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WHAT AFFECTS THE PREDICTIONS OF PRIVATE FORECASTERS? THE ROLE OF CENTRAL BANK FORECASTS[*]

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Abstract

This study analyses what affects the expectations of the private forecasters and, particularly, if they are influenced by the central bank's forecasts. The analysis uses data from the Economic Expectation Survey (EES), conducted by the Central Bank of Chile, and from the Monetary Policy Reports (IPoMs) covering the period 2001–2011. Short- and medium-term inflation expectations as well as short-term growth expectations are compared before and after the publication of a given issue of the IPoM, controlling for other factors, which may affect the expectations. These factors include Central Bank credibility, surprises in published data, and changes in the evaluation of the future interest rate, exchange rate and oil price.

The results suggest that short-run inflation expectations (current year) of private forecasters are indeed influenced by the forecasts published by the central bank, mainly when these are lower and when they are published at the beginning of the year. They are also affected by surprises in published monthly inflation rates as well as by changes in the expectations for the exchange rate and monetary policy rate. The medium-term inflation expectations depend mainly on changes in short-run expectations, but oil price expectations and the future monetary policy rate also seem to matter. They are also influenced by central bank projections published in the last quarter of the year. The current year's GDP growth expectations in the EES are not affected by the central bank's forecasts as they are affected only by surprises in the monthly indicator of economic activity and the outlook for the monetary policy rate.

Resumen

Este estudio analiza qué afectan las expectativas de los analistas privados y, en particular, si están influenciados por las proyecciones del banco central. El análisis utiliza datos de la Encuesta de Expectativas Económicas (EEE), elaborada por el Banco Central de Chile, y de los Informes de Política Monetaria (IPoMs), abarcando el período 2001-2011. Las expectativas de inflación a corto y mediano plazo, así como las expectativas de crecimiento a corto plazo, son comparadas antes y después de la publicación de un nuevo IPoM, controlando por otros factores que pueden afectar las expectativas. Estos factores incluyen la credibilidad del Banco Central, las sorpresas en los datos publicados y los cambios en la evaluación de la tasa de interés futura, tipo de cambio, y el precio del petróleo.

Los resultados sugieren que a corto plazo (año concurrente) las expectativas de inflación de los analistas privados están efectivamente influenciadas por las predicciones publicadas por el banco central, principalmente cuando éstas son más bajas y cuando son publicadas a principios de año. Las expectativas privadas de inflación también se ven afectadas por las sorpresas en las tasas efectivas de inflación mensual, así como por los cambios en las expectativas de tipo de cambio y tasa de política monetaria. Las expectativas de inflación a mediano plazo dependen principalmente de los cambios en las expectativas a corto plazo, y en menor medida de la expectativa del precio del petróleo y la tasa futura de política monetaria. Las expectativas a mediano plazo también se ven influenciadas por las proyecciones del banco central publicadas en el último trimestre del año. Las expectativas para el año en curso del crecimiento del PIB de la EEE, no se ven afectadas por las previsiones del banco central, ya que sólo se ven afectadas por las sorpresas en el indicador mensual de actividad económica y por las perspectivas para la tasa de política monetaria.

Not only do expectations about policy matter, but, at least under current conditions, very little else matters. (Woodford, 2003, p. 15).

1. Introduction

Expectations about the central bank's monetary policy depend to a great extent on the market's outlook for inflation and growth. In this context, an important question for policymakers is whether the central bank (CB) can influence the market's expectations. CB forecasts may be published so that the policymakers can send signals or reveal private information and, in that way, the predictions serve as a tool to affect private expectations. Often the CB's forecasts are presented in inflation reports or monetary policy reports.[1] The present paper studies which factors affect the predictions of private forecasters (PFs) and, especially, whether the CB's forecasts influence these predictions. This is done by explaining the change (update) the PFs' expectations with the difference between the CB prediction and that of the PFs by means of regressions, which also include surprises in released data and changes in related expectations. Data from Chile are utilized in this study, as the Chilean Economic Expectations Survey (EES) contains questions not only on inflation and growth expectations, but also on other variables, which may in turn affect the predictions of inflation and growth.

The evidence suggests that short-run inflation expectations (current year) of PFs are indeed influenced by the forecasts published by the Central Bank of Chile (CBC), mainly when the CBC's forecast is lower than that of the PFs and when it is published in the first half of the year. These expectations are also affected by surprises in published data as well as the outlook for the foreign exchange rate and the monetary policy rate (MPR). The medium-term inflation expectations (next year) depend mainly on changes in short-run expectations, but the policy rate and oil prices also seem to matter. Only when the CBC's forecast is

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[1] In Chile the forecasts are presented quarterly in the Monetary Policy Report (IPoM, for its Spanish abbreviation: *Informe de Política Monetaria*).

published in the last quarter of the year, does it seem to directly affect the private medium-term outlook. The short-run GDP growth expectations in the EES are not affected by the CB's forecasts. Changes in these expectations are mainly explained by surprises in the monthly indicator of economic activity (Imacec, short for *Índice mensual de actividad económica*) and the expected future exchange rate. In general, the assessment of the CBC's credibility does not seem to play a role in the formation of private expectations.

Whether or not private expectations are affected by those of the CB relates to the question of asymmetric information. If PFs believe that the CB has inside information, o better resources, which may improve the forecasts, then PFs take into account the forecast of the CB when forming their own expectations. Indeed, Romer and Romer (2000) find in a study including the forecasts of the US Federal Reserve Bank and those of commercial forecasters, that the Fed has substantially more information than the commercial forecasters when making their inflation forecasts.

Several scholars have studied the predictions of private forecasters. One direction of the literature is concerned with characterizing these forecasts in terms of rationality and inconsistency (e.g. Engelberg et al., 2009; Clements, 2009, 2010) and another related direction investigates disagreement (Capistrán and Timmermann, 2009). There are also several studies concerned with the investigation of CB forecasts. One line assesses costs and benefits of publishing these forecasts (e.g. Faust and Svensson, 2001, 2002; Geraats, 2002, 2005). Another line, which is related to the present analysis, examines the effects that CB communication and transparency have on the formation of private expectations (e.g. Jansen and de Hann, 2007).

