

Use of Chilean business surveys in conjunctural assessment and short-term forecasting*

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1. Introduction

Business surveys are designed to extract information of the current state of the economy as well as of the nearest future. Several studies are dedicated to evaluating just how successful these surveys are,¹ and the present paper offers a first (and preliminary) evaluation of the information contained in the Chilean surveys and, hence, the usefulness for the assessment of the conjunctural situation and for short-term forecasting.

After a brief description of the surveys in section 2, section 3 presents three case studies; the purpose of the first one is to analyze how well the Chilean business surveys anticipate the business cycle, while the last one aims at spreading some light over some current conjunctural phenomena regarding inventories. Because the sample is very short, the results presented are preliminary, but might serve as indications of the usefulness of the surveys when more data become available.

With respect to cross correlations, the preliminary results, however, are quite promising for the general survey indicator and those of the retail and manufacturing sectors; less promising for the mining and construction industries. Tests of Granger causality indicate that the retail and manufacturing sector surveys cause the activity of these sectors, while this does not seem to be the case for mining and construction. As for short-term forecasting (or rather nowcasting), simple autoregressive distributed lag (ADL) models indicate that the surveys generally do have predictive content. Cross-checking answers indicate that the recent unstocking is due to expectations of lower demand rather than financial difficulties.

2. Business surveys in Chile

The business survey in Chile (IMCE²) was developed by the Central Bank of Chile and outsourced to ICARE³ and Universidad Adolfo Ibáñez (UAI) after it was put out to tender. It was launched in November 2003 and covers four sectors of the economy: manufacturing, retail, construction, and mining, which together account for approximately 40 per cent of the Chilean economy. The survey is conducted monthly

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[§] The opinions expressed in this paper are those of the author and do not necessarily reflect those of the Central Bank of Chile or its board members.

¹ A recent survey can be found in Gallardo y Pedersen (2007a).

² For its Spanish abbreviation: Indicador Mensual de Confianza Empresarial.

³ A private organization dedicated to promoting principles, values and concepts, which inspire the development of private firms and agents of national progress.

and the questionnaires were designed as recommended by OECD (2003) with some exceptions; for example, that the Chilean respondents are not asked to adjust their answers to account for seasonal effects, as recommended in the Handbook of the Organization for Economic Co-operation and Development (OECD), and that in Chile questions about “order books” are formulated in terms of demand. These modifications were incorporated for the sake of clarity of the questions.

Despite these minor differences, the Chilean survey is, in broad terms, harmonized as recommended in OECD (2003). On the initiative of the Economic Commission for Latin America and the Caribbean (ECLAC) in collaboration with the OECD and the European Commission (EC), in the year 2000, a project was started to promote the development and harmonization of business surveys in the Latin American region. The status of the harmonization process with respect to the surveys of the manufacturing sector can be found in Gallardo and Pedersen (2008). According to this analysis, the Chilean survey has a high degree of harmonization with the OECD recommendations.

Some main characteristics of the Chilean business survey are:⁴

- It is conducted on a monthly basis.
- Samples are selected to include a fixed panel of the largest companies of the sector and a random selection of smaller ones.
- The total sample includes around 607 firms representing 16% of total GDP. These are divided as follows: mining sector: 11 companies (representing 74% of the added value of the sector); manufacturing sector: 281 companies (35% of total sales); retail: 179 companies (23% of total sales); and construction: 136 companies (21% of total sales).
- Results are presented as diffusion indices calculated with the simple balances of the answers.

The overall indices of the four sectors⁵ are calculated as:

$$\begin{aligned}
 ICIN &= \frac{1}{2} * \left(\frac{PE + DT - IPT}{3} + 100 \right), & ICOT &= \frac{1}{2} * \left(\frac{DT + E}{2} + 100 \right), \\
 ICOM &= \frac{1}{2} * \left(\frac{SEA + SEF - IPV}{3} + 100 \right), & ICMI &= \frac{1}{2} * \left(\frac{PE + DT - IPT}{3} + 100 \right),
 \end{aligned}$$

where PE is the balance of the expected production, DT is the balance of current production, IPT/IPV is the balance of the answers concerning inventories, E is the balance of expected employment, and SEA/SEF is the general situation of the firm's current situation and expectations, respectively.

