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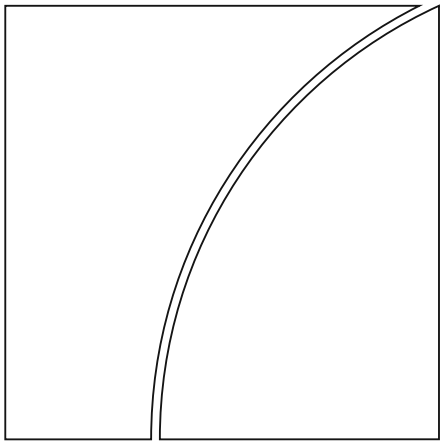

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by Ana Aguilar-Argaez, Carlo Alcaraz Pribaz, Victoria Nuguer and Jessica Roldán-Peña

Monetary and Economic Department

June 2022

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Monetary Policy Announcements and Expectations: The Case of Mexico*

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June 8, 2022

Abstract

In this paper we study the effects of Mexico's Central Bank monetary policy decisions on the expectations about inflation and monetary policy rate expectations of private forecasters. We estimate a fixed effect model at analyst level using a panel of professional forecasters from 2010 to 2017. We study the differences in expectations before and after a monetary policy announcement and we compare them when there are no announcements. We find that professional forecasters "listen" to the central bank, i.e. the changes in their short-run expectations are different when there are monetary policy announcements. Also, we find that analysts' surprises in realized inflation affect short-term inflation expectations but do not affect

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long-term inflation expectations suggesting anchored inflation expectations. Additionally, monetary policy surprises have an impact on end-of-the-year inflation expectations and reference rate expectations.

JEL Classification: E43; E59; D84; C83
Keywords: Central bank communication; Survey microdata; monetary policy interest rate expectations

1 Introduction

The literature has shown that the effectiveness of monetary policy depends on public understanding the central banks' decisions (Bernanke (2004, 2013) and Woodford (2005)). One key channel of the transmission mechanism from policy actions to the economy is through agents' expectations. Most central banks have implemented an inflation targeting regime as a strategy to anchor the public's inflation expectations. This framework has proven to be effective on reducing inflation and inflation expectations in many emerging market economies (EME) (Capistrán and Ramos-Francia, 2010, De Mello and Moccero, 2009). Mexico implemented inflation targeting in 2003 and the central bank have been improving its communications. Private sector analysts shape their expectations in response to Central Bank announcements and data releases. A relevant issue for monetary authorities is if long-term inflation expectations are anchored around the target even during uncertain times or data surprises.

In this paper, we study the effect of monetary policy announcements (MPA) on professional forecasters' expectations. We have used a novel dataset from the Citibanamex Survey with economic variables expectations such as inflation and the reference rate (monetary policy rate) from economic analysts. The survey is conducted twice monthly and there are eight monetary policy decisions per year, so we can compare surveys just before and after each policy decision.

For the analysis, first we look at the determinants of inflation expectations (short and long-term) and reference rate expectations before and after a MPA. Second, the survey findings point to the direction and timing of the next monetary policy decision expected by economic analysts. Thus, we are able to study the determinants of changes on the timing of the next reference rate movement and how inflation data and central bank announcements affect them. The benchmark we use for comparison is the surveys in which there are no MPA.

We find that monetary policy surprises, defined as the difference between

the observed and the expected reference rate, matter for end-of-the-year inflation and reference rate expectations. Moreover, the monetary surprises are also significant for the timing of the next movement of the reference rate. Professional forecasters update their expectations with the information that comes after the Monetary Policy Committee's meetings.

In general, inflation surprises do not change the expected rate since there could be considered short-term pressures on inflation and not change significantly the projected inflation in the medium term. The data and econometric strategy used in this study do not allow to know if those inflation surprises are related to demand or supply shocks. Reference rates should react to persistent demand shocks and to changes in medium-term inflation expectation this topic is out of the scope of this paper and it could covered in further research. This specific topic could be an area of opportunity for further research about central bank communication, since there seem to be a misunderstanding of what the central bank would do when inflation is higher than expected. In this sense, in 2021 and with the high uncertainty due to the Covid-19 pademic, the central bank decided to increase transparency and to publish their inflation projections for two years ahead in every MPA, so the public can understand better the decision.

To the best of our knowledge, our paper is the first one to study how monetary policy announcements shape end-of-the-year inflation and monetary policy rate expectations in an EME, such as Mexico. Moreover, we are able to look at changes in the expectations on the next movement of the reference rate due to the features of the survey we use. This variable is usually not included in similar surveys, and analyzing this type of information helps to understand how professional forecasters build their expectations.

Related Literature Our paper is related to the literature that relates to how communication of the central bank might shift expectations regarding inflation, monetary policy, or financial markets in general. Rosa and Verga (2007) look at effectiveness of the ECB communication policy, while Reeves and Sawicki (2007) study the market's reaction to the Bank of England's communication. Both papers find evidence of communication affecting short-term market expectations and taking them closer to the actual ones. Miah et al. (2016) analyze 20 emerging markets and 10 developed economies, and find that forecasters do not use available information efficiently. Garcia-Herrero et al. (2015) study how financial markets (in terms of volatility and volume in the money market rates) react to the communication of the Bank of Mexico's monetary policy decision. Their results

show evidence of effective oral and written communication from the policy maker towards domestic money markets. The analysis of EME's cases started recently and is still incipient due to data availability. We show that expectations in Mexico react to monetary policy announcements in the predicted manner.

Due to the relevance of inflation expectations for the inflation targeting regime of monetary policy, surveys on inflation expectations have gained interest. In particular, professional forecasters' surveys helped to reduce disagreement on inflation expectations in inflation targeting regimens (Brito et al., 2018, Capistrán and Ramos-Francia, 2010). Baghestani and Marchon (2012) look at the Brazilian case and find that the transparency that came with the inflation targeting has contributed to anchoring expectations. Coibion et al. (2018) study firms' macroeconomic expectations in New Zealand and find that firms' inflation expectations are much higher than the inflation target because of incentives to collect and process information. We contribute to this literature by using private forecasters expectations and studying their determinants in an inflation targeting regime in an EME such as Mexico.

We use a survey to professional forecasters because in Mexico there is no other source of information on inflation expectations. We understand this is a limitation of the data and the relevance of surveys to firms and households. Nevertheless, looking at professional forecasters surveys in Mexico is interesting because it allows us to analyze the effects of MPA, as part of the communication toolkit, in a country that has have surveys on expectations for several years now and the inflation targeting regime is well established.

The paper is organized as follows. In Section 2 we characterize the survey and the observed data that we use. Additionally, we describe the time series and the empirical model. In Section 3 we present our main results. Lastly, in Section 4 we present the final remarks.

2 Data, Descriptive Statistics and Empirical Model

2.1 Data

We constructed a panel dataset with published economic variables and Citibanamex surveys to professional forecasters that include questions about their expectations on inflation, GDP, exchange rate, and policy rate. Regarding inflation, professional forecasters respond questions about their expectations on core and general inflation, for the previous fortnight, month, end-of-the-current-year, end-of-the-next-year and the average for the next

two to six years. Regarding GDP and exchange rate, they have to answer their expectations about end-of-the-current and -next year. Finally, they are also asked about when they expect the next movement of the interest rate is going to be and which will be the magnitude, together with the closing rate for the current and the next year. Citibanamex publishes the survey bimonthly— once every fortnight— in pdf version, two to four days before the National Institute of Statistics and Geography (INEGI, in Spanish) publishes inflation data for the previous fortnight. We compile all the surveys from January 2010 to December 2017 in order to create the database. It is worth noting that some analysts did not respond every survey during our study period, and sometimes analysts did not answer all questions in the survey. Thus, we have an unbalanced panel dataset with twenty-nine analysts.[1] We also run regressions of the main specifications with a balanced panel of the 10 main banks and the results (available upon request) do not change substantially.