Contrary to the directions of research mentioned above, there are fewer studies concerned with the influence of CB projections on private expectations. Two papers related to the present one are those of Fujiwara (2005) and Hubert (2011). With observations from Japan, Fujiwara shows that professional forecasters are influenced by the Bank of Japan's inflation forecasts, but not vice versa. The analysis focuses on the dispersion of the forecasts and suggests additionally that the CB's forecasts reduce the professional forecasters' uncertainty about the future. In a study on CB influence on private forecasts, Hubert concludes that in Japan, Sweden and the UK, private inflation forecasts are influenced by

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those of the CB, but this is not the case in Canada and Switzerland. Although the strategy applied in that paper is similar to the one in the present study, there are important differences. The general focus of Hubert's study is on explaining a specific forecast of, say, the private forecasters with the most recent forecast of the CB, controlling for persistence in the private forecasters' projection (i.e. the forecast at time *t*-1) and released news. On the other hand, this study focuses on how PFs' predictions change when the CB has published its forecast (i.e. how PFs' expectations are updated). Another important difference is concerned with the control of released news. Hubert includes a news variable that measures the difference between the actual data and the forecast of that data made one period earlier. The information utilized in the present analysis allows controlling for surprises in monthly data released before the update of the PFs' predictions.

Another important contribution of the present analysis is that the models used control for changes in related expectations (exchange rate, interest rate and oil price) as well as for the assessment of the credibility that the CBC will meet its target. The EES conducted by the CBC includes questions which make it possible to address the issues of exchange rate and interest rate expectations, surprises in monthly published data and CBC credibility. Data from Consensus Forecast include oil price predictions.

The rest of the paper is organized as follows: the next section presents the theoretical framework and section 3 discusses the data utilized in the empirical analysis and the important issue of timing. The fourth section includes the results of the empirical exercise while section 5 offers some concluding remarks.

2. Theoretical framework

The present analysis is based on the assumption that private forecasters make their predictions with econometric models using all the information available at the time of making the projection. The PFs' forecast for time *h* made at time *t* is:

$$X_t^h = f(I_t; \widehat{\theta}_t),$$

where I_t includes the information available at the time of making the prediction, and $\widehat{\theta}_t$ are the estimated parameters, which can be interpreted as the weights the forecasters assign to

the different pieces of information available to them. In the present context, h is a fixed point in time in the future such that the comparison of two forecasts is time-independent.

The forecast of the CB is made with the same information available for PFs and some inside information, available only to the central bank, H_t. Hence, the forecast of the CB for time h made at time t is:

$$Y_t^h = g\left(I_t, H_t; \widehat{\xi}_t\right).$$

PFs' predictions are influenced by the CB's forecast only if they believe that H_t includes additional information, which is useful for making the forecast and/or if they believe that the parameters estimated by the CB are better for forecasting. This could, for example, be the case if the PFs think that the CB has more resources (e.g. human capital) devoted to making the projections. Then the function used to make the prediction will also depend on the CB forecast:

$$X_{t+1}^h = f\left(I_{t+1}, Y_t^h; \hat{\theta}_{t+1}\right).$$

The update of the forecast, which is the measure of interest in the present analysis, is:

$$\Delta X_t^h = X_{t+1}^h - X_t^h = f_1(\Delta I_{t+1}, Y_t^h - X_t^h; \Delta\hat{\theta}_{t+1}).$$

In other words, the update depends on changes in the information set, the difference between the CB's forecast and that of the PFs at time t and the update of the weights assigned to each piece of information.

3. Data and timing

An important purpose of this analysis is to discover to what extent expectations of PFs are affected the CB's projections. To do this, it is necessary to control for other information, which may also affect the forecasts. The general econometric model utilized is:

$$\Delta X_{t+1}^h = \alpha + \beta\left(Y_t^h - X_t^h\right) + \varphi\Delta Z_t + \varepsilon_t,$$

where α is a constant, β is a coefficient that captures to what extent the forecast of the PFs is affected by the CB's forecast, Z_t includes other variables that may cause changes in the

forecast, and ε_t captures the variations in the forecast that cannot be explained by the variables included in the model.

Three predictions are analyzed in the present paper, namely inflation and growth forecasts for the current year, and inflation forecasts for the following year.[2] The timing of the process analyzed is illustrated in figure 1. The EES is conducted in months t and $t+1$, and changes in these expectations may be due to (1) the publication of the CB's forecasts, (2) surprises in data released between the two surveys, and (3) changes in related expectations. The extent to which the CB's forecasts affect private ones may depend on their perception of the credibility of the CB.

Figure 1. Timing of the forecasts
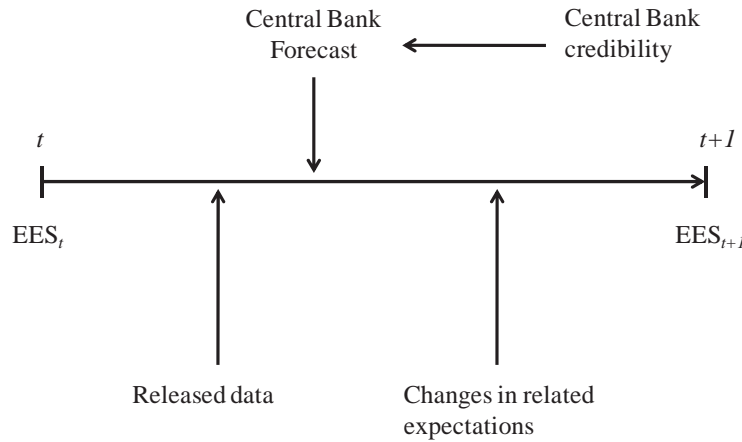
Source: Author's elaboration.