With these, the IMCE is calculated as:

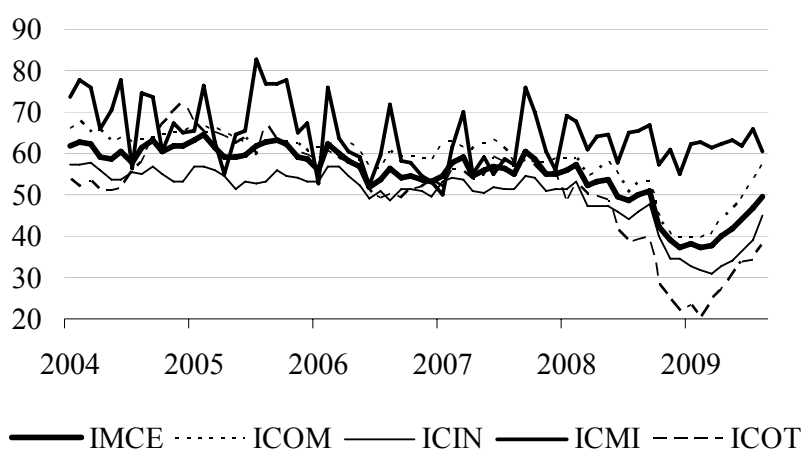
$$IMCE = w_1 * ICIN + w_2 * ICOT + w_3 * ICOM + w_4 * ICMI,$$

⁴ Descriptions of the surveys are available in Spanish at www.icare.cl.

⁵ Manufacturing sector: ICIN (indicador de confianza de la industria); Construction: ICOT (indicador de confianza de la construcción); Retail: ICOM (indicador de confianza del comercio); and Mining: ICMI (indicador de confianza de la minería).

where w_i ($i=1,2,3,4$) is the relative participation of the aggregate value of the four sectors. Currently, the following weights are used: $(w_1, w_2, w_3, w_4) = (39\%, 18\%, 26\%, 17\%)$. The series with data up to August 2009 are displayed in figure 1. In general, the correlations between the retail, manufacturing and construction sectors are quite high (coefficients around 0.9), whereas the correlations between these and the mining sector are substantially lower (around 0.3).

Figure 1. Diffusion indices



Source: ICARE /UAI.

3. Information in the business surveys about the Chilean activity

Because of the relatively short sample, business surveys have so far been mainly used in the conjunctural analysis on an ad-hoc basis, i.e. without implementing them formally in statistical models. Based on the methodology described in OECD (2005), Gallardo and Pedersen (2007b) calculate composite leading indicators for eleven Latin American countries with data ending in 2006. Chilean business survey data are not included in the initial data set as there were not sufficient observations as required for applying this methodology. Pedersen (2009) also uses the OECD (2005) method with data until the end of 2007 and reaches the same conclusion: not sufficient observations for applying this methodology.

To illustrate the usefulness of Chilean business surveys for assessing the conjunctural situation and short-term forecasting of economic activity, three case studies are presented. The first one, presented in sub-section 3.1, evaluates the information contained in the aggregated indicators with respect to cross correlation with activity indicators and Granger causality.⁶ Sub-section 3.2 analyzes by means of simple ADL models if the business surveys could be helpful in short-term forecasting (or nowcasting) Chilean economic activity. Finally, sub-section 3.3 presents a study using disaggregated data to investigate why stock flows have fallen in the recent period.

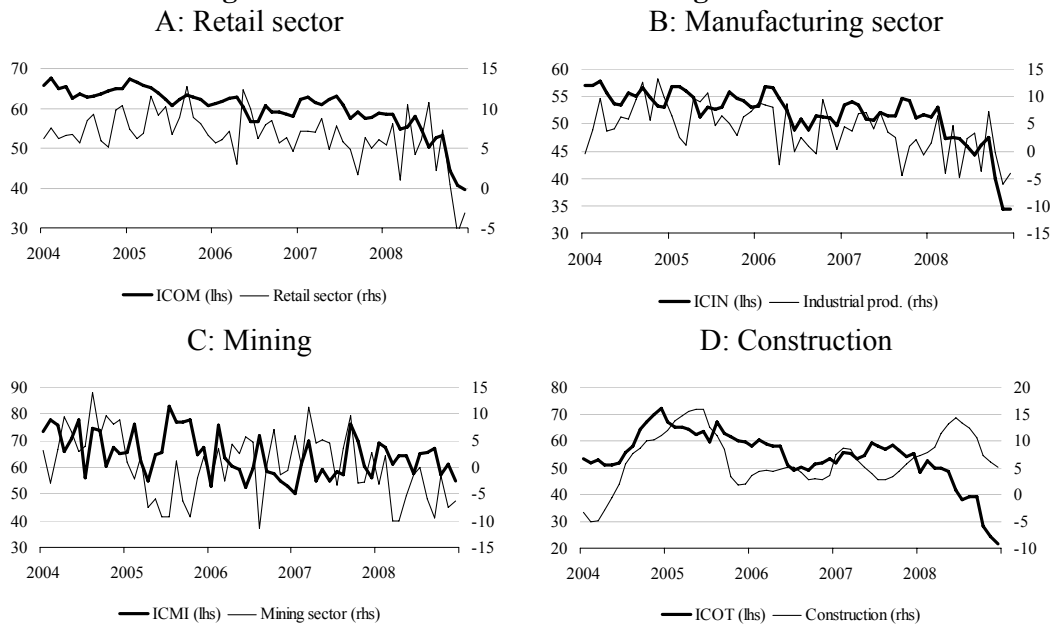
⁶ The analysis is similar to the one presented in Santero and Westerlund (1996).

