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Fiscal Policy and Inflation Expectations

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Abstract
Theory suggests that inflation expectations play an important role in transmitting fiscal considerations into inflation. We contribute new empirical evidence of a positive relationship between the budget deficit to GDP and inflation expectations of firms. This suggests interdependence between fiscal and monetary policies, which may imply that monetary policy faces more challenges to maintain inflation expectation anchored when the fiscal outcomes worsen. The result is robust to considering other fiscal variables and to controlling for macroeconomic covariates.

Keywords: Inflation expectations, budget deficit, fiscal policy, monetary policy, Uruguay

JEL Classification: E52, E62, E63

1. Introduction

Inflation expectations play a crucial role in modern monetary policy. Economic agents update their expectations based on new information. In turn, these expectations regarding the future affect present behavior and macroeconomic outcomes. Monetary authorities aim to anchor inflation expectations to the values that are targeted in order to ensure price stability. But inflation expectations may be affected by other variables in general, and by fiscal policy in particular, determining interdependence between fiscal and monetary policies. While theory suggests that inflation expectations play an important role in transmitting fiscal considerations into inflation, little empirical evidence exists on the matter.[2] What limits does fiscal policy impose on the achievement of the monetary policy objective through the inflation expectations channel?

This paper uses micro data on inflation expectations by firms with the aim of providing an answer to this question. More precisely, it assesses the effect of fiscal variables that are known by firms in Uruguay at the moment of answering to a monthly inflation expectation survey. The period under analysis ranges from October 2009 to March 2020. This is a unique data set containing systematic and quantitative data on firms' macroeconomic expectations.

Empirical evidence shows a positive and statistically significant relationship between the budget deficit to GDP and inflation expectations. This relationship is robust to a series of controls and

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[2] One important exception is Coibion *et al.* (2021).

robustness checks. Overall, this result suggests that fiscal policy may impair monetary policy effectiveness by affecting inflation expectations. Monetary policy may face extra challenges to maintain inflation expectations anchored when the fiscal outcomes worsen, implying an interdependence between fiscal and monetary policies.

The results also show that the short-term interest rate acting through the credit channel of monetary policy was not enough to fully revert the negative impact of fiscal policy on inflation expectations. Nevertheless, monetary policy also affects inflation expectations through other channels. In order to assess the relevance of monetary policy communication, we compile a monetary contractivity index. This index has the expected negative sign and is statistically significant. Hence, a contractive tone in the communication of the central bank reinforces the interest rate channel of monetary policy.

Overall, the empirical results suggest that monetary policy working through both the credit (or interest rate) and the communication channels attenuate the impairing effect of fiscal policy on inflation expectations. The coefficient of the interaction of these three variables is negative and statistically significant, meaning that their combined effect is correlated with a reduction on inflation expectations towards the target range.

The previous result does not imply, however, that monetary policy was effective to put the inflation rate in the target range. Both the inflation rate and the median of inflation expectations were above the upper bound of the inflation target range for most of the period under analysis. Nevertheless, inflation expectations remain relatively stable and out of a continuously increasing path that would be expected if its positive correlation with the budget deficit to GDP were not attenuated by a negative correlation introduced by monetary policy.

This paper provides empirical evidence on the effect of fiscal policy on the formation of inflation expectations by firms, and thus on the relationship between fiscal and monetary policies through the expectations channel. Fiscal dominance could be an explanation of the results. Recent work by Bucacos (2022) finds evidence of a mild fiscal dominance in Uruguay during the period 1999 to 2019. Nonetheless, the budget deficit is a macroeconomic variable that calls the attention of large part of the population and thus it could serve as a summary of the macroeconomic context, capturing a set of macroeconomic determinants of inflation expectations. Poor fiscal results could lead to increasing prices today as agents anticipate the rising inflation and pass it into current prices and wages.

The rest of the paper is organized as follows. The next section revises related literature. Section 3 presents and describes the data. Section 4 describes the empirical strategy, presents the results and robustness checks. Finally, Section 5 contains final remarks. The methodology to compute the monetary contractivity index, extra figures and tables with robustness check results are in the Appendix.

2. Related literature

This paper contributes to a growing body of literature on the formation of inflation expectations. Considering survey-based agents' inflation expectations one could distinguish between experts (i.e. professional forecasters) and non-experts (i.e. firms and households). Mankiw and Reis (2002) argue that professional forecasters update their information set infrequently. Coibion and Gorodnichenko (2015) estimate the degree of information rigidity among experts and show that monetary institutions affect the formation of expectations. Andrade and Le Bihan (2013) show that professional forecasters in the Eurozone do not systematically update their forecasts following new information. Carroll (2003) argues that not every household pays close attention to

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all macroeconomic news and that they absorb the economic content probabilistically, which implies stickiness on the formation of expectations. Reis (2006a) and Reis (2006b) argue that consumers and producers update their information set sporadically. Easaw et al. (2013) show that households tend to absorb professionals forecasts when forming their expectations. A recent strand of literature focuses on how agents' form their inflation gap forecasts (see Chan et al., 2018; Dixon et al., 2020; Jain, 2019). When agents form multi-period forecast (as is the case in our survey data), they are trying to capture the momentum of inflation (see Cogley et al., 2010).