The empirical analysis is based on data starting with the first publications of the IPoM and the EES, i.e. with data from May 2000. However, as several of the questions of the EES changed in September 2001, this is used at the first observation of the sample. Until 2007 the IPoM was published three times per year, in January, May and September, but in November 2008 an additional projection update was released because of the global financial crisis. Since 2008 the IPoM is published quarterly; in 2009 it was released in January, May, September and December and since 2010 the third, sixth, ninth and twelfth

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[2] Growth expectations for the next year are excluded from the analysis because only 21 observations of the CBC's forecasts are available.

month of the year.[3] Data up till 2011 are used; hence the analysis includes 35 observations. The CBC's forecasts extracted from the IPoMs are those of inflation for the current and the following year, while GDP growth rates are for the current year. In the last three years of the sample, however, the December projections utilized are those of the following and the subsequent years. Inflation forecasts are the annual rates in December each year, while the growth forecasts are annual averages. The CBC publishes a range for the growth forecast, and mid-range estimates are used in the present analysis.

PFs' expectations are extracted from the monthly survey conducted by the Central Bank of Chile.[4] The questions used for comparison with the CB forecasts are inflation expectations for December the current and the next year[5] and the annual GDP growth rate for the current year. The analysis is made with at total of 70 surveys, the surveys published just before and after the release of the given IPoM. From the EESs data are also extracted for the expected foreign exchange rate and the monetary policy rate (MPR), both available for horizons of eleven and 23 months. The data published are the medians of the surveys.

As oil price expectations are not available in the EES, they are extracted from the Consensus Forecast surveys published immediately before and after the publication of the IPoMs. The predicted prices correspond to WTI oil and the published data are for three and twelve months ahead. In the present context twelve months ahead predictions are used, but the series are highly correlated. The source of these expectations is "Latin American Consensus Forecasts" and the time series include the mean of the answers.

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[3] For the exact dates of publication of the IPoMs used in the analysis see table A1 in appendix A.

[4] A description of the survey is supplied by Pedersen (2010).

[5] The surveys of September and October 2001 and November and December 2008 did not include questions on the inflation expectation for December of the same year. In these cases the predictions were calculated with the monthly expectations. The September 2001 calculation assumes that the monthly December expectation is the same as the October – November average and the November 2008 calculation assumes that the monthly December rate is the same as the December – January average. In January and February 2005 and in January 2006 the surveys did not explicitly report expectations for December next year, hence, the expectations 23 months ahead were used. In any case, the results are robust to the exclusion of these observations.

For assessing the credibility of the CBC, inflation expectations for the two-year horizon, which is also part of the EES, is used. The variable included in the study is the difference between this expectation and 3%, the target of the Central Bank of Chile, which is formulated for a two-year horizon.[6] Hence, in the present context, "credibility" should merely be understood as the belief that the CBC will meet its target.

To measure surprises in published data, the questions of the monthly CPI inflation and the monthly indicator of economic activity (Imacec) are utilized. These are compared to the released data. The inflation rate is published by Chile's National Statistics Institute and the data for the empirical study are extracted from the web page of the Central Bank of Chile. To avoid possible effects of data revisions, the Imacec data are first vintages (Pedersen, 2013). Due to changes in the dates of publication, before February 2004 the questions concerning the Imacec were from two months earlier, while after this date it was only one month earlier.

An important issue with respect to the timing has to be pointed out. Until February 2005, the EES was closed the day after the publication of the CPI, and afterwards, it was closed after the publication of the CPI or the Imacec, whichever was published latest. This implies that the surveys published after the IPoMs of June 2004 and January 2005 were made without new information of the Imacec. Accordingly, for these dates the surprises in the published growth data are set to zero.

Figures 2 to 4 present cross-plots of the forecast data, i.e., the first axis shows the update of the EES expectation between times t and $t+1$, while the second axis shows the difference between the CBC's forecast and that of the PFs. If the CBC's projections affect those of the PFs, one might expect the points to be concentrated in the first and the third quadrants of the graphs.

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[6] See Central Bank of Chile (2007).

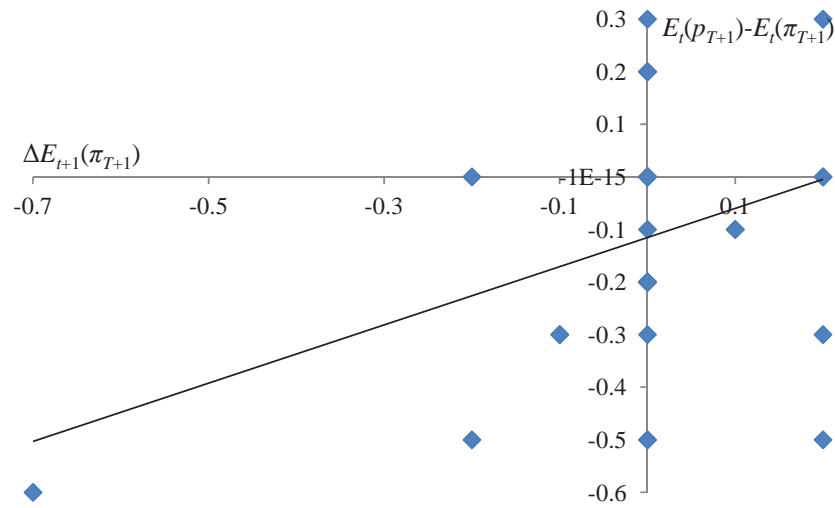**Figure 2. Inflation forecasts, current year**
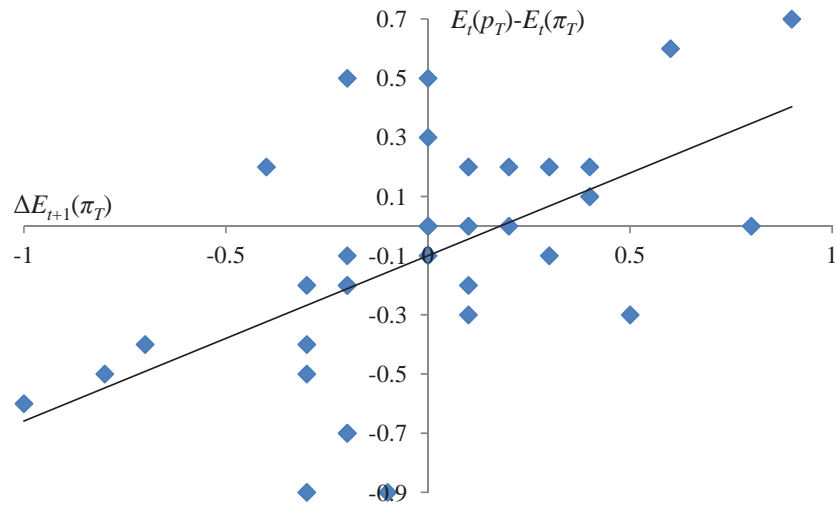
Source: Author's elaboration with data from the Central Bank of Chile.