3.1. Case 1: Evaluating information in aggregated indicators

As mentioned earlier, less than six years of observations are available of the Chilean business survey. This relatively short period of time does not allow for a thorough econometric investigation of the series and, hence, more simple tools are required. This case study presents the cross correlations between the series and the monthly activity indicators as well as tests for Granger causality.

Recently, the Central Bank of Chile published disaggregated monthly GDP data of the supply side,⁷ covering the period 1996-2008, which can be used to evaluate the information contained in the survey data with respect to economic activity. Figure 2 presents the series for the four sectors surveyed, while figure 3 shows the cross correlation coefficients. For the general index (IMCE) and for manufacturing sector, the highest coefficients, 0.59 and 0.52, respectively, are contemporaneous but more or less constant when leading the activity indicator with between 2 and 0 months. For the retail sector, the highest coefficient is obtained with 1 lag, almost equal to the contemporaneous coefficient. The correlations between the survey results and the growth rates for the mining and construction sectors are generally small.

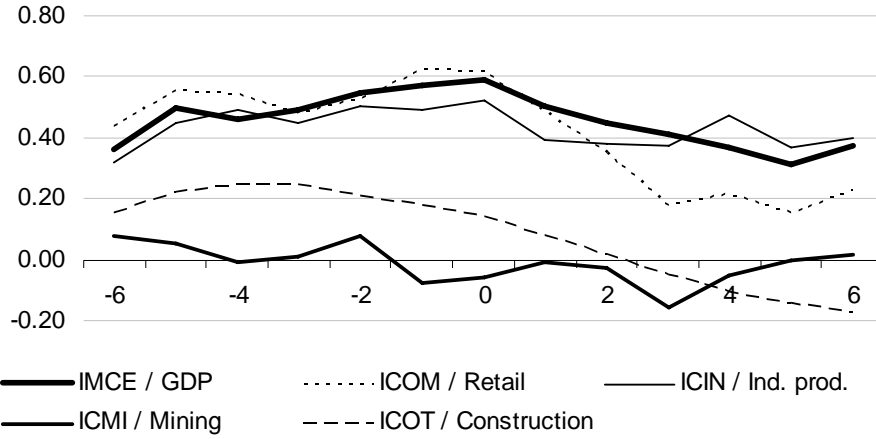
Figure 2. Diffusion indices and annual growth rates



Sources: ICARE / UAI, Pozo and Stanger (2009) and own calculations.

⁷ See Pozo and Stanger (2009).

Figure 3. Cross correlation coefficients



Sources: ICARE / UAI, Pozo and Stanger (2009) and own calculations.

Note: Negative numbers on the first axis indicate that the business survey leads activity.

Table 1 presents the results of the test for Granger causality. In none of the cases do economic activity indicators seem to lead the survey. On the other hand, with standard confidence intervals, the tests indicate that the surveys Granger cause the activity of the retail and the manufacturing sectors, while there is no evidence of causality in the mining and construction sectors. There is only weak evidence that the total survey indicator Granger causes the GDP.

Table 1. Tests for Granger causality

	IMCE	ICOM	ICIN	ICMI	ICOT
Activity → survey	0.21	0.95	0.62	0.87	0.26
Survey → activity	0.10	0.00	0.00	0.76	0.43

Source: Own calculations.

Note: *p*-values for the null hypothesis of *no* Granger causality tested in bivariate VAR models with the number of lags selected according to Schwarz information criteria.

