Dynamics of firms' inflation expectations in an emerging economy*

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Abstract

We show that inflation expectations by firms provide a good characterization of inflation dynamics based on a Phillips curve for Uruguay. The share of firms that differentiate their inflation expectations between one-year and two-year horizons is a relevant statistic for changes in inflation expectations. Furthermore, we observe that firms who obtain information from the central bank are more likely to distinguish between horizons and forecast convergence in inflation expectations. Decision-makers tend not to differentiate between horizons when forecasting inflation, but when they do, they are more likely to predict convergence in inflation expectations. External advisors tend to differentiate between horizons and are more likely to predict divergence in inflation expectations. Our study highlights the importance of analyzing inflation expectations formation by firms for understanding inflation dynamics and conducting effective monetary policy.

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1 Introduction

Monetary policy requires a forward-looking view of the evolution of the economy. For that reason, central bankers look at the private sector's expectations and regularly communicate its economic forecasts. One particular expectation dominates the discussion of monetary policy: inflation. A scrutiny of the job of the central bank is usually based on whether inflation expectations are low or high. Hence, over the last decades, there has been a growing interest in having different measures of private sector inflation expectations.

Nowadays, several countries have inflation expectations obtained from financial prices and surveys to professional forecasters, financial specialists, households, and firms. Several recent studies have documented interesting patterns of economic expectations obtained from different sources (see, for instance, the collections of studies in Bachmann *et al.*, 2023). In the case of inflation, expectations tend to be different among professional forecasters, households, and firms. These differences also vary across countries. For instance, using firms' surveys in a sample of several countries, Candia *et al.* (2022) find that awareness of inflation by firms is quite different between advanced and emerging economies.

In this context, the purpose of this work is to analyze the factors that determine the dynamics of inflation expectation by firms in Uruguay, an emerging economy that has a well-established firms' survey on economic expectations. In doing so, we include additional questions in June 2022 to the regular survey to understand the differences across firms in the way that predict inflation. The case of Uruguay is interesting because it has a higher level of inflation compared to advanced economies, which provides more incentive to firms to acquire information about the evolution of inflation.

We pay particular interest in uncovering what determines that a firm expects a reduction or an increase in inflation toward the policy horizon (two years). We focus our analysis on three main questions. First, Does inflation expectation evolution by firms depends on who regularly answers the survey? Second, How does the information source affect inflation expectations by firms? Finally, Are there differences in the inflation expectations depending on how the firms use the results from the survey?

Before analyzing statistically these questions, we take an aggregate view of how the inflation expectations by firms fit a Phillips Curve in Uruguay. We find that they do better than other measures like, for instance, the inflation rate. The results also stress that the fractions of firms expecting a rise and a reduction of inflation are useful statistics to understand the inflation dynamics.

We focus on firm forecasts of inflation at different horizons. If firms are aware of the difference between inflation in the short run (one year ahead) and in the monetary policy horizon (two years), they should be more aware of the mechanisms of monetary policy. A firm that does not differentiate its forecast between the different horizons might be expected to be a firm that is less sophisticated or attentive to monetary policy. If a firm does differentiate between the horizons, it is presumed to be more precise in its predictions. Likewise, if they

predict higher inflation in the short-run than in the monetary policy horizon, it implies that they consider current inflation as transitory, and they expect inflation to converge to a certain point coherent with the central bank's objective of stabilizing inflation.[1] On the contrary, the expectation of an increase in inflation in the long run implies that firms are less aware of the monetary policy and the role of the central bank in having low and stable inflation.

Our estimations are based on an unbalanced panel of monthly frequency of 289 firms between the months of October 2020 and September 2022. The main results are the following. First, inflation expectations by professional forecasters and firms provide a good characterization of inflation dynamics based on the Phillips curve estimation for Uruguay. Second, the shares of firms expecting divergence and convergence of inflation from one to two years are relevant aggregate statistics to changes in inflation expectations. Third, firms getting informed through the Central Bank of Uruguay (BCU) are more likely to differentiate horizons when predicting inflation and to forecast a convergence of inflation two years ahead. Although with less intensity, getting informed through government agencies and the statistical office has similar effects. Decision makers in the firms tend not to differentiate horizons. When predicting inflation, but when they do, they are more likely to forecast a convergence of inflation from one to two years. In contrast, when advisors respond to the survey, they do differentiate the horizons when predicting inflation and are more likely to forecast a divergence of the inflation rate.

Our results have policy implications. Although we have not identified what type of information by the central bank implies a reduction of inflation expectations by firms in the long run, we find that central bank communication offers a great opportunity to shape inflation expectations in Uruguay. This is particularly relevant for attentive decision markers in the firms (those that differentiate horizons when predicting inflation ahead) because they will search for information to forecast inflation and the central bank communication is indeed a source of information that they use. This contrasts with the evidence showing that in advanced economies with low inflation, firms, and household expectations tend to be relatively inattentive to monetary policy changes (see Coibion *et al.*, 2020). Finally, this opportunity of using central bank communication comes with the responsibility of conducting monetary policy consistently to keep and expand the capacity of the central bank in influencing inflation expectations.

The rest of the manuscript is organized as follows. The next section presents related literature. Section 3 presents a simple assessment of how the inflation expectations by firms are useful to characterize the inflation dynamics. Section 4 discussed the data coming from the firms' survey and the special questions added to the survey in June 2022, providing descriptive statistics. Section 5 shows our empirical approach to estimating the factors that determine whether a firm predicts an increase or reduction in inflation. Finally, Section 6 provides concluding remarks.

[1]The inflation target ranges between 3% and 6%, while the average inflation expectation by firms in the period under analysis is 8.46% in the monetary policy horizon of 24 months.

2 Related literature

Our work is related to three strands of the literature. First, with the use of private sector inflation expectations to predict and explain the aggregate inflation dynamics. Thus, several studies have shown that using inflation expectations by the private sector helps to predict actual inflation. Relevant contributions about this are Ang *et al.* (2007) and Faust and Wright (2013). The use of the Phillips curve to explain inflation dynamics has also recognized the value of inflation expectations by the private sector. This has become more relevant since the behavior of inflation after the global financial crisis has raised questions about the validity of the Philips curve relationship that connects inflation with unemployment. However, several works have shown that controlling for private inflation expectations, alternative measures of unemployment, and changes in the slope of the relationship argue that the Phillips curve is still a valid equation to explain inflation dynamics. These conclusions are arrived in studies such as Blanchard (2016) Ball and Mazumder (2011), Ball and Mazumder (2019), Coibion and Gorodnichenko (2015b), among many others.

Second, our study is also related to recent works that analyze how individual inflation expectations inform us about how private agents use and process information about the state of the economy. For instance, Andrade and Le Bihan (2013), Coibion and Gorodnichenko (2015a), and Fuhrer (2018) provide empirical support for the fact that agents form expectations deviating from full-information and rational expectations. Moreover, Coibion and Gorodnichenko (2015b) argue that inflation expectations by households are better equipped than those by professional forecasters to explain inflation dynamics in the US after the great recessions, whereas Coibion *et al.* (2018) find that firms' expectations display widespread dispersion using a survey in New Zealand.[2]

Third, this work is a continuation of previous studies that have used the firms' survey in Uruguay to understand how the price and wage decisions are connected with monetary policy and inflation expectations. Examples are Borraz *et al.* (2013), Borraz and Zacheo (2018), Frache and Lluberas (2019), Borraz and Mello (2020), Caruso *et al.* (2022) and Carotta *et al.* (2023) who use the same survey as this study to understand the expectations by firms in different aspects such as knowledge about the current inflation, inflation target, the effect of wage adjustment, and other dimensions relevant for monetary policy conduct and communication in Uruguay.