We constructed the following variables: (1) inflation and monetary policy surprises, defined as observed minus expected, (2) changes in inflation, policy rate, GDP growth, and nominal exchange rate level expectations, at the end-of-the-current year and end-of-next year, as well as (3) the accumulated changes in the policy rate for that year and the lagged monthly inflation rate. In Table A.1 we include a detailed description of the variables.

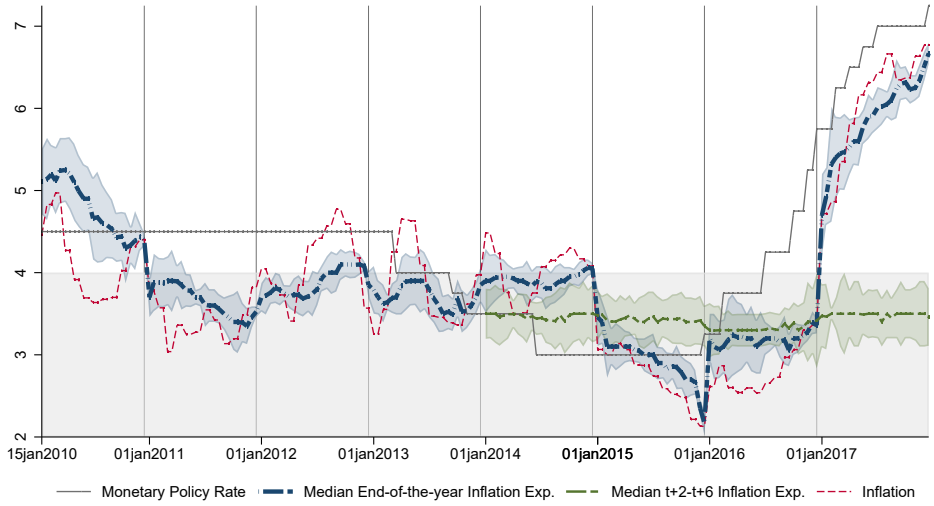
In order to match the economic time series with the survey, we assign the former to the fortnight corresponding to the survey's publication date. We are interesting on evaluating the effects of the MPA, then, we take the difference between the data of the survey before and after the monetary policy decisions; we use the change in the surveys without monetary policy decision as benchmark. On three occasions the day of the publication of the survey coincided with the monetary policy decision.[2] In these cases, the survey was released a couple of hours after the monetary policy decision and, thus, we considered such surveys in our database as published after the decision. We capture 68 monetary policy decisions, most of them within a pre-fixed calendar.

In addition, Citibanamex survey ask forecasters their end-of-the-year policy rate's expectation. We used this information to calculate the difference in policy rate expectations before and after the last decision of the year.

[1] We excluded four analysts from the sample because the number of observations was too small.

[2] The dates for these events are September 5, 2014, December 5, 2014 and March 18, 2016.

Fig. 1. Reference interest rate, inflation rate, and inflation expectations



Source: Own calculations with data from Banco de México, INEGI, and Citibanamex Survey. The grey area represents the interval of variability of Banxico's inflation target of 3 percent

However, Citibanamex did not ask this question in the post decision surveys of December 2015 and 2016. Therefore, in both cases we set analysts' end-of-the-year policy rate expectations at the level set in the last monetary policy decision of the corresponding year.

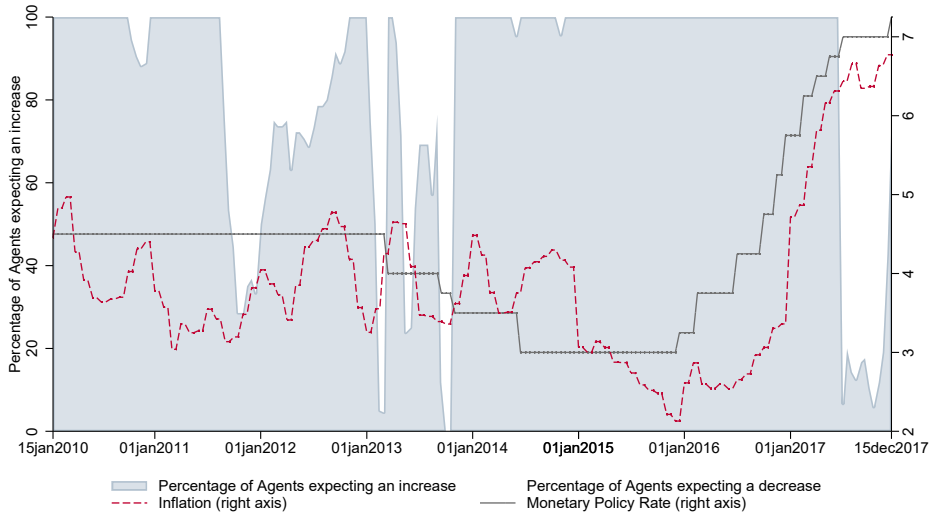
2.2 Descriptive Statistics

We look at the period starting in January, 2010 up to December, 2017, because of data availability. In this subsection we describe the observable data (the monetary policy rate and inflation) and some characteristics of the data on expectations that we use in our analysis.

In Figure 1, we plot the monetary policy rate, the observed inflation. We also include the median of the end-of-the-year and median of the average for the next 2 to 6 years inflation expectations, the areas around these lines correspond to the interquartile deviation for each survey. The vertical lines correspond to the last survey of the year.

From the figure, we learn that for the first part of our sample, from January, 2010 until March, 2013, the monetary policy rate remained fixed at 4.5 percent, as a response to the latest financial crisis; since then, in

Fig. 2. Percentage of analysts that expect increase or decrease in the policy rate's next move



Source: Own calculations with data from Citibanamex Survey.

nearly 18 months, the Bank of Mexico reduced the monetary policy rate to 3 percent. Since June, 2014 and until December, 2015, the Monetary Policy Committee maintained the monetary policy rate at it lowest level. Afterwards, as a result of inflationary pressures started a period of monetary policy tightening. The reference interest rate reached 7.25 percent at the end of the sample. During most part of the period, around 60% of our sample, annualized inflation has remained inside the boundaries of the Bank of Mexico's inflation target; the most notably exception is 2017, year in which inflation increased to almost 7 percent. In this context, long-run inflation expectations (measured as the median of the average for the next 2 to 6 years) have remained stable at around 3.4 percent, while shorter term (end-of-the-current-year) inflation expectations have moved with observed inflation (with a correlation coefficient of 0.92).