In Sims (2003) agents update prices continuously but they only have access to imperfect information. Hence, agents access noisy measures of the variables of interest when making their inflation expectations. The question that arises is how inflation expectations of firms are affected according to economic information. In this paper, we assess whether or not a key fiscal variables affect the formation of inflation expectations by price setters. As in Coibion et al. (2018), firms in our sample update their beliefs after receiving new information about macroeconomic conditions that could be summarized in the outcome of fiscal policy.

The interaction between fiscal and monetary policies has been explored at length since the seminal work by Sargent and Wallace (1981). Most of the literature focuses on the concept of fiscal dominance (see Leeper and Leith, 2016, for a survey). Conceptually, poor fiscal outcomes (e.g. high debt levels without foreseeable improvements in the budget deficit) could lead to increasing prices today as agents anticipate the rising inflation and pass it into current prices and wages. While theory suggests that inflation expectations play an important role in transmitting fiscal considerations into inflation, little empirical evidence exists on the matter. One exception is Coibion et al. (2021). They conduct a randomized control trial survey to assess whether household inflation expectations are sensitive to fiscal considerations, and find that news about future debt leads households to anticipate higher inflation. In this paper, we provide empirical evidence showing that firms' inflation expectations are sensitive to fiscal outcomes. Hence, fiscal policy might impair the transmission channels of monetary policy.

We contribute to the line of work by Gelós and Rossi (2008) by exploiting a novel, monthly survey on firms' inflation expectations. As we do, they find a strong influence of the tax situation upon the shaping of expectations in the case of Uruguay. Nevertheless, both papers complement in several respects: they use an IMF's dataset on inflation expectations for a non-inflation targeting period, while we use a novel survey of firms' inflation expectation in Uruguay, which is representative of the universe of firms with more than 10 employees, in a period where the central bank follows an inflation targeting regime.

Moreover, we assess the interaction effects between fiscal and monetary policies. Our paper also contributes to a growing literature on inflation expectations in Uruguay by assessing the limits that fiscal policy may impose to monetary policy and the relative importance of the tone of monetary policy communication (following Blinder et al., 2008). We construct a monetary contractivity index by using web scrapping and text analysis techniques of monetary policy statements. Similarly to Borraz and Mello (2020), we find that a contractive tone of monetary policy communication has a negative correlation with firms' inflation expectations. Licandro and Mello (2014) also find a negative relationship between the monetary stance and inflation expectations made by firms.

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3. The data

3.1. Inflation expectations survey

Our main source of data is the Inflation Expectations Survey (IES) carried out by the Instituto Nacional de Estadísticas (INE), commissioned by the Banco Central del Uruguay (BCU), to firms in Uruguay. The survey is conducted monthly to a sample of firms that is representative of the universe of the Uruguayan private companies with more than 10 employees, being one of the few systematic and quantitative surveys of firms' macroeconomic expectations (Candia et al., 2021). The survey, however, does not cover the agricultural and the financial sectors. The sample period is from October 2009 to March 2020.

The IES has a monthly frequency and contains information about firms' price and cost expectations. Specifically, our dependent variable corresponds to the answers to the question that reveals inflation expectations in the survey: What do you think will be the percentage change in the CPI (Consumer Price Index)? This question is asked considering 4 different time horizons: the current year, the next 12, 18 and 24 months.

In this work we consider the firms' inflation expectation in the horizon of monetary policy (t = H).[3] In June 2013 the horizon of monetary policy was extended from 18 to 24 months. At the same time, the inflation target was expanded from 4-6% to 3-7%. We control for these changes in the regressions that are presented in the next section. The IES is sent monthly to around 500 different firms with an average response ratio of 77% since October 2009 (with a minimum response ratio of 54%). The resulting dataset is an unbalanced long panel with a total of 126 months and 46,580 observations. During the sample period, 591 firms completed the survey at least once, while 65% of the firms answered the questionnaire more than 50% of the times (64 months).

3.2. Fiscal and other macroeconomic variables

Since the aim of the paper is to determine the effect of fiscal policy on inflation expectations, in a benchmark model we regress firms' expected inflation on the budget deficit as a percent of GDP (as well as additional controls). This fiscal variable is widely accessible to the general public and to firms in particular. It is published by the Ministry of Economy and Finance the last day of each month with a delay of one month.[4] While other fiscal variables could also be relevant, an extended practice in Uruguay is that fiscal statements and fiscal news generally focus on the budget deficit expressed as a percentage of GDP. Hence, we consider this as a relevant fiscal variable, or sufficient statistic, to assess the impact of fiscal policy when firms form their inflation expectations.

We run robustness analysis by replacing the budget deficit to GDP by another fiscal variable: the gross public debt to GDP. This variable comes from the same source than the budget deficit to GDP. The empirical results in the next section show that while other fiscal variables also affect inflation expectations, the budget deficit to GDP have coefficients significantly larger, which can be interpreted as evidence of their relative importance.