Notes: $E_t(\pi_T)$: EES expectation. $E_t(p_T)$: CB forecast.

With respect to the inflation forecasts for the current year (figure 2), 23 (60%) of the observations, are placed in the first or the third quadrant indicating that EES forecasts may be affected by those published by the CBC. Two observations are on the point (0,0), i.e. the predictions are the same and the EES forecast did not change. For next year forecasts (figure 3), five observations (14%) are located in the first and third quadrants and nine observations are placed in the intersection of the two axes. Thus, it is more doubtful if these expectations are affected by the predictions of the CBC. This is also true for the growth forecasts, where current year predictions (figure 4) only have eight observations positioned in the relevant quadrants and three observations are on (0,0).
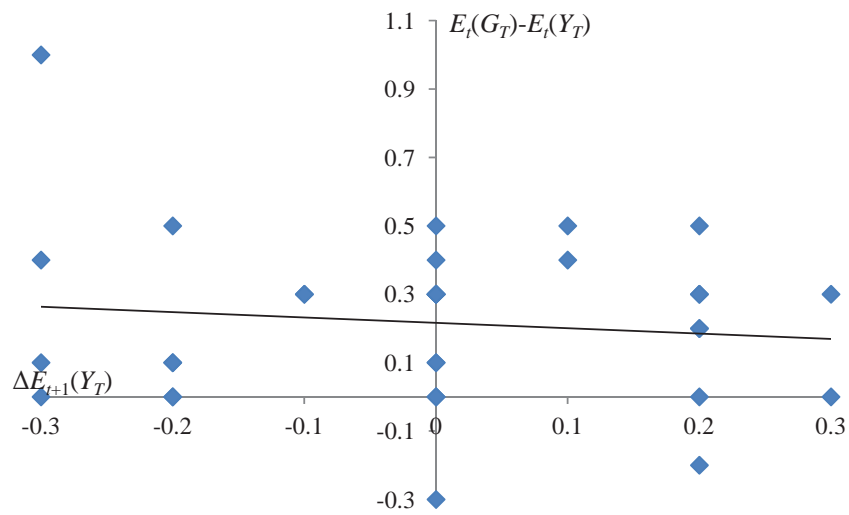
Figure 3. Inflation forecasts, next year

Source: Author's elaboration with data from the Central Bank of Chile.

Notes: $E_t(\pi_{T+1})$: EES expectation. $E_t(p_{T+1})$: CB forecast.

Figure 4. Growth forecasts, current year

Source: Author's elaboration with data from the Central Bank of Chile.

Notes: $E_t(Y_T)$: EES expectation. $E_t(G_T)$: CB forecast.

Some dummies are also included in the empirical models. The first controls for the fact that the CBC's forecasts in the first eleven issues of the IPoM are made under the assumption of a fixed policy rate for the entire prediction horizon, whereas the most recent forecasts assume an implicit path, which is not explicitly published but is commented in the text. Another set of dummies are included to control for the time of the year the IPoM is released, i.e. the quarter of the year in which it is released. This is done to take into account that CBC forecasts may be more or less influential at the beginning or at the end of the year.

The next section presents the results of the empirical analysis.

4. Empirical results

This section presents, firstly, the baseline analysis which is based on a general-to-specific approach to investigate to what extent updates of the expectations of PFs are influenced by the CB's forecasts. The second subsection includes two conditional analyses which focus on the extent to which the PFs are affected by the CB when conditioning on the time of the year the CB forecast is published and on whether the CB's forecast is higher or lower than that published in the EES.

4.1 Baseline analysis

The empirical analysis is conducted with a general-to-specific approach, such that the first estimated regression includes the difference with respect to the CBC's forecast as well as changes in all potentially related expectations. The models include, furthermore, surprises in published monthly data, the variable for CBC credibility and some deterministic terms; a constant, the monetary policy rate (MPR) dummy to control for the fixed interest rate assumption in the early issues of the IPoM and some time dummies.

Table 1 presents the results for the changes in the EES inflation forecasts for the current year, $\Delta E_{t+1}(\pi_T)$. The possible explanatory variables are (see table A2 in appendix A for notation) differences with respect to the CB forecast, surprises in the published inflation rate of the month, changes in the foreign exchange rate (US dollars) expectations, changes

in the expectations to the future MPR, changes in oil price expectations and the credibility that the CB will meet its target. Furthermore, the dummies mentioned above are included.

Table 1. Results of estimations.

Dependent variable: Changes in inflation expectations current year

	(1)	(2)	(3)
$E_t(p_T)\text{-}E_t(\pi_T)$	0.36^{***}	0.33^{***}	0.33^{***}
	(0.11)	(0.09)	(0.09)
$\pi_t - E_t(\pi_t)$	0.69^{***}	0.59^{***}	0.59^{***}
	(0.12)	(0.15)	(0.17)
$\Delta E_{t+1}(FX_{t+11})$	0.006^{**}	0.008^{**}	0.009^{***}
	(0.003)	(0.003)	(0.003)
$\Delta E_{t+1}(r_{t+11})$	0.26^{**}	0.32^{***}	0.33^{***}
	(0.11)	(0.05)	(0.06)
$\Delta E_{t+1}(P_{t+12})$	-0.002		
	(0.009)		
$E_{t+1}(\pi_{t+23})\text{-}3$	0.32^{*}	0.22	
	(0.18)	(0.16)	
Constant	0.04		
	(0.05)		
Dum_MPR	0.09^{*}	0.09^{**}	0.11^{**}
	(0.05)	(0.04)	(0.05)
Dum_Q2	0.02		
	(0.09)		
Dum_Q3	-0.15		
	(0.12)		
Dum_Q4	-0.23		
	(0.18)		
Obs.	35	35	35
Adj. R^2	0.77	0.77	0.77
Wald1		0.47	0.29
Wald2		0.47	0.17

Source: Author's elaboration.