One of the variables included in the Citibanamex Survey, and is rare for EME, is the next monetary policy "call". In Figure 2, we plot the percentage of forecasters that expect an increase (or a decrease) in the following interest rate movement. We also include the monetary policy rate together with the inflation rate. During the studied period, in general, analysts expected an increase in the interest rate (blue area): 85 percent of the time professional forecasters expected a rise in the interest rate, while only 15

percent expected a reduction.[3] There are other interesting points to emphasize. First during the start of our study period with no changes in the monetary policy rate (Jan-2010 to Mar-2013), most analysts were expecting an increase in the interest rate, suggesting that they thought that such rate was at its lowest point. However, after a period of stability and important economic reforms that suggested a structural change in the economy, the Monetary Policy Committee decided to decrease the reference rate in 2013. The percentage of analysts expecting a reduction started increasing only three months before the actual reduction in the monetary policy rate. Second, when the reference interest rate reached 7 percent in June 2017, forecasters estimated that the interest rate was at its celling and expected a reduction in the next movement that did not materialized. In fact, the Monetary Policy Committee decided to increase the reference rate again in December 2017. This "unexpected" movement in the interest rate was not necessarily a problem in the Central Bank communication since the Mexican economy experimented a sequence of additional supply inflationary shocks that hampered the inflation convergence to Bank of Mexico's inflation target.

Table A.2 shows the summary statistics of the variables included in our regressions (in Table A.3 we show the summary statistics for the variables in levels). We can observe that the medians of almost all variables are zero, except for that of the inflation surprise —that is slightly negative— and of the lagged annual inflation rate —that is closed to 3.5 percent. Therefore, we do not observe a systematic bias in the forecasters' medians. The interquartile ranges of the variables constructed from the survey are close to zero because the medians are zero, except for the interquartile range of the inflation surprise. The standard deviations for the accumulated changes in the policy rate and the lagged annual inflation rate were lower for the later period (2016-2017) than for the complete period.

2.3 Econometric Analysis

We estimate a fixed-effects regression with the expected end-of-the-year reference rate and inflation expectations as dependent variables. Analyst fixed effects allow us to control for observable and unobservable characteristics at analyst level that do not change over time and could simultaneously affect the dependent and the independent variables. This addresses possible endogeneity problems related to constant-in-time unobservables. For example,

[3] Something to consider is the short period of analysis, since we are not considering a full business cycle or monetary policy cycle.

the presence of systematic bias among professional forecasters could affect the results in a traditional econometric setting that uses the variables in levels. Ehrbeck and Waldmann (1996) showed that systematic bias is indeed a characteristic amidst professional forecasters. If analysts with a particular characteristic predominately enter the sample in a specific period of time, say, when a movement in the reference interest rate becomes imminent more "systematically biased" analysts enter the sample, the coefficients estimated with a pooled regression could be biased. However, because the panel fixed effects model only uses the information of changes in time of the same analyst (Angrist and Pischke, 2009), this regression is less prone to this type of bias. In other words, any unobserved or observed characteristic that does not change in time is captured in the fixed effects term at analyst level and it will not bias the results. However, we do not know if an analyst changes or goes to another institution, so we cannot control for that, we abuse the terminology and we refer to analyst or institution indistinctly. Additionally, panel data fixed effects models are particularly useful in this setting because they capture the behavior of the relationship between the relevant variables in time and also identify changes in time of this relationship.

We run three sets of regressions with alternative dependent variables. The first set of regressions includes differences in analyst's inflation expectations, the second has the change in the end-of-the-year monetary policy rate expectation, and, the third studies the change in the analysts "call".

In the first set we use $(\Delta E_{it}\pi^{x})$, where x corresponds to two different periods of time; the short-term one, that corresponds to end-of-the-year inflation expectations, and the longer-term one, that is the average expected inflation between 2 and 6 years from the time of the survey. Both regressions are shown below, for every institution i, at time t:

$$\begin{aligned}\Delta E_{it}\pi^{\text{end y}} &= \beta_0 + \beta_1\pi^{\text{surp}}_{it-1} + \beta_2 r^{\text{surp}}_{it-1} + \beta_3\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right) \\ &+ \beta_4\Delta E_{it}\left(\text{NER}^{\text{end y}}\right) + \beta_5\sum_{\text{jan}}^{t-1}\Delta r \\ &+ \beta_6\pi^{\text{monthly}}_{t-1} + m + y + p_i + \varepsilon_{it} \qquad (1)\end{aligned}$$

and

$$\begin{aligned}\Delta E_{it}\pi^{\text{y+2, y+6}} &= \beta_0 + \beta_1\pi^{\text{surp}}_{it-1} + \beta_2 r^{\text{surp}}_{it-1} + \beta_3\Delta E_{it}\left(\text{GDP}^{\text{end y+1}}\right) \\ &+ \beta_4\Delta E_{it}\left(\text{NER}^{\text{end y+1}}\right) + \beta_5\Delta E_{it}\left(r^{\text{end y+1}}\right) + \beta_6\sum_{\text{jan}}^{t-1}\Delta r \\ &+ \beta_7\pi^{\text{monthly}}_{t-1} + m + y + p_i + \varepsilon_{it}, \qquad (2)\end{aligned}$$

where we include the inflation surprise (the difference between observed and expected monthly inflation), π^{surp}_{it-1}, the monetary surprise (the difference between observed and expected change in the monetary policy rate), r^{surp}_{it-1}, the change in the end-of-the-year expected GDP growth, $\Delta E_{it}\left(\text{GDP}^{\text{end y+1}}\right)$, the change in the end-of-the-year expected nominal exchange rate, $\Delta E_{it}\left(\text{NER}^{\text{end y+1}}\right)$, the year-cumulative sum of the changes in the reference rate, $\sum_{\text{jan}}^{t-1}\Delta r$, the monthly inflation rate, $\pi^{\text{monthly}}_{t-1}$, month fixed-effect, m, year fixed-effect, y, and analyst fixed-effect, p_i. In the longer-term regression we also include the change in the end-of-the-year reference rate, $\Delta E_{it}\left(r^{\text{end y+1}}\right)$, we do not include such variable in the shorter-term inflation regression expectation because movements in that year monetary rate will not have an impact on that year's inflation due to the time that monetary policy has to be effective.

The second group of regressions has as dependent variable the change in the end-of-the-year monetary policy rate expectation. The specification reads as follows, using the same notation as in the previous one,

$$\begin{aligned}\Delta E_{it}r^{\text{end y}} &= \beta_0 + \beta_1\pi^{\text{surp}}_{it-1} + \beta_2 r^{\text{surp}}_{it-1} + \beta_3\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right) \\ &+ \beta_4\Delta E_{it}\left(\text{NER}^{\text{end y}}\right) + \beta_5\Delta E_{it}\left(\pi^{\text{end y}}\right) + \beta_6\sum_{\text{jan}}^{t-1}\Delta r \\ &+ \beta_7\pi^{\text{monthly}}_{t-1} + m + y + p_i + \varepsilon_{it}. \qquad (3)\end{aligned}$$

However, this regression may present problems because the dependent variable may show little variation since the reference rate remained unchanged during an important part of the study period (see Figure 1). Also, a forecaster may adjust her expectation towards a more restrictive monetary policy stance without changing his end-of-the-year expected interest rate but by moving forward an increase in the interest rate. In order to deal with these potential problems, in this third set of regressions, we create a variable that represents analyst's change in the call of the next movement of the monetary policy reference rate, E_{it}(r call). For example, if a professional forecaster decides to postpone two months his expectation of the next

movement in the monetary policy rate, this variable takes the value 2. We use this variable as dependent variable in our third set of regressions, the equation reads:

$$\begin{aligned}\Delta E_{it}(\text{r call}) &= \beta_0 + \beta_1 \pi^{\text{surp}}_{it-1} + \beta_2 r^{\text{surp}}_{it-1} + \beta_3 \Delta E_{it}\left(\text{GDP}^{\text{end y}}\right) \\ &+ \beta_4 \Delta E_{it}\left(\text{NER}^{\text{end y}}\right) + \beta_5 \Delta E_{it}\left(\pi^{\text{end y}}\right) + \beta_6 \sum_{\text{jan}}^{t-1} \Delta r \\ &+ \beta_7 \pi^{\text{anualized}}_{t-1} + m + y + p_i + \varepsilon_{it}. \end{aligned} \tag{4}$$