We contribute to these strands in the literature by providing evidence on how the evolution of inflation expectations by firms in an emerging economy helps to understand the actual behavior of inflation and how monetary policy can shape these expectations. Like Ball and Mazumder (2011) and Blanchard (2016), we find that a Phillips curve augmented with private sector expectations, either by professional forecasters or firms, can fit better the aggregate inflation in Uruguay. Also, related to the studies that have documented the heterogeneity in

[2]The recent book by Bachmann *et al.* (2023) contains several chapters that analyze inflation expectations by different types of sources and agents.

inflation expectation across firms such as Coibion *et al.* (2018), Candia *et al.* (2022), Weber *et al.* (2022), and Frache and Lluberas (2019), we try to explain this dispersion in inflation expectations based on additional questions included to the survey in June 2022.

3 The Phillips Curve and inflation expectations

Low and stable inflation expectations are considered preconditions to have less macroeconomic volatility. In fact, inflation expectations provide a nominal anchor for the economy and, therefore, are crucial to determining the current behavior of inflation. In this section, we analyze, at the aggregate level, the role of inflation expectations in shaping the actual price dynamics using the Phillips curve as analytical framework.

The New-Keynesian framework requires two critical variables to include, namely, the output gap (or other variables that captures excess demand) and inflation expectations. Despite there being concerns regarding the stability of the Phillips curve, we use it in order to understand the role of inflation expectations in explaining the inflation behavior in Uruguay. This preliminary analysis provides a motivation for the use firm-level data on inflation expectations.

Based on Coibion and Gorodnichenko (2015), an expectation-augmented Phillips curve can be written as:

$$\pi_t = E_t[\pi_{t+1}] + c + \kappa x_t + u_t, \tag{1}$$

where π_t is the inflation rate in period t, $E_t[\pi_{t+1}]$ is an inflation expectation, c is a constant term, x_t is a measure of output gap or excess of demand, parameter κ is known as the slope of the Phillips Curve, and u_t is an error term. In order to apply this equation to Uruguay we need to specify the inflation expectation, $E_t[\pi_{t+1}]$, and the variable that measures the excess of demand, x_t. For inflation expectation we will first follow Ball and Mazumder (2011) and Ball and Mazumder (2019), assuming that inflation expectations can be modeled by past inflation. In particular, we use quarterly data from 2012 to 2021 for Uruguay and we re-write equation (1) as:

$$\pi_t^a = \pi_{t-4}^a + \tilde{c} + \tilde{\kappa} x_{4,t} + \tilde{u}_t, \tag{2}$$

where now π_t^a is the annual inflation accumulated up to quarter t and $x_{4,t} = (x_t + x_{t-1} + x_{t-2} + x_{t-3})/4$ is the annual moving average of excess of demand x_t. In contrast to the US, Uruguay is a small open economy and, therefore, the output gap is not necessarily a sufficient statistic to measure the overall excess of demand and inflation pressures. Moreover, fluctuations in GDP and the unemployment rate could provide alternative information about the cyclical position of the Uruguayan economy. Hence, we estimate the following specification:

$$\pi_t^a = \pi_{t-4}^a + \beta_0 + \beta_1 y_{4,t} + \beta_2 q_{4,t} + \beta_3 u_{4,t} + \tilde{v}_t, \tag{3}$$

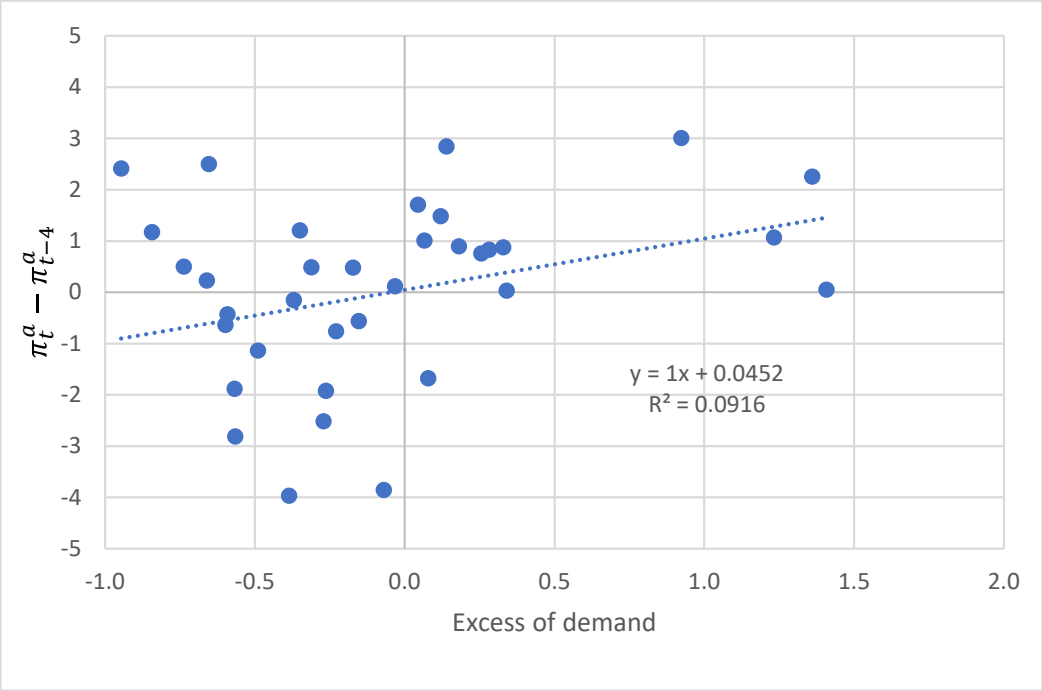
where $y_{4,t}$ is the annual moving average of the log deviation of GDP with respect to its trend, $q_{4,t}$ is the annual moving average of the log deviation of the real exchange rate with respect its

trend, and $u_{4,t}$ is the annual moving average of the deviation of the unemployment rate with respect its trend. The trends for these three variables are computed with a Hodrick-Prescott filter. Using this estimation, we define the excess demand variable as:

$$x_{4,t} = \beta_1 y_{4,t} + \beta_2 q_{4,t} + \beta_3 u_{4,t}, \tag{4}$$

In order to represent the estimation of equation (3) in a graphical manner, Figure 1 shows the scatter plot from the relationship between the excess of demand variable, $x_{4,t}$, and inflation minus expectation based on past inflation, $\pi_t^a - \pi_{t-4}^a$. The figure also presents the R^2 of this linear regression, having a value quite low. From Figure 1 we can see that past inflation is a weak proxy to understand inflation dynamics based on a measure of excess demand in Uruguay.