Notes: */**/***: Statistically significant when applying a 10%/5%/1% confidence level. Numbers in parentheses are HAC robust standard errors. Wald1(2): p-value calculated with the χ^2 distribution for the hypothesis of exclusion of the variables compared to the less parsimonious model (the model in the column to the left).

Indeed the evidence suggests that CBC inflation forecasts do affect those reported by the EES. The effect is statistically significant with a coefficient around 0.35 implying that 35% of the difference between the two predictions at time t is transferred to the EES expectations when the projections are updated at time $t+1$. This percentage is quite robust in all the regressions presented. Also surprises in the monthly published inflation rate are taken into account when PFs revise their expectations, and in this case the parameter

estimates are around 0.6. As noted in table A2, these inflation rates are monthly, which should be taken into account for the interpretation of this coefficient. While changes in the expectations about the oil price do not seem to affect the inflation predictions, exchange rate expectations and the MPR do seem to have some impact. The coefficient of the future MPR is positive, which suggests that when the PFs expect a more contractive future monetary policy, they revise their short-term inflation expectations upwards. Finally, the dummy controlling for the assumption of fixed monetary policy rate at the beginning of the sample is statistically significant.

Although there is no strong evidence that the CBC's credibility affects the formation of the EES forecasts, the coefficient does have the expected sign. The interpretation should be done together with the coefficient of $E_t(p_T)$-$E_t(\pi_T)$. In this context it should be noted that 25 out of the 35 observations of the credibility variable are zeros, and for the remaining ten data, the values are between 0.2 and 0.5. In the ten cases where the credibility variable took strictly positive values, the CBC forecast was either equal to or greater than the previous EES forecast and, looking apart from the effects of the surprise in the monthly published inflation rate and related expectations, the EES forecast increased more than was implied by the CBC forecast and its estimated coefficient. In other words, when PFs doubt that the CBC will reach its target of 3%, the inflation forecast changes more (increases more) than in the situation with full credibility, i.e. the PFs consider that the CBC inflation forecast for the current year is too low.

The results of the exercise with the forecasts of next year inflation rate are presented in table 2. In this case the evidence of direct CBC influence is weaker. Indirectly, however, the CBC does affect the changes in the EES expectations as the dominant factor is the change in the current year expectations, which, as argued above, are affected by the CBC's forecasts. The other variables that affect changes in next year inflation expectations are the future MPR and the oil price. Contrary to the case of the short-term expectations, the coefficient of the MPR expectations is negative suggesting that PFs believe that the monetary transmission works, meaning that a tighter monetary policy results in a lower future inflation rate. In this exercise, changes in expected output were also included to take into account that PFs might consider that changes in the output gap could have an effect on

the medium-term inflation rate. The estimated coefficient for this variable, however, turns out not to be statistically significant.

Table 2. Results of estimations

Dependent variable: Changes in inflation expectations next year

	(1)	(2)	(3)	(4)
$\Delta E_{t+1}(\pi_T)$	0.18^{***}	0.16^{***}	0.18^{***}	0.19^{***}
	(0.06)	(0.04)	(0.05)	(0.04)
$E_t(p_{T+1})-E_t(\pi_{T+1})$	0.14	0.18^{**}	0.14^{*}	
	(0.09)	(0.09)	(0.08)	
$\Delta E_{t+1}(FX_{t+23})$	-0.003			
	(0.002)			
$\Delta E_{t+1}(r_{t+23})$	-0.20^{***}	-0.19^{***}	-0.20^{***}	-0.20^{***}
	(0.05)	(0.04)	(0.05)	(0.05)
$\Delta E_{t+1}(P_{t+12})$	0.02^{***}	0.02^{***}	0.02^{**}	0.02^{***}
	(0.005)	(0.006)	(0.005)	(0.005)
$E_{t+1}(\pi_{t+23})-3$	0.14^{*}	0.09		
	(0.09)	(0.08)		
$\Delta E_{t+1}(Y_{T+1})$	0.01			
	(0.08)			
Constant	0.002			
	(0.03)			
Dum_MPR	0.02			
	(0.03)			
Dum_Q2	0.05			
	(0.05)			
Dum_Q3	0.0004			
	(0.03)			
Dum_Q4	-0.08			
	(0.11)			
Obs.	35	35	35	35
Adj. R^2	0.65	0.68	0.68	0.63
Wald1		0.77	0.61	0.51
Wald2		0.77	0.24	0.06

Source: Author's elaboration.

Notes: See table 1.

Table 3. Results of estimations

Dependent variable: Changes in growth expectations current year

	(1)	(2)	(3)	(4)	(5)
$E_t(G_T)-E_t(Y_T)$	0.16***	0.10**	0.10*	0.08	
	(0.05)	(0.05)	(0.05)	(0.06)	
$y_{t-1} - E_t(y_{t-1})$	0.08***	0.08***	0.08***	0.08***	0.08***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
$\Delta E_{t+1}(FX_{t+11})$	-0.001	-0.001			
	(0.001)	(0.001)			
$\Delta E_{t+1}(r_{t+11})$	0.21***	0.17***	0.17***	0.14***	0.13***
	(0.06)	(0.03)	(0.03)	(0.03)	(0.03)
$\Delta E_{t+1}(P_{t+12})$	-0.01*	-0.005	-0.004		
	(0.004)	(0.004)	(0.003)		
$E_{t+1}(\pi_{t+23})-3$	0.01				
	(0.11)				
Constant	-0.03				
	(0.05)				
Dum_MPR	0.05				
	(0.04)				
Dum_Q2	0.04				
	(0.07)				
Dum_Q3	-0.03				
	(0.07)				
Dum_Q4	0.18***	0.17***	0.17***	0.20***	0.21***
	(0.06)	(0.03)	(0.03)	(0.01)	(0.02)
Obs.	35	35	35	35	35
Adj. R^2	0.63	0.65	0.65	0.66	0.65
Wald1		0.15	0.03	0.04	0.01
Wald2		0.15	0.35	0.21	0.20

Source: Author's elaboration.