This variable shows more variation during the studied period since analysts may change their expected date of next movement in the reference rate at any month even if the expected change is months ahead. Details of variables used in the regressions are in Table A.1. We run the regressions for two different periods. The first one goes from 2010 until 2017. The second one is a subset of the first one, and includes from Dec-2015 until Dec-2017; this period was characterized by important increases in observed inflation and external volatility. We consider that is relevant to also analyze this period in particular in order to verify if the determinants of professional forecasters' expectations changed or remained constant with respect to the full sample. As we previously mentioned, our benchmark for comparison are the same regressions but in periods in which there are no MPA.

3 Results

In Table 1 we report the first set of regressions with analyst's inflation expectations as dependent variable. Columns (1) and (2) have as dependent variable short term inflation expectations, the change in the end-of-the-year inflation expectation, while columns (3) and (4)'s dependent variable are long term inflation expectations, the change in the t+2 to t+6 inflation expectation. Column (1) includes the surveys from Jan-2010 until Dec-2017; columns (2) and (4) include the surveys in 2016 and 2017; while column (3) includes data from Jan-2014 until Dec-2017 due to data availability. It is relevant to note that surprises in inflation data affect only short-term inflation expectations and have no effect on long-term expectations. This reveals anchoring of inflation expectations in Mexico. A surprise in the monetary policy i.e., that the reference rate turned out to be higher than the expected rate (more restrictive stance), has a positive effect on the inflation expectations at the end of year. A possible explanation of this result is that a private forecaster with a higher observed rate than expected is surprised

because the central bank has information that the analyst could not observe or interpret; all these indicate higher inflationary pressures and, as a result, analysts rise inflation expectations. Another evidence of anchored inflation expectations is the fact that monetary policy surprises have no effect on long term expectations. In general, an increase in the GDP growth expectations may reveal demand pressures and, as a result, more inflationary pressures which would suggest a positive relationship between both variables. However, the coefficient of this variable is always non significant. This result could reveal that, during the period of study, there were no significant demand pleasures which is consistent with the narrative of the all Inflation Reports published during the period of study that never identified demand inflationary pressures. Depreciation of expected nominal exchange rate at the end of the year has a positive effect on inflation expectations on specifications that only include the last two years of the sample, included longer term inflation expectations. This reflects that, in general, analyst consider depreciations as a serious risk to inflation.

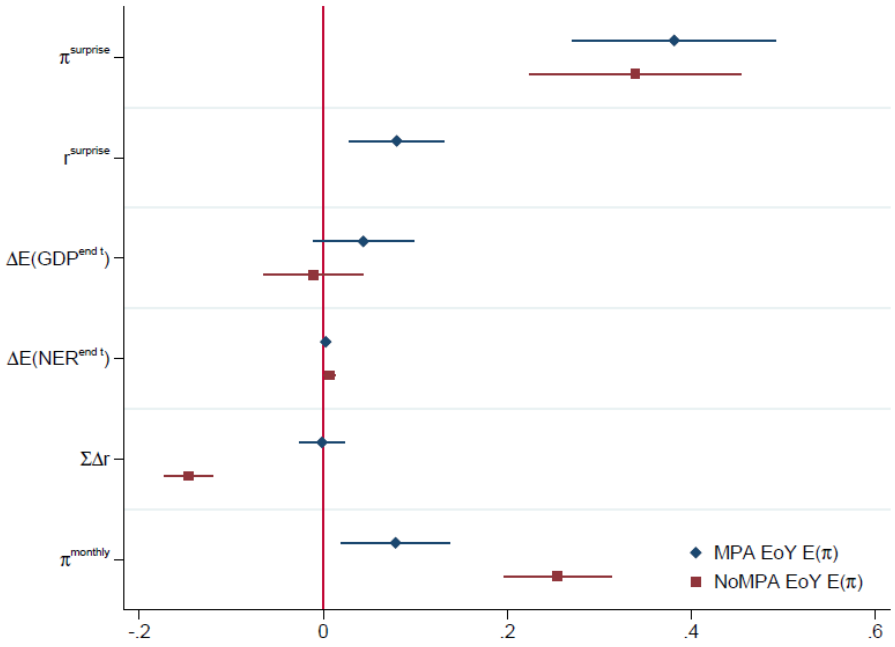
MPA could modify the effects of our independent variables on analyst's expectations. In general, the days in which the central bank communicates its monetary policy decisions are fixed in advanced, except for extraordinary meetings. When there are monetary policy decisions, analysts could put more attention on the Mexico's Central Bank's communique and reduce the relevance of other variables to modify their expectations. To analyze this point, in Table 2 we show the same regressions of Table 1 but only in periods without MPA; we compare the results between these two sets of regressions. To facilitate the comparison, in Figure 3 we present the coefficients of both sets of regressions for short-term inflation expectations and full sample (column 1). There are several results worth noticing from comparing Table 1 and Table 2. First, when we look without MPA (Table 2), the coefficients of all the variables for the long-run inflation expectations regressions remain non-significant (columns 3 and 4), this is evidence of anchored inflation expectations. Second, in contrast with the regressions that include MPA (Table 1), the end-of-the-year exchange rate expectations become significant for the full sample (column 1, Table 2). Third, the inflation surprise coefficient becomes negative to explain end-of-the year inflation expectations in the regression that includes only latest data 2016-2017 (column 2). This coefficient is counterintuitive and could be explained by the unusual variation that experimented our data during this particular period. Fourth, inflation seems to affect more expectations at the end of the year when there are no MPA. Finally, the fact that the cumulative sum of changes in the interest rate has a negative effect on short term inflation expectations when

Tab. 1. Results from Fixed-Effect Estimations with End-of-the-Year Inflation Expectations and t+2,t+6 Inflation Expectations as Dependent Variables with Monetary Policy Announcements

Dependent Variable:	$\Delta E_{it}\left(\pi^{\text{end y}}\right)$		$\Delta E_{it}\left(\pi^{\text{end y, t+2,t+6}}\right)$	
	(1)	(2)	(3)	(4)
Sample:	All	Latest	All	Latest
π_{t-1}^{surp}	0.3820***	0.3520**	0.0480	0.0264
	(0.0538)	(0.1610)	(0.0329)	(0.0632)
r_{t-1}^{surp}	0.0799**	0.1180***	-0.0227	-0.0200
	(0.0253)	(0.0364)	(0.0272)	(0.0331)
$\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right)$	0.0436	-0.0981		
	(0.0268)	(0.0742)		
$\Delta E_{it}\left(\text{NER}^{\text{end y}}\right)$	0.0028	0.0073**		
	(0.0017)	(0.0028)		
$\sum_{\text{jan}}^{t-1}\Delta r$	-0.0013	-0.0159	0.0307	0.0289
	(0.0119)	(0.0242)	(0.0210)	(0.0268)
$\pi_{t-1}^{\text{monthly}}$	0.0787**	0.1020	-0.0214	-0.0743
	(0.0286)	(0.1600)	(0.0609)	(0.111)
$\Delta E_{it}\left(\text{GDP}^{\text{end y,t+1}}\right)$			-0.0011	-0.0309
			(0.0320)	(0.0460)
$\Delta E_{it}\left(\text{NER}^{\text{end y,t+1}}\right)$			0.0027	0.0047**
			(0.0019)	(0.0018)
$\Delta E_{it}\left(\text{r}^{\text{end y,t+1}}\right)$			0.0159	-0.0065
			(0.0248)	(0.0357)
Constant	-0.0058	-0.2880***	0.0330	0.0250
	(0.0237)	(0.0718)	(0.0221)	(0.0575)
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Analyst FE	Yes	Yes	Yes	Yes
Observations	1,104	302	500	273
R-squared	0.203	0.318	0.146	0.238
Number of banks	29	24	24	24