Figure 1: Phillips Curve with past inflation



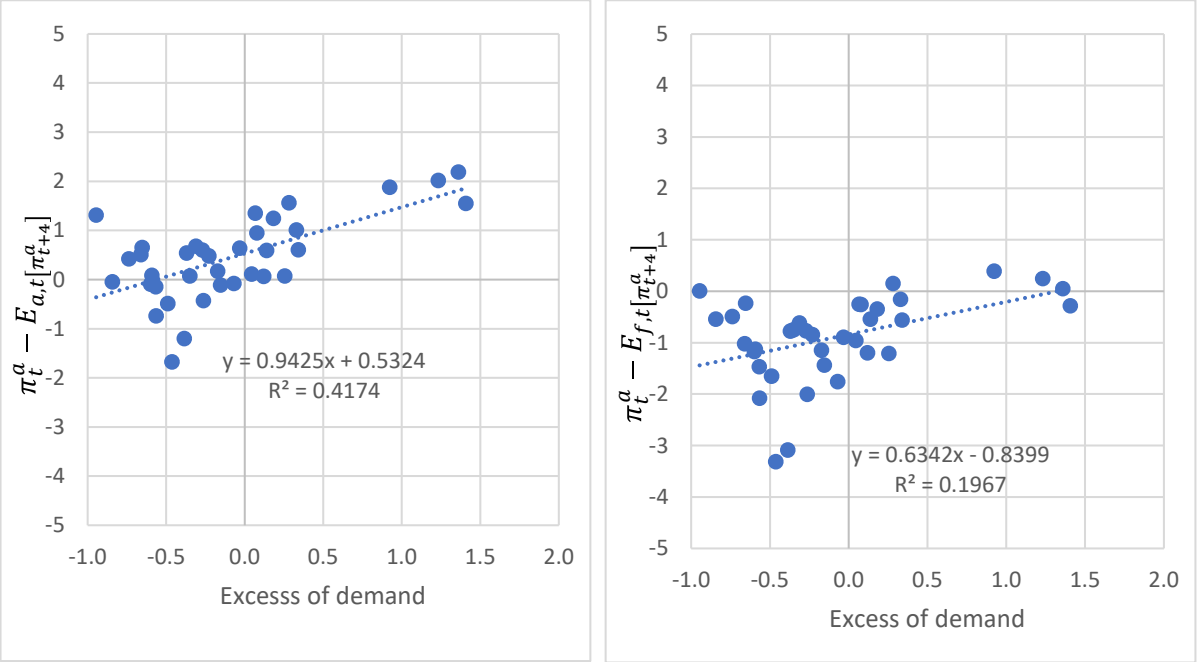
We now replace the inflation expectations that we approximate by past inflation with the expectations coming from two alternative surveys in Uruguay. One survey is based on professional forecasters (analysts) and the other on a sample of firms.[3]

Figure 2 shows two scatter plots based on these two alternative expectations. In the left-hand side of Figure 2, the vertical axis is the difference between annual inflation and one-year head inflation expectation by professional forecasters. On the right-hand side of the figure,

[3]This survey is conducted by Banco Central del Uruguay to a sample of professional forecasters like domestic think tanks, independent analysts, and financial institutions. The survey receives between 20 and 30 answers monthly during the period under analysis.

the vertical axis is the difference between the annual inflation and one-year-ahead inflation expectation by firms.[4]

Figure 2: Phillips Curve with inflation expectations one year ahead

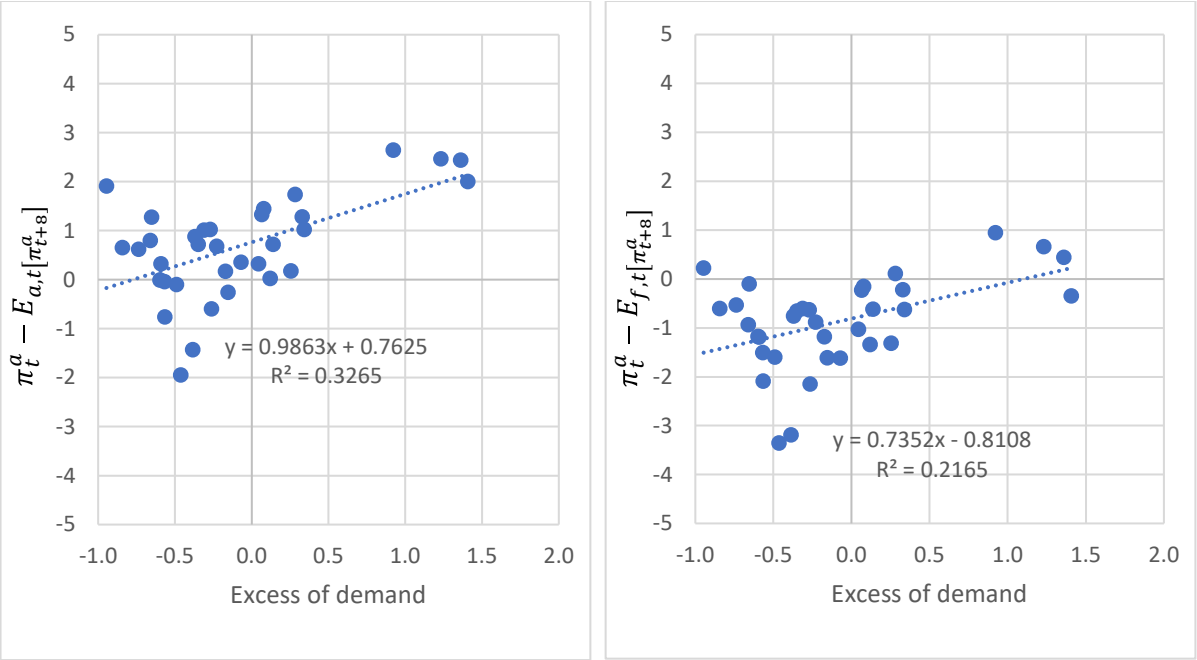


Note: Left-side panel uses professional forecasters' expectations and the right-side panel uses firms' expectations.

In both scatter plots of Figure 2 we present the R^2, showing a relevant increase in the ability to explain this relationship in contrast to what we see in Figure 1 with past inflation as a proxy of inflation expectations. Using the inflation expectations by professional forecasters and firms two years ahead generates similar results as shown in Figure 3. Hence, inflation expectations from professional forecasters and firms are more consistent to explain inflation dynamics based on a Phillips Curve equation in the case of Uruguay.

[4]We use the average of inflation expectations in both surveys.

