned state bank is above the average of private bank in cost efficiency but way below the average in profit efficiency. This behavior is also observed for the year 2004. Using a different methodology Micco, Panniza and Yañez (2005) found that private banks are more efficient than state owned banks in developing countries, which is not true for developed economies (Altunbas, Evans and Molyneux, 2001). This evidence is not supported in our data.

These results are not different from those reported in the international literature. For instance, Berger and Humphrey (1997) use parametric techniques to analyze U.S. banks; they report a range for cost efficiency between 0.61 and 0.95, with a median of 0.85. Berger and Mester (1997) report that a bank could raise profits by 50 percent if it caught up with the bank of best practice.[7] The profit efficiency range for the European Union is 0.30 to 0.75, with a median of 0.63 (Maudos and Pastor, 2000). The same study finds a cost efficiency range of 0.8 to 0.96, with a median of 0.93, for the same group of countries. These studies serve only as a point of reference, since they measure banks' efficiency relative to their own frontier. We thus cannot conclude that Chilean banks are more efficient than European banks and less efficient than American banks.

Table 7 exhibits the evolution of cost and profit efficiency for different categories of banks. Listed banks are more efficient on average than banks that are closed companies. One plausible hypothesis to explain this result is that the ownership structure for listed banks is known and that could make easier to make a take over. This will discipline the managers who do not behave in the best interest of the owners, since they could loose their jobs in the case of a take over by another bank. This threat will provide incentives to the bank to be more efficient.

Table 7 also shows that domestic banks are more profit efficient (about 10%) than foreign bank, although they show on average the same level of cost efficiency. This could be due to a several reasons: more effective monitoring by domestic banks; foreign banks maximize profit globally and not in each branch; foreign banks and domestic banks are in different niches of the market. Nevertheless this result seems to contradict the large evidence presented in the literature (Micco et al. 2005, Demirgüç-Kunt and Huizinga 2002, Bonin et al. 2005)

7. In contrast with Berger and Mester (1997), however, we found that the level of efficiency is sensitive to the estimation method: specifically, it tends to be higher with a Fourier form.

Regarding size of the banks, larger banks tend to be more cost efficient but medium size banks exhibit on average higher level of profit efficiency. All these hypotheses could be tested using Batesse and Coelli (1995), as we do in the following section.

4.1 Cost Efficiency

What factors explain cost efficiency across banks and over time? Table 8 presents the estimation results, including explanatory variables, for the mean of the truncated normal distribution. The results show that the dummy variable that controls for type of bank—that is, that takes a value of 1 if the bank is a listed company—has a negative and statistically significant coefficient. This means that this group of banks is less inefficient than the closed corporations, which are mainly international bank branches. One interpretation of this result, following Schranz (1993), is that managers of banks that are likely to be threatened by a takeover tend to act in the best interest of the stockholders. However, this variable may be capturing the type of property—domestic versus foreign—so we include a dummy variable that takes a value of 1 if the bank is foreign. We also control for type of business, market concentration, credit risk, size, and economic activity.

The loan-to-investment ratio has a negative effect on inefficiency, meaning that banks that have a large proportion of their portfolio in loans (which raises their risk) are more efficient than banks that concentrate on investment intermediation. The Herfindhal index enters with a non-significant coefficient. This implies that high market concentration does not affect cost efficiency. Size, whether measured as the log of interest earning assets or as market share, enters with a negative sign: larger banks tend to be more cost efficient. Credit risk also enters with a positive sign only. When the bank's portfolio risk increases, the bank managers have weak incentives to control costs, which results in a lower level of efficiency. The negative sign for the log of GDP indicates that inefficiency increases when the economy is contracting.

One hypothesis to explain the negative sign and statistical significance of the listed corporation variable is that closed companies are branches of international banks and are thus held to a different standard, namely, the frontier established by other branches of the same bank. We can reject this hypothesis, however, because the listed company dummy has a statistically significant negative coefficient when we include the dummy for foreign banks. A second hypothesis is that banks in this category are in a different market niche. Here again, when we include the loan-to-investment ratio as a proxy of market niche, the variable of interest retains a negative coefficient. There is something special about open corporations that makes them more efficient than other types of banks.

To explore the effect of ownership concentration on cost efficiency, we use data reported by the Superintendency of Banks to construct a C12 index for listed banks, based on each stockholder's share of total property (see table 9). We find that high ownership concentration corresponds with a high level of efficiency, even after we control for size, credit risk, and the loan-to-investment ratio. The signs of the control variables are the same as before, showing the robustness of the results.