3.2. Case 2: Information in the business surveys about activity

The tests for Granger causality presented in the previous sub-section may indicate predictive contents of the business survey of the retail and manufacturing sectors, while the indications are weaker for the two remaining sectors and the general index. In this second case study, the predictive power is investigated in greater detail by means of simple ADL models, which include lags of the annual growth rate of the activity indicator (x_t) and contemporaneous and lagged effect of the relevant business survey (y_t):

$$x_t = c + \sum_{i=1}^p \alpha_i x_{t-i} + \sum_{j=0}^q \beta_j y_{t-j} + \varepsilon_t, \quad (1)$$

where ε_t are *iid* errors and the number of lags of p and q is determined by Schwarz information criteria. The exercise consists of evaluating the 1-step-ahead out-of-sample forecasts, and the benchmark used is the simple autoregressive (AR) model, i.e. (1) with $\beta_j = 0$ for $j = 0, 1, \dots, q$. The forecasts are made for the twelve months of 2008 and the results are presented in table 2. Measured by the root mean squared error (RMSE), only in the case of the construction sector, the model that includes business surveys does not forecast better than the simple AR models. Furthermore, in the general case, and for the manufacturing sector, the better performance is statistically significant according to the test of Diebold and Mariano (1995). These results, however, are based on few observations and should be interpreted in this light. But, in the case of the general indicator, the business survey (BS) model does make better predictions in 75% of the cases, a number which is 67% for the retail and the manufacturing sector, and less than half the number of times for the mining and the construction sectors.

Table 2. Out-of-sample one-step-ahead forecasting exercise

	Total	Retail	Manufacturing sector	Mining	Construction
RMSE ^a	0.76	0.69	0.62	0.80	1.03
BS-model better ^b	75%	67%	67%	42%	42%
D-M ^c	0.00	0.07	0.00	0.10	0.59

Source: Own calculations.

Note: ^aRMSE of the business survey model divided by the RMSE of the AR model. ^bPercentage of the twelve observations where the business survey model predicts better than the AR model. ^c p -value of the Diebold and Mariano (1995) test for the hypothesis that the models have equal predictive power against the alternative that the business survey model is better.

3.3. Case 3: Information in cross-checking answers

Since the onset of the financial crisis, the inventories in Chile, as in several other countries, fell in a proportion not seen in many years (figure 4A). The question is whether this was caused because of the expectations of the future demand or because of difficulties financing the stock. Cross-checking the answer of the business survey can shed some light to this question. This has been done by Echavarría et al. (2009) who decompose the fraction of companies that replied that their inventories were larger than desired, $p(I^A)$, as:

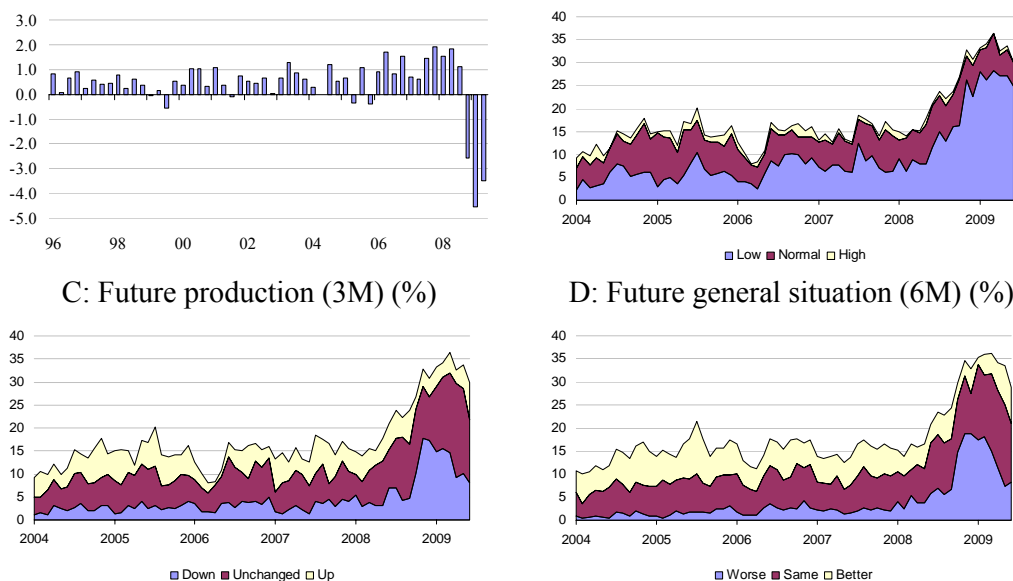
$$p(I_i^A) = p(I_i^A | V_i^A)p(V_i^A) + p(I_i^A | V_i^N)p(V_i^N) + p(I_i^A | V_i^B)p(V_i^B),$$

where $p(V^i)$ is the fraction of firms that replied that the demand is high ($i = A$), normal ($i = N$) and low ($i = B$), respectively. The authors note that, as expected, $p(I^A | V^A) < p(I^A | V^N) < p(I^A | V^B)$ for all the observations. As can be appreciated in figure 4 (B-D),⁸ the relative number of firms considering that their level of inventories is higher than desired has increased significantly since the middle of 2008. The same firms that considered their inventories to be too high, also considered that demand was low (figure 4B). Furthermore, a higher proportion thought that the future production would either be the same or go down (figure 4C). Finally, of the firms that considered their stocks to be too big, a higher proportion considered also that the general future situation of the firm would be either the same or worse (figure 4D). All of these facts seem to indicate that the reduction in inventories happened because firms considered their current levels