Figure 3: Phillips Curve with inflation expectations two years ahead



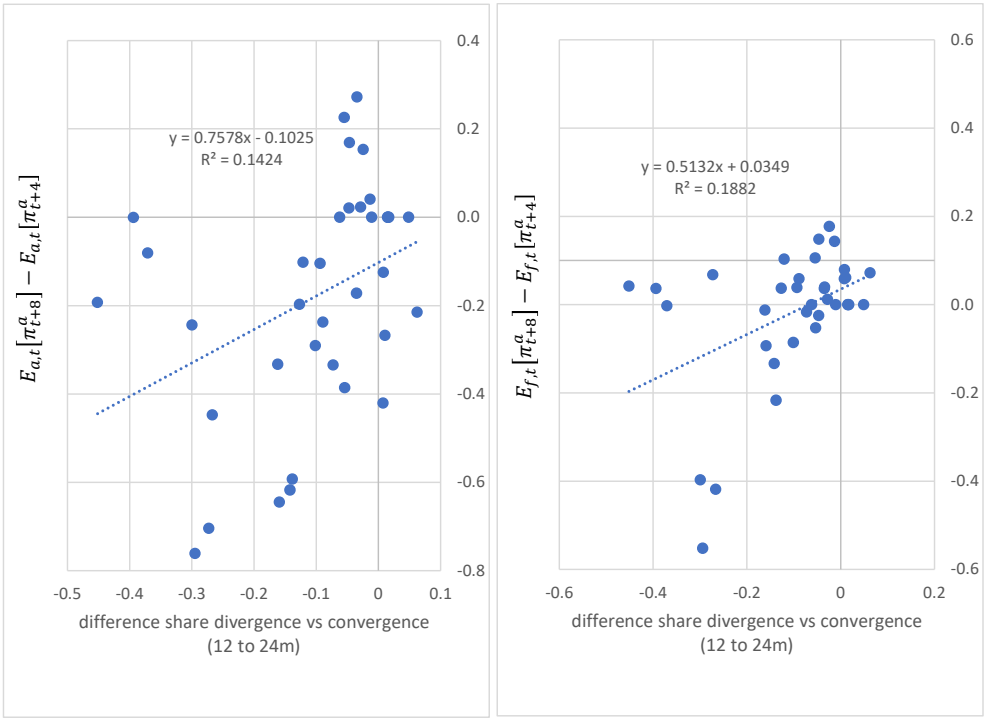
Note: Left-side panel uses professional forecasters' expectations and right-side panel uses firms expectations.

It is worth noting that Coibion and Gorodnichenko (2015b) argue that household inflation expectations can account for strong disinflationary pressures since 2009 in the US. They also present evidence that household forecasts are a better proxy of firm forecasts than either professional or backward-looking forecasts. In the case of Uruguay, there are no household inflation expectations, but we see no great difference in the dynamics of professional and firm inflation expectations.

In any case, rather than the level of inflation, expectations by firms offer alternative statistics to understand inflation dynamics. In fact, Coeuré (2019) suggests that households' and firms' expectations may not be able to identify the current level of inflation in the Eurozone, but they can provide valuable information to understand changes in the trend of inflation. Based on consumer expectations, Coeuré (2019) constructs qualitative consumer inflation expectations, computed as a balance statistic which is the difference between the share of respondents who expect prices to rise and the share of those who expect prices to fall, or stay about the same. This qualitative consumer inflation expectation has a high correlation with actual inflation in the Eurozone.

We also construct a balance statistic with the firms' survey computed as the difference between the share of respondents that expect a rise in inflation expectations from one year to two years and the share of respondents that expect a fall in inflation from one year to two years.

Figure 4: Firms expecting divergence-convergence and changes in inflation expectations



Note: Left-side panel uses professional forecasters' expectations and right-side panel uses firms expectations.

Figure 4 shows the scatter plots of this balance statistic of the share of firms' expectations divergence/convergence with the changes in inflation expectations from one year to two years by the professional forecasters and the firms. The result that emerges is that this balance statistic is a good proxy to understand changes in inflation expectations.

Two main messages are derived from this section. First, inflation expectations derived from professional forecasters and firms provide a better characterization of the inflation dynamics in Uruguay based on a Phillips Curve equation. Second, the share of firms expecting convergence or divergence of inflation from one year to two years is a relevant statistic to describe the dynamics of inflation expectations by both professional forecasters and firms.

4 The Business Expectations Survey

In the rest of the paper, we use data from the Business Expectations Survey (BES). The BES is carried out by the Instituto Nacional de Estadísticas (INE), commissioned by the Banco Central del Uruguay (BCU), to firms in Uruguay since October 2009. The survey is conducted monthly to a representative sample of the universe of Uruguayan firms with more than 100 employees, but those belonging to the agricultural and financial sectors. The BES contains information about firms' inflation and cost expectations. The main question of interest in the

survey is *What do you think will be the percentage change in the CPI (Consumer Price Index)?* This question is asked considering 3-time horizons: the current year, the next 12 months, and the next 24 months. The BES has been answered by 905 firms with an average response ratio of 74% since October 2009.

A set of special questions was asked in the wave of June 2022. These special questions refer to who usually responds to the BES, the sources of information they use to form their expectations, and the use they give to the published information from the survey. In the next subsection, we will dive deeper into these questions.[5]

In this paper, we restrict the sample to a window around the month in which the special questions were asked. More precisely, our sample ranges from October 2020 and September 2022. As a result, we use an unbalanced panel with 289 firms over 24 months, with a total of 6,298 observations.

4.1 Special questions in the BES

The first special question asked to firms in June 2022 refers to who usually answers the survey. Specifically, the question is: *Who usually answers the survey?* The options for response were: *(i) Decision maker (owner or manager); (ii) an employee; (iii) an external advisor.*

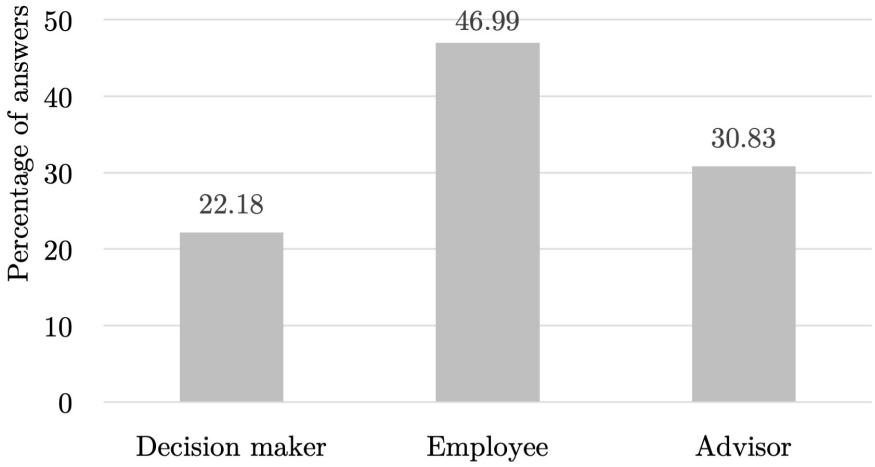


Figure 5: Who usually answers the survey

Figure 5 shows the distribution of answers to this question. The survey is usually answered by an employee in nearly half of the universe of firms. Decision makers usually answer the survey in around one-fifth of the sample, while external advisors do it in around one-third of it. The information about who answers the survey allows us to look for differences in expectations and in the accuracy of inflation forecasts according to different categories of respondents.

The second special question refers to the different sources of information that firms use

[5] A detailed description of the special questions added in June 2022 and their answers can be found in Marrero and Mello (2023).

to form their expectations. Specifically, the question is: *What kind of information do you usually use to form your economic expectations?* The response options were the following: *(i) BCU monetary policy communications; (ii) Communications from other government agencies; Statistical information (INE); (iv) Specialized press; (v) Business associations reports; (vi) Results of internal economic projection models; (vii) Advisors Reports.* Firms can select more than one option.