4.2 Profit Efficiency

We use the same variables as determinants of profit inefficiency; table 10 shows the estimation results. Again, a bank that is an open corporation has higher profit efficiency than an unlisted corporation, after we control for the same set of variables as in the case of cost function. The loan-to-investment ratio, which serves as a proxy for market niche, is significant at the 10 percent level only in model 1, while the dummy variable for foreign banks becomes positive and statistically significant. The latter could imply that foreign banks are less efficient than domestic banks or, alternatively, those foreign banks seem to be inefficient since they make profit elsewhere or they are constrained, by the mother company, in the type of markets that they can operate.[8] Size (whether measured as the log of interest-earning assets or as market share) matters for profit efficiency in the same way as in the case of cost efficiency. Large banks are less inefficient than small banks when measured by total earning assets or market share. Credit risk is significant at the 1 percent level, with a negative sign. Banks that take higher risk tend to exhibit higher levels of profit efficiency. The coefficient of GDP is negative, showing that profit efficiency improves with the business cycle. On the other hand, the higher the concentration, measured by the Herfindhal index, the higher is the level of profit efficiency. The increasing concentration in the banking sector during the 1990s thus appears not to be harmful for profit efficiency.

At last, after controlling for everything, the state-owned bank is more profit efficiency than the average bank in the group. This is interesting since Micco et al. (2005), based on the work by Altunbas et al. (2001) and La Porta et al (2002), conclude that only in developed economies the state-owned banks could be more efficient than private banks, while in less developed countries the opposite is true. Here for an emerging economy we find the result similar to the developed economies one, which may be due to the fact that the state-owned bak is efficiently operated since is under direct competition of other banks.

[8] In the literature foreign banks are more cost efficient than domestic banks. Here we are comparing profit efficiency, which is a different concept. Foreign banks could be less efficient because they have restrictions on the mix of products that they could sell or they can make profits abroad and they are not registered in the financial reports for Chile.

In table 11 we analyze the relation between profit efficiency and ownership concentration among listed banks. As in the case of cost efficiency, ownership concentration has a negative and statistically significant coefficient.

5. Concluding Remarks

Ownership structure has been in the literature as a way of ameliorate the principal agent problem between owners and managers. Specifically higher probability of take over will discipline the administration to act in the owner's best interest. This is difficult to measure in practice. This paper made an effort in that direction. We studied economic efficiency in the Chilean banking industry using a stochastic frontier approach. We used two indicators to measure economic efficiency: the cost function and the standard profit function. We found that banks that are listed companies tend to be more efficient in cost and in profit than the closed companies. This result survives after we control for type of business, size, market concentration, credit risk, and economic activity.

This suggests two alternative hypotheses. The first is related to the principal-agent problem. Listed banks are under close observation from the market, and they could be subject to a takeover. Managers must therefore handle costs and profit carefully. In contrast, the foreign owners of banks that are branches of multinational banks tend to exert less control over their managers, which results in cost and profit inefficiency.

The second hypothesis is related to the type of business that these two groups conduct. Listed banks tend to be large, and they act as universal banks by providing all the services permitted by the law. In contrast, closed banks tend to be small, and they are not involved in retail banking, but rather serve only very large firms or just intermediate investment funds. However, when we control for market niche (through the loan-to-investment ratio) and property origin (domestic versus foreign), the listed company variable is still significant for explaining inefficiency.

Another finding that supports the importance of the principal-agent problem for cost and profit efficiency is the evidence presented here on the relation between ownership structure and efficiency. Banks with higher ownership concentration show higher levels of cost and profit efficiency, indicating that ownership concentration is used to mitigate the principal-agent problem. On a different matter, the only one state-owned bank is not less efficient than the average private bank, which is different what has been found for less developed economies in the literature.

References

Akhavein, J. D., A. N. Berger, and D. B. Humphrey. 1997. "The Effects of Megamergers on Efficiency and Prices: Evidence from a Bank Profit Function." *Review of Industrial Organization* 12(1): 95–130.

Altunbas, Y., Evans, L. and P. Molyneux. 2001. Bank Ownership and Efficiency. *Journal of Money, Credit and Banking* 33 (4), 926--954.