Notes: Columns (1) and (2) have as dependent variable the change in the end-of-the-year inflation expectation, while columns (3) and (4)'s dependent variable is the change in the t+2 to t+6 inflation expectation. Columns (1) includes the surveys from Jan-2010 until Dec-2017; columns (2) and (4) include the surveys in 2016 and 2017; while column (3) includes data from Jan-2014 until Dec-2017, due to data availability. The control variables are: π_{t-1}^{surp}, inflation surprise, defined as the difference between the observed monthly inflation and the expected one; r_{t-1}^{surp}, monetary policy surprise, defined as the difference between the observed monetary policy interest rate and the one expected; $\Delta E_t\left(\text{GDP}^{\text{end y}}\right)$ corresponds to changes in the expected GDP at the end of the year; $\Delta E_t\left(\text{NER}^{\text{end y}}\right)$ is the changes in the expected nominal exchange rate at the end of the year; $\Delta E_t\left(r^{\text{end y}}\right)$ is the variation in the expected monetary policy rate at the end of the year; $\sum_{\text{jan}}^{t-1}\Delta r$ is the yearly accumulated sum of changes in the monetary policy rate; $\pi_{t-1}^{\text{monthly}}$ corresponds to the observed annualized inflation rate. Robust standard errors in parentheses. $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

Fig. 3. End-of-the-year inflation rate coefficient comparison, with and without monetary policy announcements



Source: Own calculations with data from Citibanamex Survey and Banco de México.
Notes: Confidence Interval at 95%, MPA corresponds to surveys when there are monetary policy announcements and NoMPA when there are no monetary policy announcements. Regressions from Table 1 and Table 2, column (1), full sample 2010-2017.

there are no MPA is related to an expected effect of the actions that the central bank has taken, in particular, larger increases in the policy rate drop the end-of-the-year inflation expectations.

Table 3 shows the set of regressions with expected end-of-the-year reference rate as dependent variable. We include the variations when there are MPA, columns (1) and (2), and our benchmark for comparison, when there are no MPA, columns (3) and (4). Columns (1) and (3) include data from Jan-2010 to Dec-2017 and columns (2) and (4) include data from Dec-2015 until Dec-2017. When there are MPA a surprise in inflation does not affect the expected reference interest rate at the end of the year. This suggest that analysts consider that monetary policy cannot affect inflation in the short-run, and that these shocks may be temporary. As expected, a monetary policy surprise has a positive effect on the dependent variable in both

Tab. 2. Results from Fixed-Effect Estimations with Change in End-of-the-Year Inflation Expectations and t+2,t+6 Inflation Expectations as Dependent Variables without Monetary Policy Announcements

Dependent Variable:	$\Delta E_{it}\left(\pi^{\text{end y}}\right)$		$\Delta E_{it}\left(\pi^{\text{end y, t+2,t+6}}\right)$	
	(1)	(2)	(3)	(4)
Sample:	All	Latest	All	Latest
π_{t-1}^{surp}	0.3390***	-0.3000***	0.0058	0.0087
	(0.0560)	(0.127)	(0.0281)	(0.0417)
$\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right)$	-0.0106	-0.1970		
	(0.0264)	(0.1920)		
$\Delta E_{it}\left(\text{NER}^{\text{end y}}\right)$	0.0066**	0.0144*		
	(0.0030)	(0.0084)		
$\sum_{\text{jan}}^{t-1}\Delta r$	-0.1460***	0.1010**	-0.0101	-0.0174
	(0.0127)	(0.0415)	(0.0111)	(0.0391)
$\pi_{t-1}^{\text{monthly}}$	0.2550***	0.0267	0.0067	0.0046
	(0.0285)	(0.0608)	(0.0130)	(0.0142)
$\Delta E_{it}\left(\text{GDP}^{\text{end y,t+1}}\right)$			0.0012	0.0079
			(0.0157)	(0.0164)
$\Delta E_{it}\left(\text{NER}^{\text{end y,t+1}}\right)$			-0.0001	0.0004
			(0.0010)	(0.0016)
$\Delta E_{it}\left(\text{r}^{\text{end y,t+1}}\right)$			0.0094	0.0174
			(0.0120)	(0.0136)
Constant	-0.1110***	0.5490***	-0.0198*	-0.0171
	(0.0224)	(0.0619)	(0.0101)	(0.0145)
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Analyst FE	Yes	Yes	Yes	Yes
Observations	2,283	564	991	481
R-squared	0.264	0.424	0.025	0.018
Number of banks	29	25	25	24

Notes: Columns (1) and (2) have as dependent variable the change in the end-of-the-year inflation expectation, while columns (3) and (4)'s dependent variable is the change in the t+2 to t+6 inflation expectation. Columns (1) includes the surveys from Jan-2010 until Dec-2017; columns (2) and (4) include the surveys in 2016 and 2017; while column (3) includes data from Jan-2014 until Dec-2017, due to availability. The control variables are: π_{t-1}^{surp}, inflation surprise, defined as the difference between the observed monthly inflation and the expected one; r_{t-1}^{surp}, monetary policy surprise, defined as the difference between the observed monetary policy interest rate and the one expected; $\Delta E_t\left(\text{GDP}^{\text{end y}}\right)$ corresponds to changes in the expected GDP at the end of the year; $\Delta E_t\left(\text{NER}^{\text{end y}}\right)$ is the changes in the expected nominal exchange rate at the end of the year; $\Delta E_t\left(r^{\text{end y}}\right)$ is the variation in the expected monetary policy rate at the end of the year; $\sum_{\text{jan}}^{t-1}\Delta r$ is the yearly accumulated sum of changes in the monetary policy rate; $\pi_{t-1}^{\text{monthly}}$ corresponds to the observed monthly inflation rate.

Robust standard errors in parentheses. $^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

periods. Changes in the end-of-the-year GDP growth rate have no effect on the expected end-of-the-year reference rate for both periods of study. On the contrary, the expected depreciation of the Mexican peso increases the reference rate's expectation in both periods of study, and with a stronger effect for the latest period implying that the analysts believe that this shock was going to be persistent. Inflation expectations at the end of the year have the expected positive sign and are statistically significant to explain the expected reference rate for the same period.