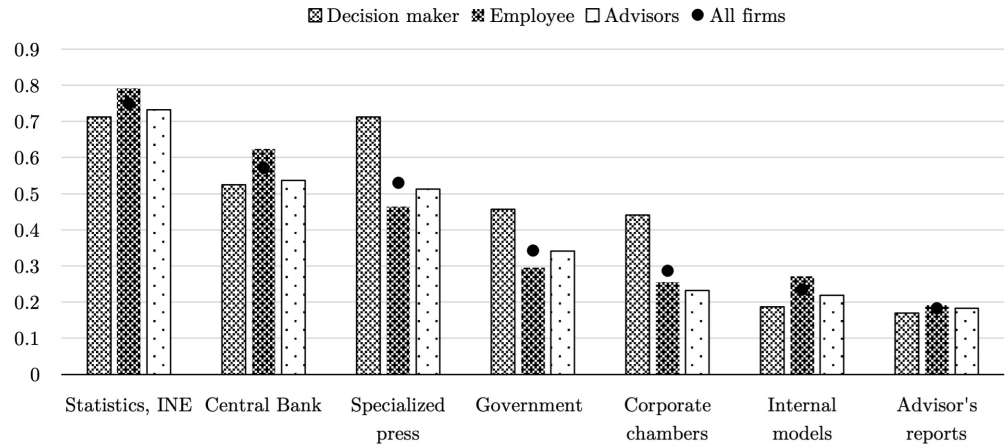


Figure 6: Information sources

Figure 6 presents the frequency of the different information sources that firms declare to use. The main source is the communication of the INE (75%). Presumably, this response refers to the monthly publication of the CPI Index by INE. Interestingly, decision-makers are informed more than the mean from the specialized press, government communications, and business associations.

Another relevant aspect that is assessed by the special questions refers to the use that firms give to the information that is monthly published from the BES, i.e. the mean, median, and standard deviation of the answers. The specific question is: *What use do you give to the information published on this survey?* The response options were: *(i) Budget planning; (ii) Define the company's pricing policy; (iii) Input for the company's wages negotiation; (iv) No use in particular; (v) I did not know that information about this survey was published; (vi) Other use.* Again, multiple responses by a firm are allowed.

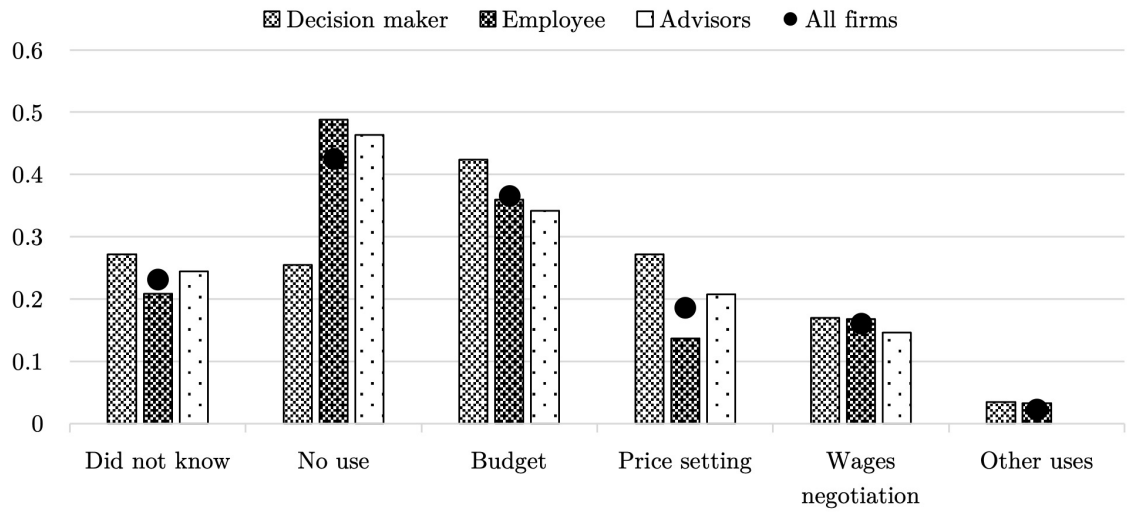


Figure 7: Survey's information uses

Figure 7 presents the distribution of the answers. The main use for the survey's information is for budget planning (37%) and for pricing (19%). Interestingly, almost 45% of the firms declare not to use the BES information, and 23% that they do not know that the information was available.

4.2 Descriptive statistics

Table 1 presents the descriptive statistics of the variables used in our analysis. The firms' inflation expectations for the 12 months horizon average 8.67%, while for the 24-month horizon, it is 8.46%.The average inflation rate during the period was 8.53%, with a maximum of 9.95%. This figure is above the ceiling of the inflation target of 3 to 6 percent. The forecast error of firms, calculated as the difference between the observed inflation rate and the prediction done 12 months before, in absolute terms, was 1.63 percentage points. From this forecast error, we found that approximately half of the sample underestimates the inflation rate, while the other half overestimates it.

The main goal of our paper is to provide evidence on the factors that determine the firms' inflation expectations dynamics. In so doing, it is relevant to determine whether the firms differentiate their predictions between temporal horizons, and if the expectations diverge or converge to the inflation target range. We construct a dummy variable that takes the value 1 if the firm does different predictions for each temporal horizon, and zero in the case that they do not differentiate, i.e. if it expects the same inflation rate in both horizons. The average share of firms that differentiate between horizons is 60.9% during the period of analysis. Additionally, 45.5% of the firms expect that the inflation will be lower in 24 months than in the 12 months horizon. 15.5% of the firms expect the inflation rate will diverge from the inflation target.

The rest of Table 1 shows descriptive statistics for the responses to the special questions

introduces to the BES in June 2022 that were analyzed in the previous subsection.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
12 months inflation expectation	6,298	8.666	1.614	3	20
24 months inflation expectation	6,298	8.456	1.865	3	20
Inflation rate	6,298	8.534	1.003	6.64	9.95
Forecast absolute error	3,395	1.634	1.288	0.010	12.04
Underestimates	3,395	0.507	0.500	0	1
Overestimates	3,395	0.493	0.500	0	1
Differentiates horizons	6,298	0.609	0.488	0	1
24 - 12 months infl. expectations	6,298	-0.210	1.034	-10	12
Expects convergence	6,298	0.454	0.498	0	1
Expects divergence	6,298	0.154	0.361	0	1
Info Source: BCU	4,966	0.572	0.495	0	1
Info Source: Government	4,966	0.330	0.470	0	1
Info Source: INE	4,966	0.760	0.427	0	1
Info Source: Press	4,966	0.528	0.499	0	1
Info Source: Business associations	4,966	0.279	0.448	0	1
Info Source: Professional reports	4,966	0.185	0.388	0	1
Info Source: Internal models	4,966	0.217	0.412	0	1
Respondent: Decision maker	4,919	0.230	0.421	0	1
Respondent: Employee	4,919	0.459	0.498	0	1
Respondent: External advisor	4,919	0.311	0.463	0	1

5 Empirical approach

When forming their expectations on short-term inflation (over the next 12 months) and on the monetary policy horizon (two years), firms make two underlying decisions: first, whether or not they differentiate their predictions in the relevant horizons that are asked in the BES. Secondly, conditionally in differentiating, whether or not they are going to give an ascending or descending trajectory to their expectations. A downward trajectory, in our case, implies a convergence to the target of the monetary authority. On the contrary, an ascending or divergent trajectory to the central bank's target implies a clear lack of credibility.