Basch, M., and J. R. Fuentes. 1998. "Macroeconomic Influences on Bank Spreads in Chile, 1990–95." In *Why So High? Understanding Interest Rate Spreads in Latin America*, edited by P. Brock and L. Rojas-Suarez, chap. 4. Washington: Inter-American Bank for Development.

Battese, G. E., and T. J. Coelli. 1995. "A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data." *Empirical Economics* 20(2): 325–32.

Bauer, P. W., A. N. Berger, G. D. Ferrier, and D. B. Humphrey. 1997. "Consistency Conditions for Regulatory Analysis of Financial Institutions: A Comparison of Frontier Efficiency Methods." *Finance and Economics Discussion Series.* Washington: Board of Governors of the Federal Reserve System, Divisions of Research and Statistics and Monetary Affairs.

Berger, A. N., and D. B. Humphrey. 1997. "Efficiency of Financial Institutions: International Survey and Directions for Future Research." *European Journal of Operation Research* 98: 175–212.

Berger, A. N., and L. J. Mester. 1997. "Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions." *Journal of Banking and Finance* 21(7): 895–947.

Bonin, J., I. Hasan and P. Wachtel (2005). Bank performance, efficiency and ownership in transition countries. *Journal of Banking and Finance* 29 (1), 31-53.

Brickley, J. A., and C. M. James. 1987. "The Takeover Market, Corporate Board Composition, and Ownership Structure: The Case of Banking." *Journal of Law & Economics* 30(1): 161–80.

Brock, P., and H. Franken. 2002. "Bank Interest Margins Meet Interest Rate Spreads: How Good Is Balance Sheet Data for Analyzing the Cost of Financial Intermediation?" Santiago: Central Bank of Chile. Mimeographed.

Budnevich, C., Franken, H., and R. Paredes. 2001. "Economías de escala y economías de ámbito en el sistema bancario chileno." *Economía Chilena* 4(2): 59–74.

Chumacero, R., and P. Langoni. 2000. "Riesgo, tamaño y concentración en el mercado bancario chileno." *Economía Chilena* 4(1): 25–34.

Coelli, T. 2000. A Guide to Frontier Version 4.1: A Computer Program for Stochastic Frontier Production

and Cost Function Estimation." *Working paper* 96/07. University of Queensland (Australia), School of Economics, Centre for Efficiency and Productivity Analysis (CEPA).

Demirgüç-Kunt, A. and H. Huizinga (2000). Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. *World Bank Economic Review* 13 (2), 379-408.

Jensen, M. C., and J. A. Meckling. 1976. "Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure." *Journal of Financial Economics* 3(4): 305–60.

Jensen, M. C., and R. S. Ruback. 1983. "The Market for Corporate Control." *Journal of Financial Economics* 11(1): 5–55.

Kumbhakar, S. C., and C. A. K. Lovell. 2000. *Stochastic Frontier Analysis*. Cambridge University Press.

La Porta, R., F. López-de-Silanes, A. Shleifer (2002). Government Ownership of Banks. *Journal of Finance* 57 (2), 265-301.

Loyola, G. 2000. "An assessment of the Bank's Mergers in Chile." *Unpublished master's thesis,* Santiago: University of Chile.

Maudos, J., and J. Pastor. 2000. "La eficiencia del sistema español en el contexto de la Unión Europea." *Papeles de Economía Española* 84–85: 154–68.

Micco, A., Panniza, U. and Yañez, M. (2005). Bank and performance does politics matter? *Working paper* Nº 356, Central Bank of Chile.

Schranz, M. S. 1993. "Takeovers Improve Firm Performance: Evidence from the Banking Industry." *Journal of Political Economy* 101(2): 299–326.

Table 1. Concentration in the Chilean Banking System: Full Sample and Private Banks, 1990–2004

		All banks		*Private banks*	
Year	*No. banks*	*Herfindhal*	*C4*	*Herfindhal*	*C4*
1990	36	0.0927	0.5115	0.0515	0.3626
1991	36	0.0886	0.4936	0.0489	0.3481
1992	36	0.0852	0.4800	0.0467	0.3374
1993	36	0.0826	0.4671	0.0473	0.3382
1994	34	0.0856	0.4698	0.0492	0.3412
1995	32	0.0840	0.4589	0.0502	0.3429
1996	31	0.0818	0.4594	0.0538	0.3609
1997	29	0.0975	0.5526	0.0700	0.4644
1998	29	0.0976	0.5505	0.0714	0.4668
1999	29	0.0974	0.5494	0.0724	0.4706
2000	28	0.0962	0.5426	0.0710	0.4650
2001	30	0.0937	0.5338	0.0718	0.4696
2002	32	0.1100	0.6068	0.0901	0.5522
2003	32	0.1266	0.6540	0.1003	0.5614
2004	32	0.1248	0.6522	0.0961	0.5529