Finally, the accumulated yearly changes of the reference rate have a positive effect on the dependent variable.This variable intends to capture the previous decisions of the Monetary Policy Committee while the monetary surprise variable only captures the immediate monetary policy decision. In this sense, we find that as the central bank increases rates during the year, the expected end-of-the-year reference rate also increases. This result is not trivial because if the agent would have already expected the end-of-the-year reference rate including those central bank's actions, that variable shouldn't be significant. The reaction to these changes is higher for the latest period, showing that professional forecasters where expecting a more aggressive response of the central bank.

When we compare the results of the periods in which there are MPA with those in which there are no MPA, Table 3 we can see that the analyst do react different. In particular, there are three remarkable difference. The first difference is the coefficient of inflation surprises when there are no MPA which is significant and negative. The sign is contra-intuitive: one would expect to have a higher end-of-the-year reference rate when observed inflation is higher than expected, however, looking into the details of where this result comes from, and breaking the sample by time (before and after December 2015), one can see that the result is a consequence of the latest period only, see Figure A.1; this shows some degree of complexity in terms of changes in determinants of expectations for that period. The second remarkable difference comes from the accumulative changes in the monetary reference rate: for the complete sample this variable becomes negative. We interpret this change in the sign as a slowdown in the increase in end-of-the-year reference rate, the professional forecasters believe that the central bank's interest rate movements at the moment of the survey have already "compensated" the rest of the year expected movements. The third difference is in the latest period analysis. When there are no MPA, monthly inflation rates are significant on increasing expected end-of-the-year interest rates, which shows that the latest period was one with very high inflation rates and news that

Tab. 3. Results from Fixed-Effect Estimations with End-of-the-Year Monetary Policy Rate Expectations as Dependent Variable

Dependent Variable: $\Delta E_{it}\left(r^{\text{end y}}\right)$				
	(1)	(2)	(3)	(4)
	MPA		No MPA	
Sample:	All	Latest	All	Latest
π_{t-1}^{surp}	-0.0226	-0.343	-0.171***	-0.153**
	(0.0376)	(0.259)	(0.0344)	(0.0654)
r_{t-1}^{surp}	0.584***	0.529***		
	(0.0611)	(0.107)		
$\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right)$	-0.0102	-0.0220	0.0248	-0.0966
	(0.0213)	(0.0873)	(0.0175)	(0.0976)
$\Delta E_{it}\left(\text{NER}^{\text{end y}}\right)$	0.0167***	0.0208***	0.00325	0.00996**
	(0.00227)	(0.00503)	(0.00215)	(0.00404)
$\Delta E_{it}\left(\pi^{\text{end y}}\right)$	0.131***	0.307***	0.274***	0.517***
	(0.0388)	(0.109)	(0.0506)	(0.0477)
$\sum_{\text{jan}}^{t-1}\Delta r$	0.0762***	0.124**	-0.0741***	-0.0413
	(0.0163)	(0.0520)	(0.00724)	(0.0251)
$\pi_{t-1}^{\text{monthly}}$	0.0325	0.139	0.000722	0.0949**
	(0.0382)	(0.231)	(0.0189)	-0.0397
Constant	-0.103***	0.0816	0.163***	0.0525
	(0.0264)	(0.162)	(0.0179)	(0.0446)
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Analyst FE	Yes	Yes	Yes	Yes
Observations	1,096	302	2,261	563
R-squared	0.431	0.495	0.329	0.723
Number of banks	29	24	29	25

Notes: Columns (1)-(4)'s dependent variable is the change in the end-of-the-year monetary policy rate expectation. Columns (1) and (3) include the surveys from Jan-2010 until Dec-2017; columns (2) and (4) include the surveys from Dec-2015 until Dec-2017. Columns (1) and (2) are the changes when there are monetary policy announcements while columns (3) and (4) are the differences when there no monetary policy announcements. The control variables are: π_{t-1}^{surp}, inflation surprise, defined as the difference between the observed monthly inflation and the expected one; r_{t-1}^{surp}, monetary policy surprise, defined as the difference between the observed monetary policy interest rate and the one expected; $\Delta E_t\left(\text{GDP}^{\text{end y}}\right)$ corresponds to changes in the expected GDP at the end of the year; $\Delta E_t\left(\text{NER}^{\text{end y}}\right)$ is the changes in the expected nominal exchange rate at the end of the year; $\Delta E_t\left(\pi^{\text{end y}}\right)$ is the variation in the expected inflation at the end of the year; $\sum_{\text{jan}}^{t-1}\Delta r$ is the yearly accumulated sum of changes in the monetary policy rate; $\pi_{t-1}^{\text{monthly}}$ corresponds to the observed monthly inflation rate.

Robust standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Tab. 4. Results from Fixed-Effect Estimations with Policy Rate Call Dependent Variable

Dependent Variable: Δ Policy Rate Call				
	(1)	(2)	(3)	(4)
	MPA		No MPA	
Sample:	All	Latest	All	Latest
π_{t-1}^{surp}	-1.417	0.844	-0.426	-0.476
	(0.976)	(2.537)	(0.526)	(0.785)
r_{t-1}^{surp}	-1.902**	-4.396**	-1.948***	-1.740**
	(0.801)	(0.939)	(0.665)	(0.686)
$\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right)$	-0.407	-1.355	-0.0837	-0.644
	(0.545)	(1.198)	(0.217)	(0.549)
$\Delta E_{it}\left(\text{NER}^{\text{end y}}\right)$	-0.207***	-0.188***	-0.0312	-0.0914***
	(0.0474)	(0.0626)	(0.0228)	(0.0320)
$\Delta E_{it}\left(\pi^{\text{end y}}\right)$	-0.899	-1.392	-0.992***	-0.580
	(0.753)	(1.327)	(0.314)	(0.362)
$\sum_{\text{jan}}^{t-1}\Delta r$	2.130***	6.559***	0.699***	5.789***
	(0.361)	(0.760)	(0.208)	(0.431)
$\pi_{t-1}^{\text{annualized}}$	-2.496***	-0.371	-0.913***	-0.452*
	(0.285)	(0.683)	(0.143)	(0.237)
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
Analyst FE	Yes	Yes	Yes	Yes
Observations	918	229	2,476	636
R-squared	0.367	0.532	0.098	0.361
Number of banks	29	23	29	25

Notes: Columns (1) and (2) include the surveys that had a monetary policy announcement right before, while columns (3) and (4) include the complete set of surveys. Columns (1) and (3) include the surveys from Jan-2010 until Dec-2017; columns (2) and (4) include the surveys in 2016 and 2017. The dependent variable in the 4 specifications is changes in the policy rate call when the professional forecasters expect an increase in the rate. The control variables are: π_{t-1}^{surp}, inflation surprise, defined as the difference between the observed monthly inflation and the expected one; r_{t-1}^{surp}, monetary policy surprise, defined as the difference between the observed monetary policy interest rate and the one expected; $\Delta E_t\left(\text{GDP}^{\text{end y}}\right)$ corresponds to changes in the expected GDP at the end of the year; $\Delta E_t\left(\text{NER}^{\text{end y}}\right)$ is the changes in the expected nominal exchange rate at the end of the year; $\Delta E_t\left(\pi^{\text{end y}}\right)$ is the variation in the expected inflation rate at the end of the year; $\sum_{\text{jan}}^{t-1}\Delta r$ is the yearly accumulated sum of changes in the monetary policy rate; $\pi_{t-1}^{\text{annualized}}$ corresponds to the observed annualized inflation rate.

$^{*}p < 0.10,\ ^{**}p < 0.005,\ ^{***}p < 0.001$

made professional forecasters to update their expectations frequently. The rest of the variables do not show a big change across the models.