We will represent the first decision through the variable, *Differentiate horizons*, D_{it}, defined as follows:

$$D_{it} = \begin{cases} 1 & \text{if} \quad E_{it}(\pi_{t+24}) - E_{it}(\pi_{t+12}) \neq 0 \\ 0 & \text{if} \quad E_{it}(\pi_{t+24}) - E_{it}(\pi_{t+12}) = 0 \end{cases}. \tag{5}$$

This will be the dependent variable in the first stage of our regressions.

In the second stage, conditional in $D_{it} = 1$, the firm defines whether they believe that inflation will converge or diverge. We define the qualitative variable, *Convergence*, C_{it}, through the sign of the difference between the inflation forecasts in the different horizons:

$$C_{it} = \begin{cases} 1 & \text{if} \quad E_{it}(\pi_{t+24}) - E_{it}(\pi_{t+12}) < 0 \\ 0 & \text{if} \quad E_{it}(\pi_{t+24}) - E_{it}(\pi_{t+12}) > 0 \end{cases}. \tag{6}$$

We will estimate a two-step model, with a selection of endogenous first stage. The Heckman-type selection model reflects well this sequence of decisions. In particular, we estimate the following equation system, where Equation 7 is Heckman's model selection equation, and Equation 8 is the equation that explains the convergence of inflation expectations:

$$D_{it} = \alpha + \beta_1 E_{it-1}(\pi_{t+12}) + \beta_k W_{ik} + \beta_j I_{ij} + \beta_q X_{iq} + \delta_t + \varepsilon_{it}, \text{ and} \tag{7}$$

$$C_{it} = \gamma + \theta_1 E_{it-1}(\pi_{t+12}) + \theta_k W_{ik} + \theta_j I_{ij} + \theta_{q-1} X_{iq-1} + \rho_t + \mu_{it}. \tag{8}$$

In both equations, we include the lagged inflation expectation, $E_{it-1}(\pi_{t+12})$, in the 12 months horizon to control for the level of inflation expectations. The intuition to include this variable is that if expectations are anchored, high previous expectations probably are followed by a decreasing trend for the future inflation rate. On the contrary, for low levels of previous expectations, it is more likely that the firm will expect an increasing trend in the inflation rate. We also include a vector of dummy variables, W_{ik}, that represents who usually answers the BES, a vector of dummy variables, I_{ij}, that reflects the sources of the information that the firm uses, a vector of other control variables, X_{iq}, and a time fixed effects, ρ_t, as a control for the omitted aspects that might affect all firms in a given month. Since around two-thirds of the firms do not know or use the results from the survey, we do not include the variable related to the survey's information uses. Nevertheless, including this variable does not change the results.

Table 2 presents the baseline estimations. In the lower panel of the table, we show the selection equation (Equation 7). The differentiation of horizons is related to a higher level of sophistication in the predictions. The Mills ratio is statistically different from zero, this implies that the differentiation of horizons by the firms, significantly selects the sample in two kinds of different firms, those that differentiate temporal horizons in their expectations are different from those that do not.

Firms that use official information sources, e.g. the central bank, the government, and the statistical institute (INE), have a higher probability of differentiating horizons when forming their inflation expectations. This result is quite intuitive since more sophisticated agents are more likely to know and use the official data. On the other side, those firms that use business associations and advisors as information sources are less likely to differentiate horizons. However, those firms that answer the BES through external advisors present a higher probability

of doing differentiated predictions in the different temporal horizons.

Table 2: Convergency models

Convergence	M1	M2	M3	M4	M5
$E_{it-1}(\pi_{h=t+12})$	-0.073***	-0.050***	-0.085***	-0.053***	-0.085***
	(0.007)	(0.005)	(0.011)	(0.005)	(0.011)
Source CB	0.176***		0.264***		0.259***
	(0.026)		(0.046)		(0.046)
Source gov.	0.093***		0.124***		0.118***
	(0.020)		(0.033)		(0.033)
Source INE	0.097***		0.144***		0.142***
	(0.025)		(0.041)		(0.041)
Source press	0.029*		0.013		0.008
	(0.017)		(0.027)		(0.028)
Source chambers	-0.001		-0.057*		-0.061*
	(0.020)		(0.034)		(0.034)
Source models	0.047**		0.036		0.034
	(0.021)		(0.033)		(0.033)
Source advisors	0.021		-0.006		-0.010
	(0.022)		(0.035)		(0.035)
Decision makers		0.008	0.110***		0.107***
		(0.019)	(0.040)		(0.041)
Advisors		-0.070***	-0.084***		-0.085***
		(0.018)	(0.032)		(0.032)
Use budget				0.021	0.016
				(0.017)	(0.024)
Use pricing				0.037*	0.024
				(0.020)	(0.030)
Use wages				0.047**	0.024
				(0.022)	(0.033)
Differentiate Horizons					
$E_{it-1}(\pi_{h=t+12})$	-0.070***	-0.070***	-0.070***	-0.070***	-0.070***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Source CB	0.483***	0.483***	0.483***	0.483***	0.483***
	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)
Source gov.	0.148***	0.148***	0.148***	0.148***	0.148***
	(0.044)	(0.044)	(0.044)	(0.044)	(0.044)
Source INE	0.273***	0.273***	0.273***	0.273***	0.273***
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Source press	-0.012	-0.012	-0.012	-0.012	-0.012
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)
Source chambers	-0.112**	-0.112**	-0.112**	-0.112**	-0.112**
	(0.045)	(0.045)	(0.045)	(0.045)	(0.045)
Source models	-0.075	-0.075	-0.075	-0.075	-0.075
	(0.048)	(0.048)	(0.048)	(0.048)	(0.048)
Source advisors	-0.123**	-0.123**	-0.123**	-0.123**	-0.123**
	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
Decision makers	0.091	0.091	0.091	0.091	0.091
	(0.076)	(0.076)	(0.076)	(0.076)	(0.076)
Advisors	0.209***	0.209***	0.209***	0.209***	0.209***
	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
DM#CB	0.308***	0.308***	0.308***	0.308***	0.308***
	(0.104)	(0.104)	(0.104)	(0.104)	(0.104)
Adv#CB	-0.482***	-0.482***	-0.482***	-0.482***	-0.482***
	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)
N Obs	4,693	4,693	4,693	4,693	4,693
N Censored	1,813	1,813	1,813	1,813	1,813
Mills ratio	0.374	-0.090	0.793	-0.118	0.794
SE Mills	0.085	0.046	0.168	0.044	0.169
Time fixed effects	Yes	Yes	Yes	Yes	Yes

* p<0.10, ** p<0.05, *** p<0.01

In the estimation of Equation 8, the official information sources are the most important factor to explain a convergence in inflation expectations. In particular, using the central bank source has a positive, statistically significant, and robust coefficient. Additionally, we can state that those firms that answer the BES through external advisors have a higher probability of expecting higher inflation in the 24 months horizon than in the 12 months horizon, i.e. to show divergence in inflation expectations. In contrast, firms that respond to the survey through decision-makers have a higher probability of converging in their expectations.