Notes: See table 1.

The last exercise concerns the changes in the current year's growth forecast, and the results are presented in table 3. In this case, surprises in the monthly released data affects the updates of the EES forecast together with expectations of the future MPR and the fourth-quarter dummy. The coefficient of the MPR expectations is positive, implying that an expected future monetary tightening goes hand in hand with an upward revision of the short-term growth forecast. It is not evident that the CBC's forecast influences that of the private forecasters, even though the coefficient is statistically significant in the least parsimonious models.

To sum up, the empirical results presented in this section suggest that the CB's inflation forecasts do influence those of the PFs. The current year's forecasts are, furthermore,

affected by surprises in the monthly released data and changes in exchange rate and MPR expectations. The CBC's influence on the forecast for next year is mainly implicit as these expectations depend on changes in current year inflation projections, but also on the MPR and oil price forecasts. On the other hand, the growth forecasts of the CBC do not seem to have significant effects on the EES expectations, which are mainly influenced by surprises in the monthly released Imacec data and expected future MPR changes. It is noteworthy that the MPR expectations have significant effects on both inflation and growth expectations, but the signs differ in the short and longer run, such that expectations of a more tight monetary policy in the future push short-term expectations up (higher growth and higher inflation), and mid-term inflation expectations down. Finally, while PFs take into account the CBC's forecast when forming their expectations for the future inflation rate, the assessment of the CBC's credibility does not seem to matter in a statistically significant way.

Other relevant variables were also included in the models to examine if the results are robust to the inclusion of these. The first is a measure of disagreement among the PFs. The EES of the Central Bank of Chile reports together with the mean, the first and the ninth deciles. As a measure of disagreement among the forecasters, the difference of these deciles at time $t+1$ was included as explanatory variable, as was the update of the difference between times t and $t+1$. In none of the cases did the estimated coefficients turn out to be statistically significant, and the coefficients of the other explanatory variables were not altered significantly. As a second robustness-check, the changes in the expectations of the future real interest rate (11 and 23 months ahead) were included in the regressions.[7] In all cases the results were robust to the inclusion of this variable and the coefficients were not statistically significant.

Two additional variables where included in the regression of the current year's growth expectations. The first was changes in the forecast of the US growth rate—taken from Consensus Forecast—as a proxy for world activity. The estimated coefficient was not statistically significant, and the results presented were robust to this inclusion. Secondly,

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[7] Real interest rate expectations correspond to PRC (central bank promissory note) with a maturity of eight years up till 2002, and from 2003 onwards, to BCU (central bank bond) with a maturity of five years.

revisions of the Chilean GDP data were included if they were known between times t and $t+1$. These included revisions of quarterly data as well as differences between the published data of the monthly activity indicator (Imacec) and the quarterly accounts. The revisions were measured in terms of annual rates, i.e. the impact the revisions have on the growth rate of the current year. They turned out, however, not to be statically significant, nor did the inclusion alter the coefficients estimated for the other variables in the regression.

As a final check of robustness, it was examined if the results were influenced by individual observations. Dummies of the type {…,0,1,0,…} were included for each of the observations and a couple were found to be statistically significant when applying a 5% confidence level: observations 13 and 25 for the current year inflation expectations; and 23 and 30 for next year inflation expectations. In none of the cases did the inclusion of these dummies alter the results reported.[8]

4.2. Conditional analysis

To gain further insight in how the private expectations may be influenced by the CB's forecast, two conditional analyses are performed. The first takes into account the sign of the difference between the CBC's forecast and that of the EES. Hence, it is examined whether the PFs react to negative and/or positive differences with respect to the CBC when they update their expectations. The results are presented in tables 4 to 6.

With respect to current year's inflation expectations (table 4), it turns out that they are influenced by the CBC's forecast when this is lower. Even though both coefficients are positive, the only statistically significant one is when the difference is negative. When next year's expectations are considered (table 5), it is a similar story, but the coefficient for the negative difference is only statistically significant when a 10% confidence level is applied. In none of the cases is the update of the growth expectations influenced by the CBC's projection.

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[8] The results are also robust to the inclusion of dummies which are statistically significant when applying a 10% confidence level.

Table 4. Results of estimations

Dependent variable: Changes in inflation expectations current year

	(1)	(2)
$E_t(p_T)-E_t(\pi_T)$	0.33*** (0.09)	
$E_t(p_T)-E_t(\pi_T)(+)$		0.21 (0.19)
$E_t(p_T)-E_t(\pi_T)$ (-)		0.38*** (0.10)
$\pi_t - E_t(\pi_t)$	0.59*** (0.17)	0.59*** (0.18)
$\Delta E_{t+1}(FX_{t+11})$	0.009** (0.003)	0.009*** (0.003)
$\Delta E_{t+1}(r_{t+11})$	0.33*** (0.06)	0.33*** (0.07)
DUM_MPR	0.11** (0.05)	0.13** (0.05)
Obs.	35	35
Adj. R^2	0.77	0.77

Source: Author's elaboration.

Notes: (+)/(-): CB forecast higher / lower than EES expectation. */**/***: Statistically significant when applying a 10%/5%/1% confidence level. Numbers in parentheses are HAC robust standard errors.