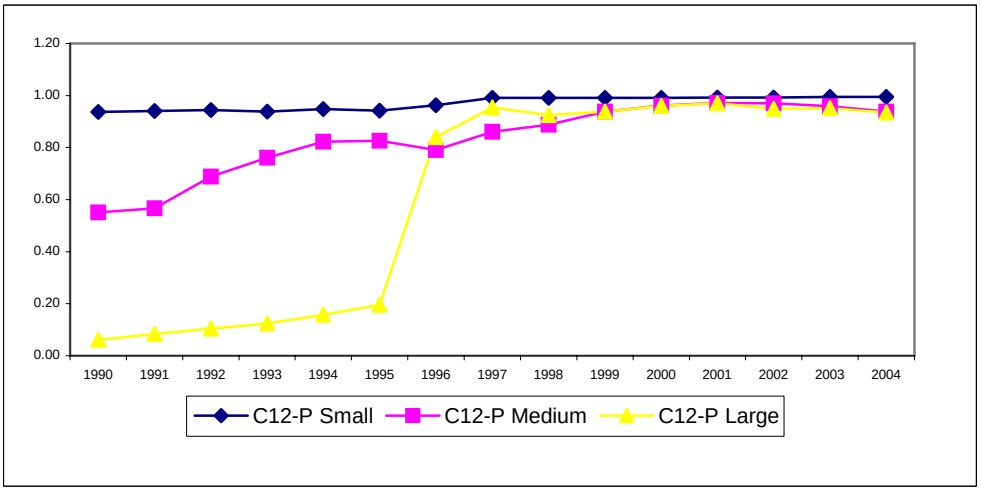
Source: Superintendency of Banks and Financial Institutions. The Herfindhal and C4 are calculated using earning assets

Table 2. Bank Ownership Concentration: 1990–2004

		Listed banks as percent of total no. private banks	*All private banks*					
			C4		*C12*		*Herfindhalf*	
Year	*No. banks that are listed firms*		*Average*	*Standard deviation*	*Average*	*Standard deviation*	*Average*	*Standard deviation*
1990	18	50	0.712	0.325	0.82	0.289	0.477	0.484
1991	19	53	0.733	0.316	0.836	0.272	0.455	0.396
1992	19	53	0.731	0.304	0.839	0.253	0.406	0.353
1993	19	53	0.741	0.296	0.848	0.247	0.483	0.487
1994	19	56	0.762	0.276	0.859	0.235	0.568	0.594
1995	18	56	0.748	0.268	0.848	0.211	0.586	0.609
1996	17	55	0.795	0.2	0.879	0.132	0.555	0.454
1997	15	54	0.843	0.177	0.926	0.082	0.547	0.402
1998	15	54	0.864	0.167	0.938	0.074	0.575	0.4
1999	15	52	0.92	0.085	0.96	0.044	0.633	0.366
2000	15	54	0.933	0.073	0.968	0.038	0.658	0.357
2001	17	57	0.945	0.078	0.977	0.036	0.647	0.298
2002	18	56	0.941	0.077	0.973	0.036	0.729	0.398
2003	19	59	0.944	0.082	0.974	0.041	0.699	0.309
2004	19	59	0.935	0.105	0.967	0.059	0.700	0.313

Source: Superintendency of Banks and Financial Institutions.

Figure 1. Ownership Concentration by Bank Size



Source: Authors' calculations, based on information from the Superintendency of Banks and Financial Institutions.