Finally, we report changes in the timing of private forecasters' call for movement of the reference rate by Banco de México. It is important to note that regression results change according to the expected sign of the next movement. For example, if the expected next movement in the interest rate is an increase, a rise in the expected end-of-the-year nominal exchange rate would put more pressure on inflationary concerns among forecasters and would advance the date of the next movement in the interest rate, i.e., a negative effect on the dependent variable. However, if the sign of the next movement is a reduction in the reference rate, the same increase in the expected nominal exchange rate would delay the date of the next movement in the interest rate, i.e., a positive effect. Given this opposite expected sign of the coefficients on the independent variables, we need to present the results separately, one regression than includes only data of expected rises in the movement in the interest rate and another for expected decreases in the next expected movement in the interest rate.[4] We only present the results that include expected rises in the monetary policy rate, because these represent 85 percent of the observations during our study period. Until now all regressions described in this section included only surveys that were completed before and after each decision. In our analysis, and as a robustness exercise, we decided to include all available surveys during our study period, because there are eight monetary policy decisions per year and the surveys are implemented on a biweekly basis, but other independent variables like inflation and exchange rate are available every fortnight. Therefore this regression could improve the explanatory power of these variables. However, in this specification the monetary policy surprise variable will not contribute with much information to the model. Table 4 presents the results of these regressions. Columns (1) and (2) include the change in the surveys that were immediately preceded and followed by MPA, and columns (3) and (4) include the complete set of surveys. Columns (1) and (3) include surveys from Jan-2010 to Dec-2017; columns (2) and (4) include surveys from Dec-2016 until Dec-2017. Surprises in inflation seem not to affect the decision in subsequent rise in the reference interest rate in all the specifications. However, a surprise in the monetary policy, i.e., a higher than expected movement in the reference rate brings forward the next expected movement in the in-

[4] Alternatively, it could be added a dummy variable equal to one when the expected movement is an increase in the interest reference rate or interactions of this variable with the rest of the dependent variable but this increases the difficult to interpret the coefficients.

terest rate. For example, in the case of regression (1), if the surprise in the monetary policy is of one percentage point, that is if the monetary policy movement observed was an increment of one percentage point above of what the forecaster had expected, the expectation of the next rise in the interest rate moves forward by almost 2 months. Of course, this is not a change observed in the data, surprises in monetary policy are generally at 0.25 percent, in this case, the analyst would bring forward the expected moment in the interest rate by 0.475 months, on average. Expected end-of-the-year GDP growth does not affect the dependent variable. Like in the other regressions, the coefficient of the expectation changes in the nominal exchange rate is significant and has the expected sign, i.e. rises in the nominal exchange rate bring forward the timing of the next expected rise in the reference rate. In this regression the variable of the accumulated reference interest rate has a particular relevance because after the central bank implements a movement in the reference interest rate, forecasters move back the time of the next movement. This change is not caused by any economic development but only because the central bank moved the interest rate and, as a result, analysts need to figure out which will be the date of the next movement, this resembles a reset of the expectations. The coefficient of this variable is positive, congruent with this explanation. For example, in regression (1) a movement in the interest rate would move back the date of the next movement by 2.130 months.

4 Final Remarks

The evidence presented in this paper suggests that monetary policy announcements in Mexico, that has been implementing inflation targeting form almost twenty years, have an impact on the adjustments of expectations of private forecasters. Specifically, agents incorporate the new information and update their inflation and reference rate expectations as well as their expected next call on interest rate with the observed data. Short-term inflation and reference rate expectations do change when there are MPA. Inflation expectations are more sensible to observable variables when there are no MPA. We do not find changes for the latest period, 2016-2017, suggesting that the determinants of the expectations remain similar to the complete period (2010-2017), showing high degree of anchoring of expectations. The most important result is that inflation surprises affect short term inflation expectations, but do not change log-term ones. This result is consistent with inflation expectations anchored. GDP growth seems not to affect inflation expectations, reference rate expectations and the expected timing

of the next movement of the reference rate reflecting the fact that during the period of study the Mexican economy did not experimented inflation pressures form the demand.

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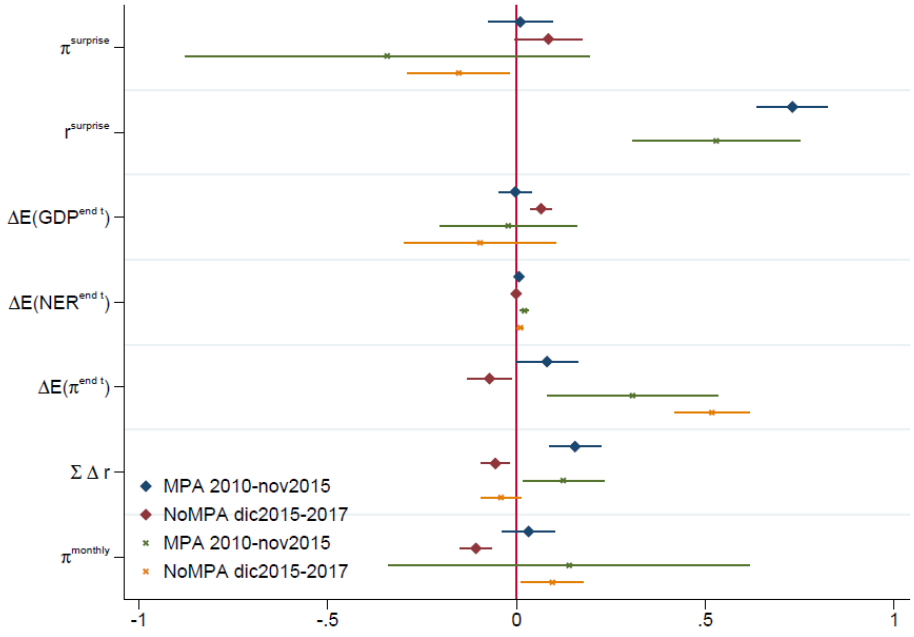
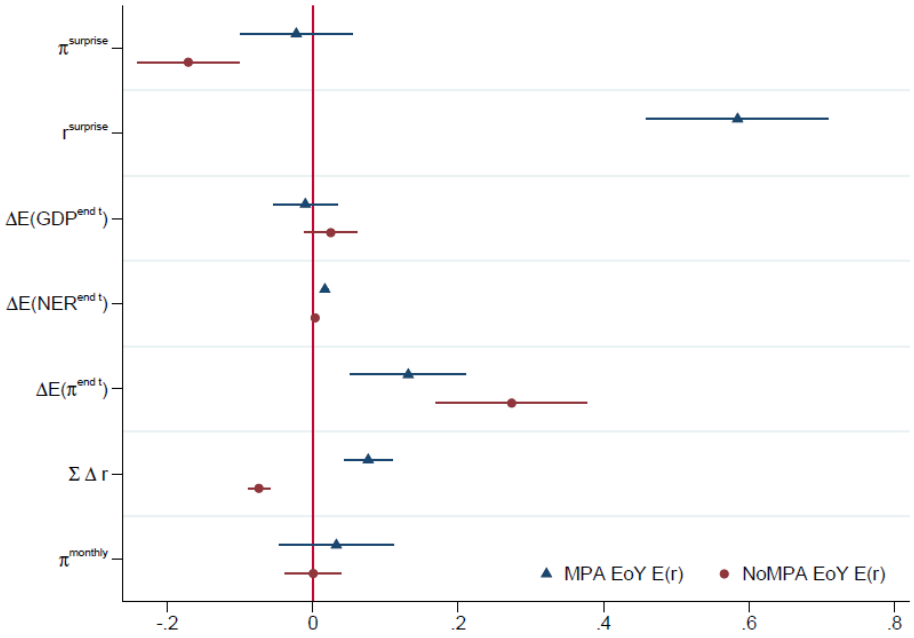
A Data: Summary Statistics and Sources of Data

Fig. A.1. End-of-the-year reference rate coefficient comparison, different time periods



Source: Own calculations with data from Citibanamex Survey and Banco de México.
Notes: Confidence Interval at 95%, MPA corresponds to differences in surveys when there are monetary policy announcements and NoMPA when there are no monetary policy announcements. The regressions are similar to the ones presented in Table 3.