Table 5. Results of estimations

Dependent variable: Changes in inflation expectations next year

	(1)	(2)	(3)
$\Delta E_{t+1}(\pi_T)$	0.18*** (0.05)	0.19*** (0.04)	0.17*** (0.03)
$E_t(p_{T+1})-E_t(\pi_{T+1})$	0.14* (0.08)		
$E_t(p_{T+1})-E_t(\pi_{T+1})$ (+)			0.10 (0.11)
$E_t(p_{T+1})-E_t(\pi_{T+1})$ (-)			0.15* (0.09)
$\Delta E_{t+1}(r_{t+11})$	-0.20*** (0.05)	-0.20*** (0.05)	-0.20*** (0.05)
$\Delta E_{t+1}(P_{t+12})$	0.02** (0.005)	0.02*** (0.005)	0.02*** (0.005)
Obs.	35	35	35
Adj. R^2	0.68	0.63	0.67

Source: Author's elaboration.

Notes: See table 4.

Table 6. Results of estimations

Dependent variable: Changes in growth expectations current year

	(1)	(2)	(3)
$E_t(G_T)-E_t(Y_T)$	0.08		
	(0.06)		
$E_t(G_T)-E_t(Y_T)$ (+)			0.07
			(0.06)
$E_t(G_T)-E_t(Y_T)$ (-)			0.17
			(0.33)
$y_{t-1} - E_t(y_{t-1})$	0.08***	0.08***	0.08***
	(0.01)	(0.01)	(0.01)
$\Delta E_{t+1}(r_{t+11})$	0.14***	0.13***	0.14***
	(0.03)	(0.03)	(0.03)
Dum_Q4	0.20***	0.21***	0.20***
	(0.01)	(0.02)	(0.01)
Obs.	35	35	35
Adj. R^2	0.66	0.65	0.65

Source: Author's elaboration.

Notes: See table 4.

Table 7. Results of estimations

Dependent variable: Changes in inflation expectations current year

	(1)	(2)
$E_t(p_T)-E_t(\pi_T)$	0.33***	
	(0.09)	
$E_t(p_T)-E_t(\pi_T)$(Q1)		0.27***
		(0.07)
$E_t(p_T)-E_t(\pi_T)$ (Q2)		0.51**
		(0.21)
$E_t(p_T)-E_t(\pi_T)$ (Q3)		0.17
		(0.24)
$E_t(p_T)-E_t(\pi_T)$ (Q4)		0.62*
		(0.34)
$\pi_t - E_t(\pi_t)$	0.59***	0.62***
	(0.17)	(0.18)
$\Delta E_{t+1}(FX_{t+11})$	0.009**	0.008***
	(0.003)	(0.002)
$\Delta E_{t+1}(r_{t+11})$	0.33***	0.29***
	(0.06)	(0.07)
DUM_MPR	0.11**	0.12**
	(0.05)	(0.04)
Obs.	35	35
Adj. R^2	0.77	0.77

Source: Author's elaboration.

Notes: See table 4.

The second conditional analysis studies to what extent the timing of the publication of the CB forecasts matters. Whereas the baseline analysis did include dummies to control for the timing of the publication, the conditional analysis in this subsection isolates the differences with the CB's projections with respect to the quarter of publication. The results are presented in tables 7 to 9. Applying a 5% confidence level, in the regression for the current year's inflation rate, only the coefficients for the first and the second quarter are statistically significant. This suggests that PFs are more influenced by the CBC's forecasts published in the first half of the year. This is not the case for the next year's expectations, where only the Q4-coefficient is statistically significant. Finally, for the short-term growth forecast, none of the coefficients is significant in none of the quarters.

Table 8. Results of estimations

Dependent variable: Changes in inflation expectations next year

	(1)	(2)	(3)
$\Delta E_{t+1}(\pi_T)$	0.18^{***}	0.19^{***}	0.15^{***}
	(0.05)	(0.04)	(0.03)
$E_t(p_{T+1})\text{-}E_t(\pi_{T+1})$	0.14^{*}		
	(0.08)		
$E_t(p_{T+1})\text{-}E_t(\pi_{T+1})$ (Q1)			-0.05
			(0.10)
$E_t(p_{T+1})\text{-}E_t(\pi_{T+1})$ (Q2)			0.05
			(0.09)
$E_t(p_{T+1})\text{-}E_t(\pi_{T+1})$ (Q3)			0.11
			(0.11)
$E_t(p_{T+1})\text{-}E_t(\pi_{T+1})$ (Q4)			0.43^{**}
			(0.16)
$\Delta E_{t+1}(r_{t+11})$	-0.20^{***}	-0.20^{***}	-0.17^{***}
	(0.05)	(0.05)	(0.045)
$\Delta E_{t+1}(P_{t+12})$	0.02^{**}	0.02^{***}	0.02^{***}
	(0.005)	(0.005)	(0.004)
Obs.	35	35	35
Adj. R^2	0.68	0.63	0.73

Source: Author's elaboration.

Notes: See table 4.

Table 9. Results of estimations

Dependent variable: Changes in growth expectations current year

	(1)	(2)	(3)
$E_t(G_T)$-$E_t(Y_T)$	0.08 (0.06)		
$E_t(G_T)$-$E_t(Y_T)$ (Q1)			0.13 (0.10)
$E_t(G_T)$-$E_t(Y_T)$ (Q2)			-0.11 (0.14)
$E_t(G_T)$-$E_t(Y_T)$ (Q3)			0.11 (0.09)
$E_t(G_T)$-$E_t(Y_T)$ (Q4)			-0.07 (0.08)
$y_{t-1} - E_t(y_{t-1})$	0.08*** (0.01)	0.08*** (0.01)	0.07*** (0.01)
$\Delta E_{t+1}(r_{t+11})$	0.14*** (0.03)	0.13*** (0.03)	0.18*** (0.05)
Dum_Q4	0.20*** (0.01)	0.21*** (0.02)	0.24*** (0.04)
Obs.	35	35	35
Adj. R^2	0.66	0.65	0.65

Source: Author's elaboration.

Notes: See table 4.

5. Concluding remarks

To what extent are central banks able to affect private expectations by publishing their forecasts? The present analysis shed some light on this question and also addressed the issue of how changes in related expectations affect those of inflation and economic growth. For this purpose Chilean data were utilized, as the Economic Expectation Survey includes several relevant questions of related expectations.