Table 3. Return on Equity and Market and Ownership Concentration[a]

	Private banks		*Listed banks*	
Year	*Return on equity*	*Market concentration (C4)*	*Return on equity*	*Concentration of ownership (C4)*
1990	0.158	0.3626	0.187	0.712
1991	0.062	0.3481	0.080	0.733
1992	0.034	0.3374	0.097	0.731
1993	0.098	0.3382	0.110	0.741
1994	0.099	0.3412	0.124	0.762
1995	0.13	0.3429	0.143	0.748
1996	0.168	0.3609	0.194	0.795
1997	0.147	0.4644	0.168	0.843
1998	0.121	0.4668	0.140	0.864
1999	0.094	0.4706	0.107	0.92
2000	0.148	0.4650	0.160	0.933
2001	0.167	0.4696	0.203	0.945
2002	0.150	0.5522	0.150	0.941
2003	0.159	0.5614	0.200	0.944
2004	0.159	0.5529	0.190	0.935

Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. Market concentration is measured over the entire population of private banks; ownership concentration is measured for those banks that are listed companies.

Table 4. Hypothesis Testing of the Functional Form against the Fourier Flexible[a]

	Cost efficiency index (CE)		*Profit efficiency index (PE)*	
Null Hypothesis	*LR test*	*d.f.*	*LR test*	*d.f.*
Cobb-Douglas	705.9	57	291.3	57
	(0.00)*		(0.00)*	
Translog	267.7	42	131.9	42
	(0.00)*		(0.00)*	

* Statistically significant at the 1 percent level.
Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. *P*-values are in parenthesis.

Table 5. Hausman Test[a]

	Cost efficiency index (CE)		*Profit efficiency index (PE)*	
Null Hypothesis	*H test*	*d.f.*	*H test*	*d.f.*
$\beta_{\Phi E} = \beta_{A\Phi\Sigma}$	43.66 (0.24).	62	-105.08	62

Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. *P*-values are in parenthesis. H test reaches a negative value for PE index. Greene (1998) shows that it could be the case that the covariance matrix of the maximum likelihood estimator be larger than the one of the alternative model, and therefore the matrix used in the statistic is not positive definitive. In this case the H statistics takes the value of zero, no rejecting the null hypothesis, i.e. the stochastic frontier assumptions.

Table 6. Estimated Cost and Profit Efficiency

	Private Sector		*State Owned Bank*	
Year	*CE*	*PE*	*PE*	*PE*
1990	0.95	0.60	0.98	0.09
1991	0.95	0.64	0.98	0.14
1992	0.94	0.65	0.97	0.20
1993	0.94	0.69	0.97	0.27
1994	0.93	0.71	0.97	0.34
1995	0.93	0.75	0.96	0.42
1996	0.92	0.77	0.96	0.49
1997	0.91	0.79	0.95	0.56
1998	0.90	0.81	0.95	0.62
1999	0.90	0.84	0.94	0.68
2000	0.89	0.86	0.93	0.73
2001	0.86	0.87	0.93	0.77
2002	0.84	0.89	0.92	0.81
2003	0.80	0.90	0.91	0.84
2004	0.78	0.93	0.90	0.87
Average	0.90	0.78	0.95	0.52

Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.

Tabla Nº 7. Evolución de la Eficiencia Bancaria: Modelo SFA

Cost efficiency	Listes companies	Closed Companies	Foreign banks	Domestic banks	Small banks	Médium size banks	Large banks
1990	0.97	0.95	0.96	0.97	0.96	0.97	0.98
1991	0.97	0.94	0.95	0.97	0.96	0.97	0.98
1992	0.97	0.94	0.94	0.97	0.95	0.97	0.97
1993	0.97	0.93	0.94	0.96	0.94	0.96	0.97
1994	0.96	0.92	0.93	0.96	0.94	0.96	0.96
1995	0.96	0.91	0.93	0.95	0.93	0.96	0.96
1996	0.95	0.92	0.92	0.94	0.92	0.95	0.95
1997	0.94	0.90	0.91	0.94	0.92	0.93	0.95
1998	0.94	0.89	0.91	0.94	0.91	0.94	0.95
1999	0.93	0.88	0.90	0.93	0.90	0.91	0.93
2000	0.92	0.88	0.90	0.91	0.89	0.90	0.92
2001	0.90	0.87	0.89	0.88	0.87	0.89	0.92
2002	0.86	0.85	0.88	0.82	0.83	0.87	0.91
2003	0.81	0.86	0.87	0.76	0.78	0.84	0.93
2004	0.79	0.81	0.85	0.74	0.73	0.83	0.91
Promedio	0.92	0.90	0.91	0.91	0.90	0.92	0.95
Eficiencia en Beneficio							
1990	0.71	0.57	0.59	0.73	0.62	0.67	0.09
1991	0.73	0.50	0.59	0.68	0.63	0.73	0.14
1992	0.78	0.52	0.60	0.75	0.65	0.81	0.29
1993	0.80	0.58	0.66	0.77	0.69	0.82	0.27
1994	0.83	0.59	0.68	0.80	0.71	0.84	0.60
1995	0.87	0.68	0.76	0.83	0.77	0.88	0.65
1996	0.89	0.73	0.79	0.85	0.80	0.90	0.70
1997	0.91	0.77	0.82	0.88	0.81	0.92	0.82
1998	0.92	0.80	0.85	0.90	0.84	0.93	0.86
1999	0.94	0.83	0.88	0.92	0.88	0.95	0.87
2000	0.94	0.86	0.91	0.92	0.90	0.95	0.91
2001	0.95	0.87	0.92	0.93	0.90	0.97	0.92
2002	0.96	0.91	0.94	0.94	0.93	0.98	0.94
2003	0.97	0.92	0.95	0.95	0.95	0.98	0.91
2004	0.98	0.93	0.96	0.96	0.96	0.97	0.96
Promedio	0.88	0.74	0.79	0.85	0.80	0.89	0.66

Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.

Table 8. Determinants of Cost Inefficiency[a]

Variable	*Model 1*	*Model 2*
Constant	2.34	4.53
	(2.16)**	(3.76)*
Listed company (DPC)	-0.34	-0.42
	(-5.89)*	(-5.65)*
Foreign bank	-0.19	-0.12
	(-2.95)*	(-1.78)***
Credit risk	3.59	3.6
	(4.20)*	(4.15)*
Loan-to-investment ratio	-0.01	-0.01
	(-30.20)*	(-23.83)*
Interest earning assets (log)	-0.32	
	(-15.81)*	
Market share		-13.11
		(-21.07)*
Herfindhal index	17.62	20.72
	(14.19)*	(10.23)*
GDP (log)	-0.18	-0.37
	(-2.77)*	(-4.64)*
ADMP	-0.99	-0.19
	(-7.78)*	(-1.38)
σ^2	0.07	0.1
	(17.82)*	(13.21)*
γ	0.99	0.99
	(2931906)*	(2044415)*
LR	200.83	155.21
P-value	(0.00)*	(0.00)*

* Statistically significant at the 1 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 10 percent level.
Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. *T*-statistics are in parenthesis.

Table 9. Cost Inefficiency and Ownership Concentration[a]

Variable	*Model 3*	*Model 4*
Constant	0.41	0.58
	(3.17)*	(2.87)*
Loan-to-investment ratio	-0.004	-0.004
	(–21.93)*	(-2.07)**
Credit risk	4.63	4.98
	(9.82)*	(6.72)*
Market share		-7.27
		(–3.96)*
Interest earning assets (log)	-0.12	
	(-9.65)*	
C12	-0.16	-0.49
	(–1.39)	(–2.68)*
σ^2	0.02	0.03
	(13.00)*	(6.69)*
γ	0.99	0.91
	(6024.25)*	(25.08)*
LR	638.90	185.77
P-value	(0.00)*	(0.00)*

** Statistically significant at the 5 percent level.
*** Statistically significant at the 10 percent level.
Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. *T*-statistics are in parenthesis.

Table 10. Determinants of Profit Inefficiency[a]

Variable	*Model 1*	*Model 2*
Constant	10.74	5.97
	(7.27)*	(5.25)*
Listed company (DPC)	-0.93	-1.53
	(-5.32)*	(-4.47)*
Foreign bank	0.87	1.89
	(4.38)*	(4.31)*
Credit risk	8.31	3.37
	(7.48)*	(3.20)*
Loan-to-investment ratio	-0.06	-0.03
	(-4.31)*	(-2.18)**
Interest earning assets (log)	-1.03	
	(-11.58)*	
Market share		-9.91
		(-7.20)*
Herfindhal index	6.56	-1.58
	(5.47)*	(-1.58)
GDP (log)	-0.63	-0.43
	(-6.21)*	(-5.64)*
ADMP	4.78	3.53
	(13.71)*	(4.86)*
σ^2	1.45	1.19
	(16.15)*	(14.96)*
γ	0.99	0.99
	(2544677)*	(4917499)*
LR	293.79	244.89
P-value	(0.00)*	(0.00)*

* Statistically significant at the 1 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 10 percent level.
Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. *T*-statistics are in parenthesis.