These results highlight the importance of official information to explain the dynamics of inflation expectations. In particular, the information provided by the central bank is the one with the greatest statistical and economic significance to explain the differentiation of inflation expectation over the different horizons of projection. Moreover, it also has a positive impact on the probability that firms show a downward trajectory of their inflation expectations.

We carry out rolling estimations to assess the robustness of the previous results, as well as to determine if the probability of convergence based on the information provided by the central bank has changed in the period under analysis. More precisely, we use a 6 months window and rolling quarterly. Tables 3 and 4 in the Appendix show the detailed results.

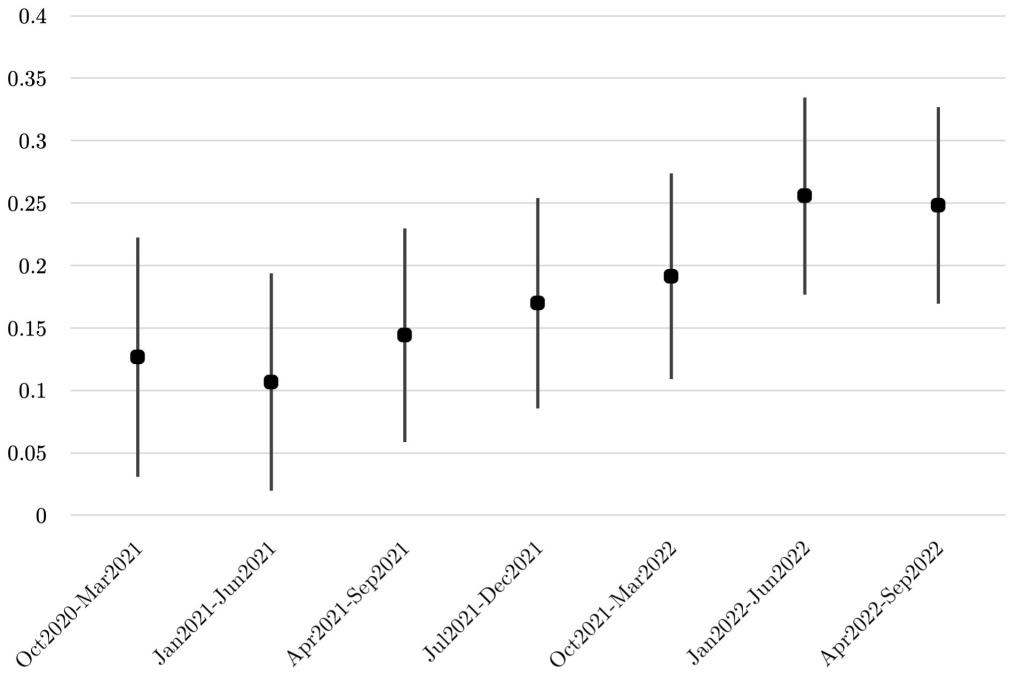


Figure 8: Probability of convergence in expectations if informed through the central bank

Figure 8 presents the probability of convergence using central bank communication as an information source. These probabilities are calculated as marginal effects over the estimated coefficients for that variable in Equation 8. The probability of predicting a lower inflation rate in the 24 months horizon with respect to the 12 months horizon raised from 13% in 2020 to

25% in 2022. However, this economically significant increase is not statistically significant, since this variation is included in the estimation confidence interval.

6 Conclusions

Sixty years ago, Milton Friedman provocatively concluded: *Inflation is always and everywhere a monetary phenomenon* (Friedman (1963)). Since then, a consensus has emerged about that the main mandate for central banks should be to achieve a low and stable level of inflation. Understanding the determinants of inflation and inflation expectations are central for this goal. As discussed above, different factors affect inflation expectations across countries and also across different types of agents within a country.

This work analyzes the evolution of inflation expectations by firms in Uruguay, an emerging economy that has faced relatively more difficulties to reign on inflation in comparison to advanced economies. However, as suggested by Candia *et al.* (2022), these difficulties of controlling inflation in emerging economies implies that firms would be more attentive about the inflation dynamics in these economies. We explore this potential attention in inflation expectations by firms in Uruguay, finding evidence that inflation expectations by firms in Uruguay can influence the dynamics of actual inflation. We also find that firms that are aware about the Central Bank information tends to expect a convergence of inflation. These results suggest the potential benefits of using intelligently and coherently the communication strategies by the Central Bank of Uruguay to shape inflation expectations and actual inflation.