Fig. A.2. End-of-the-year reference rate coefficient comparison, with and without monetary policy announcements



Source: Own calculations with data from Citibanamex Survey and Banco de México.
Notes: Confidence Interval at 95%, MPA corresponds to differences in surveys when there are monetary policy announcements and NoMPA when there are no monetary policy announcements. The regressions are similar to the ones presented in Table 3.

Tab. A.1. Description of Variables in Regressions with Monetary Policy Decisions Only

Name	Symbol	Definition	Source of data used to construct variable	Included in regression		
				Δ Inflation Expectation	Δ Policy Rate Exp.	Δ Policy Rate Call
Inflation Surprise	π_{t-1}^{surp}	Observed inflation minus analyst's inflation expectation	Citibanamex Survey and INEGI	✓	✓	✓
Monetary Policy Surprise	r_{t-1}^{surp}	Observed policy rate minus analyst's expected policy rate	Citibanamex Survey and Banco de México	✓	✓	✓
Δ GDP Expectations for the End-of-Year t or t+1	$\Delta E_{it}\left(\text{GDP}^{\text{end y}}\right)$	Change in end-of-(next)-year GDP expectations (after - before)	Citibanamex Survey	✓	✓	✓
Δ Exchange Rate Expectations for the End-of-Year t or t+1	$\Delta E_{it}\left(\text{NER}^{\text{end y}}\right)$	Change in end-of-(next)-year exchange rate expectations (after - before)	Citibanamex Survey	✓	✓	✓
Δ Inflation Expectations for the End of t or t+1	$\Delta E_{it}\left(\pi^{\text{end y}}\right)$	Change in end-of-(next)-year inflation expectations (after - before)	Citibanamex Survey	Dependent variable	✓	✓
Δ Policy Rate Expectations	$\Delta E_{it}\left(r^{\text{end y}}\right)$	Change in end-of-(next)-year policy rate expectations (after - before)	Citibanamex Survey	-	Dependent variable	✓
Accumulated Δ in Policy Rate	$\sum_{\text{jan}}^{t-1}\Delta r$	Accumulated changes in the policy rate during current year up to time t	Banco de México	✓	✓	✓
Lagged Monthly Inflation Rate	$\pi_{t-1}^{\text{monthly}}$	Lag of the observed monthly inflation rate	INEGI	✓	✓	✓
Δ Policy Rate Call	ΔE_{it}(r call)	Change in call for next policy rate movement in months (current - previous)	Citibanamex Survey	-	-	Dependent variable

Tab. A.2. Summary Statistics of Variables in Regressions with Monetary Policy Decisions Only

	2010-2017					2016-2017				
	N	median	sd/iqr	min	max	N	median	sd/iqr	min	max
Inflation Surprise	1482	-0.019	0.118	-0.687	0.496	392	-0.001	0.115	-0.383	0.318
Monetary Policy Surprise	1226	0.000	0.000	-0.500	0.500	342	0.000	0.250	-0.500	0.500
Δ End-of-Year GDP Exp.	1382	0.000	0.000	-2.600	1.400	366	0.000	0.000	-0.800	0.600
Δ End-of-Year Exchange Rate Exp.	1373	0.000	0.000	-12.556	20.879	360	0.000	0.000	-12.556	20.879
Δ End-of-Year Policy Rate Exp.	1400	0.000	0.000	-1.000	1.250	376	0.000	0.250	-1.000	1.250
Δ End-of-Year Inflation Exp.	1410	0.000	0.040	-0.800	1.560	371	0.000	0.040	-0.520	0.600
Δ End-of-Next-Year GDP Exp.	1305	0.000	0.000	-1.200	1.000	351	0.000	0.000	-1.200	1.000
Δ End-of-Next-Year Exchange Rate Exp.	1260	0.000	0.000	-11.364	34.078	321	0.000	0.000	-11.364	34.078
Δ End-of-Next-Year Inflation Exp.	1389	0.000	0.000	-1.200	1.500	366	0.000	0.000	-1.100	1.300
Accumulated Δ in Policy Rate	2108	0.000	0.648[a]	-1.000	2.500	558	1.000	0.607[a]	0.000	2.500
Δ Policy Rate Call	980	1.241	1.000[a]	-16.00	27.00	252	1.000	3.018[a]	-16.000	11.000
Lagged Monthly Inflation Rate	2,108	0.329	0.395[a]	-0.738	1.670	558	0.412	0.418[a]	-0.447	1.670

Notes: [a]the dispersion measurement corresponds to the standard deviation.

Tab. A.3. Summary Statistics of Variables in Regressions with Monetary Policy Decisions Only - Levels

	2010-2017					2016-2017				
	N	median	sd/iqr	min	max	N	median	sd/iqr	min	max
Inflation Surprise	1,482	-0.019	0.118	-0.687	0.496	392	-0.001	0.115	-0.383	0.318
Monetary Policy Surprise	1,226	0.000	0.000	-0.500	0.500	342	0.000	0.250	-0.500	0.500
End of Year GDP Exp.	1,486	2.84	1.60	0.00	5.50	397	2.100	0.400	0.000	3.500
End of Year Exchange Rate Exp.	1,498	13.0	4.50	11.0	23.50	394	18.5	1.55	16.4	23.5
End of Year Policy Rate Exp.	1,529	4.50	1.00	2.75	8.00	420	5.75	2.75	3.25	8.00
End of Year Inflation Exp.	1,521	3.83	0.93	2.02	6.80	402	3.42	2.84	2.02	6.80
End of Next Year GDP Exp.	1,414	3.40	1.10	0.50	5.00	383	2.40	0.60	0.50	4.50
End of Next Year Exchange Rate Exp.	1,377	12.9	4.30	2.20	24.0	357	18.2	2.00	2.20	24.0
End of Next Year Policy Rate Exp.	1,418	4.50	1.75	3.00	8.50	378	6.00	1.75	3.50	8.50
End of Next Year Inflation Exp.	1,491	3.60	0.45	2.78	5.39	397	3.54	0.56	2.78	4.90
Long Term Inflation Exp.	679	3.42	0.33	3.00	4.40	376	3.40	0.30	3.00	4.40
Accumulated Δ in Policy Rate	2,108	0.000	0.648[a]	-1.000	2.500	558	1.000	0.607[a]	0.000	2.500
Lagged Monthly Inflation Rate	2,108	0.329	0.395[a]	-0.738	1.670	558	0.412	0.418[a]	-0.447	1.670

Notes: [a]the dispersion measurement corresponds to the standard deviation.

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