Table 11. Profit Inefficiency and Ownership Concentration[a]

Variable	*Model 3*	*Model 4*
Constant	4.07	2.58
	(9.08)*	(7.98)*
Loan-to-investment ratio	-0.02	-0.03
	(–2.67)*	(-2.90)**
Credit risk	1.81	0.03
	(0.74).	(0.01)*
Market share		-24.59
		(–13.16)*
Interest earning assets (log)	-0.79	
	(-10.47)*	
C12	-0.92	-1.61
	(–3.27)*	(–4.90)*
σ^2	0.15	0.26
	(5.56)*	(5.78)*
γ	0.89	0.95
	(33.00)*	(52.47)*
LR	195.01	136.20
P-value	(0.00)*	(0.00)*

* Statistically significant at the 1 percent level.
** Statistically significant at the 5 percent level.
*** Statistically significant at the 10 percent level.
Source: Authors' calculations, based on data from the Superintendency of Banks and Financial Institutions.
a. *T*-statistics are in parenthesis.

Documentos de Trabajo
Banco Central de Chile

Working Papers
Central Bank of Chile

NÚMEROS ANTERIORES

PAST ISSUES

La serie de Documentos de Trabajo en versión PDF puede obtenerse gratis en la dirección electrónica: www.bcentral.cl/esp/estpub/estudios/dtbc. Existe la posibilidad de solicitar una copia impresa con un costo de $500 si es dentro de Chile y US$12 si es para fuera de Chile. Las solicitudes se pueden hacer por fax: (56-2) 6702231 o a través de correo electrónico: bcch@bcentral.cl.

Working Papers in PDF format can be downloaded free of charge from: www.bcentral.cl/eng/stdpub/studies/workingpaper. Printed versions can be ordered individually for US$12 per copy (for orders inside Chile the charge is Ch$500.) Orders can be placed by fax: (56-2) 6702231 or e-mail: bcch@bcentral.cl.

DTBC-455 Diciembre 2007
Estimating the Output Gap for Chile
Rodrigo Fuentes, Fabián Gredig y Mauricio Larraín

DTBC-454 Diciembre 2007
Un Nuevo Marco Para la Elaboración de los Programas de Impresión y Acuñación
Rómulo Chumacero, Claudio Pardo y David Valdés

DTBC-453 Diciembre 2007
Development Paths and Dynamic Comparative Advantages: When Leamer Met Solow
Rodrigo Fuentes y Verónica Mies

DTBC-452 Diciembre 2007
Experiences With Current Account Deficits in Southeast Asia
Ramon Moreno

DTBC-451 Diciembre 2007
Asymmetric Monetary Policy Rules and the Achievement of the Inflation Target: The Case of Chile
Fabián Gredig

DTBC-450 Diciembre 2007
Current Account Deficits: The Australian Debate
Rochelle Belkar, Lynne Cockerell y Christopher Kent

DTBC-449 Diciembre 2007
International Reserves Management and the Current Account
Joshua Aizenman

DTBC-448 Diciembre 2007
Estimating the Chilean Natural Rate of Interest
Rodrigo Fuentes y Fabián Gredig

DTBC-447 Diciembre 2007
Valuation Effects and External Adjustment: A Review
Pierre-Oliver Gourinchas

DTBC-446 Diciembre 2007
What drives the Current Account in Commodity Exporting Countries? The cases of Chile and New Zealand
Juan Pablo Medina, Anella Munro y Claudio Soto

DTBC-445 Diciembre 2007
The Role of Interest Rates and Productivity Shocks in Emerging Market Fluctuations
Mark Aguiar y Guita Gopinath

DTBC-444 Diciembre 2007
Financial Frictions and Business Cycles in Middle Income Countries
Jaime Guajardo

DTBC-443 Diciembre 2007
Stocks, Flows and Valuation Effects of Foreign Assets and Liabilities: Do They Matter?
Alfredo Pistelli, Jorge Selaive y Rodrigo Valdés

DTBC-442 Diciembre 2007
Latin America's Access to Nternational Capital Markets: Good Behavior or Global Liquidity?
Ana Fostel y Graciela Kaminsky

DTBC-441 Diciembre 2007
Crises in Emerging Market Economies: A Global Perspective
Guillermo Calvo

DTBC-440 Diciembre 2007
On Current Account Surpluses and the Correction of Global Imbalances
Sebastián Edwards