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Appendix

Table 3: Convergency models rolling estimation

Convergence	R1	R2	R3	R4	R5	R6	R7
$E_{it-1}(\pi_{h=t+12})$	-0.072***	-0.074***	-0.072***	-0.076***	-0.084***	-0.084***	-0.087***
	(0.012)	(0.012)	(0.010)	(0.011)	(0.013)	(0.012)	(0.015)
Source CB	0.186***	0.187***	0.183***	0.204***	0.222***	0.229***	0.277***
	(0.046)	(0.047)	(0.043)	(0.048)	(0.055)	(0.053)	(0.074)
Source gov.	0.084**	0.098**	0.084**	0.083**	0.107***	0.116***	0.135***
	(0.040)	(0.042)	(0.035)	(0.036)	(0.041)	(0.039)	(0.049)
Source INE	0.123***	0.135***	0.126***	0.125***	0.118**	0.113**	0.124**
	(0.044)	(0.045)	(0.039)	(0.042)	(0.047)	(0.047)	(0.061)
Source press	0.032	0.025	0.016	0.014	-0.012	-0.027	-0.049
	(0.031)	(0.031)	(0.028)	(0.029)	(0.034)	(0.033)	(0.041)
Source chambers	-0.062	-0.070*	-0.047	-0.043	-0.032	-0.017	-0.029
	(0.040)	(0.040)	(0.035)	(0.036)	(0.042)	(0.040)	(0.049)
Source models	0.101***	0.089**	0.081**	0.081**	0.065	0.048	0.023
	(0.039)	(0.038)	(0.034)	(0.035)	(0.040)	(0.039)	(0.048)
Source advisors	-0.052	-0.051	-0.044	-0.020	-0.024	-0.003	-0.014
	(0.046)	(0.047)	(0.041)	(0.042)	(0.046)	(0.044)	(0.053)
Decision makers	0.049	0.047	0.036	0.063	0.082*	0.080*	0.103*
	(0.044)	(0.044)	(0.039)	(0.045)	(0.050)	(0.048)	(0.060)
Advisors	-0.070*	-0.071*	-0.080**	-0.063*	-0.063	-0.046	-0.070
	(0.037)	(0.037)	(0.034)	(0.034)	(0.039)	(0.038)	(0.046)
Differentiate Horizons							
$E_{it-1}(\pi_{h=t+12})$	-0.072***	-0.073***	-0.069***	-0.068***	-0.064***	-0.061***	-0.061***
	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Source CB	0.337***	0.348***	0.363***	0.356***	0.374***	0.410***	0.435***
	(0.090)	(0.086)	(0.085)	(0.083)	(0.082)	(0.080)	(0.079)
Source gov.	0.178***	0.201***	0.173***	0.144**	0.133**	0.129**	0.135**
	(0.069)	(0.066)	(0.065)	(0.064)	(0.063)	(0.062)	(0.061)
Source INE	0.221***	0.230***	0.215***	0.219***	0.206***	0.229***	0.241***
	(0.075)	(0.072)	(0.071)	(0.070)	(0.069)	(0.068)	(0.067)
Source press	0.055	0.031	0.007	-0.008	-0.033	-0.052	-0.075
	(0.062)	(0.059)	(0.058)	(0.058)	(0.057)	(0.056)	(0.056)
Source chambers	-0.116	-0.124*	-0.101	-0.102	-0.099	-0.076	-0.086
	(0.071)	(0.068)	(0.067)	(0.066)	(0.065)	(0.064)	(0.063)
Source models	0.058	0.019	0.038	0.022	0.008	-0.022	-0.060
	(0.076)	(0.072)	(0.071)	(0.070)	(0.068)	(0.067)	(0.066)
Source advisors	-0.241***	-0.250***	-0.251***	-0.218***	-0.183**	-0.154**	-0.145**
	(0.079)	(0.075)	(0.074)	(0.073)	(0.072)	(0.071)	(0.070)
Decision makers	-0.080	-0.057	-0.082	-0.018	-0.054	-0.043	-0.007
	(0.120)	(0.114)	(0.112)	(0.111)	(0.108)	(0.107)	(0.105)
Advisors	0.096	0.107	0.090	0.111	0.123	0.187**	0.161*
	(0.106)	(0.102)	(0.100)	(0.098)	(0.096)	(0.095)	(0.094)
DM#CB	0.497***	0.458***	0.507***	0.512***	0.539***	0.507***	0.463***
	(0.164)	(0.156)	(0.153)	(0.151)	(0.148)	(0.146)	(0.144)
Adv#CB	-0.357**	-0.365***	-0.364***	-0.306**	-0.329**	-0.393***	-0.338***
	(0.139)	(0.134)	(0.131)	(0.130)	(0.128)	(0.127)	(0.126)
N Obs	2,012	2,175	2,225	2,268	2,310	2,350	2,396
N Censored	709	790	828	857	890	924	955
Mills ratio	0.607	0.630	0.555	0.591	0.689	0.679	0.828
SE Mills	0.196	0.198	0.168	0.187	0.205	0.189	0.256
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* p<0.10, ** p<0.05, *** p<0.01

Table 4: Convergency models rolling estimation

Convergence	R8	R9	R10	R11	R12	R13
$E_{it-1}(\pi_{h=t+12})$	-0.084***	-0.088***	-0.111***	-0.108***	-0.098***	-0.101***
	(0.017)	(0.018)	(0.021)	(0.022)	(0.019)	(0.019)
Source CB	0.305***	0.312***	0.368***	0.380***	0.341***	0.345***
	(0.088)	(0.087)	(0.101)	(0.099)	(0.084)	(0.083)
Source gov.	0.143***	0.137**	0.163***	0.156**	0.146***	0.155***
	(0.055)	(0.056)	(0.063)	(0.062)	(0.053)	(0.052)
Source INE	0.110*	0.127*	0.140*	0.176**	0.149**	0.170**
	(0.067)	(0.068)	(0.076)	(0.080)	(0.067)	(0.070)
Source press	-0.050	-0.057	-0.042	-0.037	-0.025	-0.014
	(0.047)	(0.048)	(0.053)	(0.053)	(0.046)	(0.046)
Source chambers	-0.028	-0.030	-0.054	-0.056	-0.049	-0.056
	(0.055)	(0.054)	(0.062)	(0.062)	(0.054)	(0.055)
Source models	0.028	0.014	0.015	-0.040	-0.027	-0.037
	(0.053)	(0.054)	(0.063)	(0.068)	(0.057)	(0.058)
Source advisors	-0.035	-0.025	-0.009	0.018	0.027	0.046
	(0.060)	(0.059)	(0.067)	(0.066)	(0.057)	(0.056)
Decision makers	0.116*	0.119*	0.140*	0.168**	0.168**	0.175**
	(0.069)	(0.068)	(0.077)	(0.079)	(0.069)	(0.069)
Advisors	-0.091*	-0.110**	-0.136**	-0.113*	-0.102*	-0.093*
	(0.052)	(0.053)	(0.061)	(0.061)	(0.052)	(0.052)
Differentiate Horizons						
$E_{it-1}(\pi_{h=t+12})$	-0.054***	-0.064***	-0.073***	-0.072***	-0.072***	-0.074***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Source CB	0.476***	0.518***	0.567***	0.556***	0.582***	0.585***
	(0.078)	(0.078)	(0.077)	(0.076)	(0.076)	(0.075)
Source gov.	0.135**	0.153**	0.154***	0.129**	0.130**	0.128**
	(0.061)	(0.060)	(0.060)	(0.059)	(0.058)	(0.058)
Source INE	0.223***	0.248***	0.235***	0.274***	0.268***	0.305***
	(0.066)	(0.066)	(0.064)	(0.064)	(0.063)	(0.062)
Source press	-0.086	-0.114**	-0.085	-0.067	-0.052	-0.056
	(0.055)	(0.055)	(0.054)	(0.054)	(0.053)	(0.053)
Source chambers	-0.110*	-0.097	-0.096	-0.087	-0.104*	-0.113*
	(0.062)	(0.061)	(0.060)	(0.060)	(0.059)	(0.059)
Source models	-0.065	-0.078	-0.108*	-0.160**	-0.151**	-0.163***
	(0.065)	(0.065)	(0.064)	(0.063)	(0.062)	(0.062)
Source advisors	-0.148**	-0.146**	-0.136**	-0.095	-0.081	-0.042
	(0.069)	(0.068)	(0.067)	(0.066)	(0.066)	(0.065)
Decision makers	0.077	0.111	0.170*	0.163	0.207**	0.210**
	(0.104)	(0.102)	(0.101)	(0.100)	(0.099)	(0.098)
Advisors	0.149	0.177*	0.198**	0.237***	0.275***	0.281***
	(0.093)	(0.092)	(0.091)	(0.090)	(0.089)	(0.089)
DM#CB	0.329**	0.266*	0.161	0.199	0.164	0.176
	(0.142)	(0.141)	(0.139)	(0.137)	(0.136)	(0.136)
Adv#CB	-0.385***	-0.450***	-0.514***	-0.514***	-0.558***	-0.564***
	(0.124)	(0.124)	(0.122)	(0.121)	(0.120)	(0.119)
N Obs	2,443	2,495	2,561	2,610	2,649	2,681
N Censored	979	1,004	1,038	1,065	1,086	1,104
Mills ratio	0.924	0.940	1.091	1.118	0.973	0.972
SE Mills	0.311	0.301	0.340	0.333	0.275	0.269
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

* p<0.10, ** p<0.05, *** p<0.01