⁸ The totals in the figures 4B-4D are not completely comparable as not all firms answered all the questions.

to be too high given the expectations for future demand rather than because of restricted access to credit.

Figure 4. Stock flow and cross-checking business survey answers
 A: Stock flow / GDP (%) B: Actual demand (%)



Source: Echavarría et al. (2009)

Note: Figure A shows the stock flows as a percentage of GDP. B-D show the proportion of the firms that considered that their stock levels were higher than desired and also considered that: (B) actual demand was low, normal and high, respectively; (C) future production will go down, not change and go up, respectively, and (D) the future general situation of the company will be worse, the same and better, respectively.

4. Conclusion and final comments

This paper presents some early results of how Chilean business surveys can be applied in the assessment of the conjunctural economic situation and short-term forecasting, or rather nowcasting. Since the surveys are relatively new, there are still few observations available and, hence, the results presented should be considered as preliminary. Having said this, the surveys are promising in the sense that for some important sectors, namely retail and manufacturing, the correlations with the economic activity indicators are relatively high, and there is some evidence that the surveys of these sectors Granger cause activity, while the opposite is not the case. Generally, it seems that the surveys provide additional information with respect to nowcasting activity, which may be useful for short-term forecasting since survey data are available before the activity indicators are out. A third case study showed how cross-checking the answers of the business surveys may be used to gain insight into complex questions that may potentially be relevant for policy recommendations.

As mentioned insistently in this study, there are still limited observations available of the Chilean business survey and many questions remain unanswered. For example, the calculations and estimations made in this paper are based on annual growth rates of the activity indicators and levels of the business survey indicators. It is not clear whether the answers reflect expectations measured by annual growth rates or in fact it is expectations of the marginal ones, i.e. monthly or quarterly rates. This raises another

interesting question: are the survey data affected by seasonality? This question may be particularly relevant for the Chilean surveys, where the questions are formulated without taking normal seasonality into consideration. Some preliminary tests indicate that the surveys might be affected by seasonality, but again, more observations are needed to judge whether this is a small sample characteristic or an actual feature of the data.

While the preliminary exercises presented in this paper point towards the fact that Chilean business surveys do indeed contain useful information about economic activity, only the future will reveal, when more data become available, how useful the surveys are for assessing the conjunctural situation and for making short-term forecasts.

References

Diebold, F. and R. Mariano (1995), 'Comparing predictive accuracy', *Journal of Business and Economic Statistics*, 13(3), 253-265.

Echavarría, G., M. Ricaurte and C. Soto (2009), 'Variación de existencias. Condiciones financieras y expectativas económicas', *Mimeo*, Central Bank of Chile.

Gallardo, M. and M. Pedersen (2007a), 'Indicadores líderes compuestos. Resumen de metodologías para construir un indicador regional en América Latina', *Estudios Estadísticos y Prospectivos No. 49*, ECLAC.

Gallardo, M. and M. Pedersen (2007b), 'Un sistema de indicadores líderes compuestos para la región de América Latina', *Estudios Estadísticos y Prospectivos No. 51*, ECLAC.

Gallardo, M. and M. Pedersen (2008), 'Encuestas de opinión empresarial del sector industrial en América Latina', *Estudios Estadísticos y Prospectivos No. 64*, ECLAC.

OECD (2003), *Business Tendency Surveys. A Handbook*.

OECD (2005), *OECD Cyclical Analysis and Composite Indicators System. User Guide Version 3*.

Pedersen, M. (2009), 'Un indicador líder compuesto para la actividad económica en Chile', *Monetaria*, forthcoming.

Pozo, P. and F. Stanger (2009), 'Metodología y resultados de la mensualización del PIB sectorial trimestre en el período 1996-2008', *Estudios Económicos Estadísticos No. 78*, Central Bank of Chile.

Santero, T. and N. Westerlund (1996), 'Confidence indicators and their relationship to changes in economic activity', *Economics Department Working Paper No. 170*, OECD.