The evidence provided in this study suggests that indeed the Central Bank of Chile can and does influence the short-term inflation expectations of private forecasters. They are also affected by surprises in monthly released data as well as changes in the exchange rate expectations and those of the future monetary policy rate. The coefficient of the policy rate is greater than zero, which suggests that when private forecasters expect that the monetary authorities will raise the policy rate, they increase their short-term inflation expectations. There was no strong evidence that the assessment of the Central Bank's credibility affected the update of the expectations. Two conditional analyses showed that private forecasters

mainly take into account the Central Bank's short-term inflation forecast, when this is lower than their own and when it is published in the first half of the year.

The Central Bank's influence on the next year's inflation expectation takes place mainly indirectly via changes in current year forecasts, but some evidence was provided that the mid-term forecast of the Central Bank does influence directly the expectations of private forecasters when it is published in the last quarter of the year. Also changes in the oil price expectations and in the predictions of the future policy rate are important when mid-term inflation expectations are updated by private forecasters. The policy rate's coefficient is negative, suggesting that private forecasters trust that a tighter monetary policy influences the inflation downwardly in the medium term.

There is no strong evidence that the Central Bank's growth forecast influences that of the private forecasters; neither when conditioning on the sign of the gap between the forecasts nor when conditioning on the time of the year they are made. The private expectations seem to be affected mainly by surprises in monthly released data of economic activity and by changes in the expectations of the policy rate, both with a positive coefficient.

It is important to emphasize that the changes in the expectations published in surveys of private forecasters may be influenced by several other factors, which do not necessarily relate do the central bank's outlook or the expectations included in the present study. However, even though there are still relatively few observations available, the analysis above does provide some evidence that in Chile, the private forecasters do take into account the central bank's inflation forecasts but less so the growth forecasts. In other words, it is possible for the central bank to affect the market's inflation outlook by publishing its forecasts, but not evidently so with the growth expectations.

A tempting policy recommendation from the present study is to advocate that central banks publish their forecasts, especially those for inflation. This may help in the formation of the private expectations and, hence, make more efficient the conduct of monetary policy. Also the evidence provided in this study advocates the publication of the projections of the future path of the policy rate, as this is the only related expectation affecting the private short- and medium-term inflation expectations as well as the short-term growth outlook. Of course

these recommendations are only valid as long as the private forecasters trust that the central bank is publishing what it really believes will happen in the future.

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Appendix A

Table A1. IPoM publication dates

Year	Dates			
2000	*16 May*	*13 Sep.*		
2001	*23 Jan.*	*16 May*	12 Sep.	
2002	16 Jan.	16 May	11 Sep.	
2003	15 Jan.	13 May	10 Sep.	
2004	14 Jan.	1 Jun.	14 Sep.	
2005	19 Jan.	18 May	31 Aug.	
2006	18 Jan.	17 May	13 Sep.	
2007	17 Jan.	16 May	5 Sep.	
2008	16 Jan.	12 May	11 Sep.	14 Nov.
2009	14 Jan.	13 May	15 Sep.	16 Dec.
2010	6 Apr.	16 Jun.	8 Sep.	20 Dec.
2011	4 Apr.	20 Jun.	9 Sep.	21 Dec.

Source: Central Bank of Chile.

Note: Dates in italics are not included in the analysis.

Table A2. Variables utilized in the empirical analysis

Variable	Notation	Measurement	Source
EES: Inflation current year	$E_t(\pi_T)$	Annual rate	EES
EES: Inflation next year	$E_t(\pi_{T+1})$	Annual rate	EES
CBC: Inflation current year	$E_t(p_T)$	Annual rate	IPoM
CBC: Inflation next year	$E_t(p_{T+1})$	Annual rate	IPoM
SPF: Growth current year	$E_t(Y_T)$	Annual rate	EES
CBC: Growth current year	$E_t(G_T)$	Annual rate	IPoM
Monthly inflation rate	π_t	Monthly rate	INE
Imacec growth rate	y_t	Annual rate	CBC
EES: Foreign exchange rate 11 months ahead	$E_t(FX_{t+11})$	CHL/USD	EES
EES: Foreign exchange rate 23 months ahead	$E_t(FX_{t+23})$	CHL/USD	EES
EES: Monetary policy rate 11 months ahead	$E_t(r_{t+11})$	Percentage	EES
EES: Monetary policy rate 23 months ahead	$E_t(r_{t+23})$	Percentage	EES
CF: Oil price 12 months ahead	$E_t(P_{t+12})$	WTI. USD per barrel	CF
EES: Inflation 23 months ahead	$E_t(\pi_{t+23})$	Annual rate	EES

Source: Author's elaboration.

Notes: EES: Economic Expectation Survey conducted by the Central bank of Chile. IPoM: Monetary Policy Report published by the Central Bank of Chile. CBC: Central Bank of Chile. INE: Chile's National Statistics Institute. CF: Consensus Forecast. "EES:"/"CBC:" in front of a variable indicates that it is the forecast according to the EES / CBC.

DTBC – 685
Pronósticos con Métodos Shrinkage utilizando una Gran Base de Datos
Wildo González y Hernán Rubio

DTBC – 684
Precio de Materias Primas y Spread Soberano en Economías Emergentes ¿Importa la Concentración de las Exportaciones?
Ercio Muñoz

DTBC – 683
Evolution of a Small Open Emerging Economy's External Vulnerability: Evidence for Chile
Gastón Chaumont y Markus Kirchner

DTBC – 682
Measurement of Household Financial Risk with the Survey of Household Finances
Felipe Martínez, Rodrigo Cifuentes, Carlos Madeira, y Rubén Poblete-Cazenave

DTBC – 681
Introducing Liquidity Risk in the Contingent-Claim Analysis for the Banks
Daniel Oda

DTBC – 680
Precio del Petróleo: Tensiones Geopolíticas y Eventos de Oferta
Eduardo López y Ercio Muñoz

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