In an inflation targeting regime, monetary policy aims to affect inflation expectations with the objective of maintaining inflation in the target range. One channel to do so goes through the interest rate and is commonly known as the credit channel of monetary policy. The basic mechanism implies that a market interest rate above that considered as neutral indicates a

[3] Qualitative results remain robust to considering different horizons.
[4] See https://www.gub.uy/ministerio-economia-finanzas/tematica/resultados-del-sector- publico?page=0.

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contractive stance, affecting market conditions and, in turn, inflation expectations. Monetary policy aims to affect the market interest rate by using its instruments. In the case under study, the selected instrument was a short-term interest rate until June 2013 and monetary aggregates since then. In order to account for the above mentioned mechanism throughout the entire period under analysis, we introduce a short-term interest rate in the empirical regressions.[5] More precisely, we compute the short-term interest rate as the 30-day node of the ITLUP curve developed by the Electronic Stock Exchange (BEVSA).[6]

Other widely accessible macroeconomic variables are introduced in order to check the robustness of the results: GDP growth, foreign exchange rate (FX) depreciation and volatility, unemployment rate, and country risk. GDP is quarterly published by the Banco Central del Uruguay with a delay of approximately a quarter. The series in monthly frequency is obtained by using the methodology proposed by Denton (1971). The FX depreciation is the inter-annual variation of the inter-bank price of the USD in BEVSA. Likewise, the FX volatility was calculated as the square of the monthly standard deviation of daily operations in the inter-bank market.[7] The unemployment rate is monthly published by the Instituto Nacional de Estadísticas the last day of each month with a delay of two months. As for the country risk, we use the JP Morgan EMBI index for Uruguay.

3.3. Monetary contractivity index

Communication by a central bank could affect inflation expectations, in particular those of firms. To account for this channel, we construct an index to assess the contractivity tone of the statements by the monetary policy authority.

To construct the monetary contractivity index we collect all the monetary policy statements that were published after policy decisions in the period under analysis. By using web scraping and text analysis techniques we identify two target words inside each statement: “inflation” and “monetary policy”. After identifying these words in a given statement, we extract the adjacent parts of the text counting from the sixth word before to the sixth word after each targeted word. So we select and analyze strings of 13 words that contain one of our targeted words. To characterize the tone of each string we assign a natural number between -2 and 2 to each one, where -2 means very expansive, -1 is expansive, 0 is neutral, 1 is contractive and 2 is very contractive. In Appendix A we present details about this assessment. Finally, the contractivity index of each monetary policy statement is computed as the simple average of the values assigned to the corresponding strings.

Figure 1 presents the normalized short-term interest rate and the monetary contractivity index. While the short-term interest rate fluctuates from values that can be considered expansive to contractive, the contractivity index is positive most of the time with values ranging between zero and one. Hence, the tone of monetary policy statements has fluctuated in a range of contractiveness during most of the period under analysis.

[5] Other monetary policy channels are also considered. See Section 3.3.
[6] ITLUP is the curve of returns of assets denominated in local currency, e.g. Pesos Uruguayos, in the local market. See https://web.bevsa.com.uy/CurvasVectorPrecios/CurvasIndices/ITLUP.aspx.
[7] See https://web.bevsa.com.uy/Mercado/MercadoCambios/Dolar.aspx.

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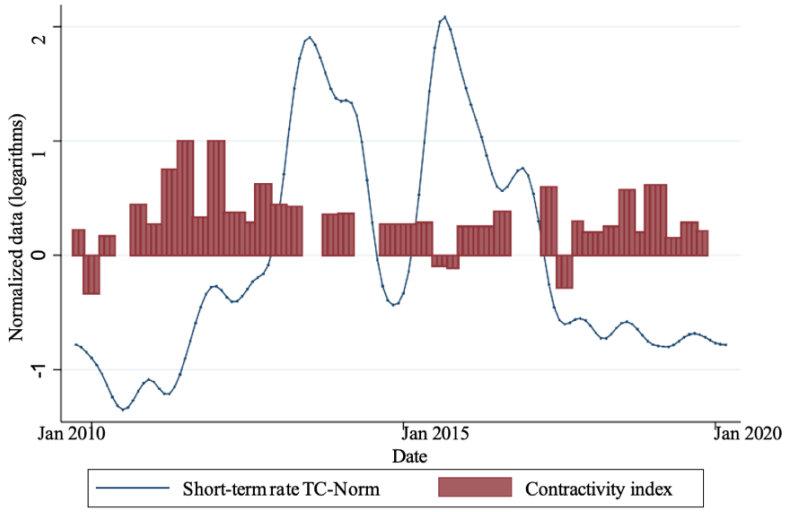

Figure 1: Short-term interest rate and monetary contractivity index

3.4. Descriptive statistics

As stated earlier, the sample period ranges from October 2009 to March 2020, including 46,580 observations. Table (1) in Appendix B shows descriptive statistics for the variables of interest.

The expected inflation rate by firms in the horizon of monetary policy (H, with H = 18 months until June 2013 and H = 24 since then) averages 8.95%, while its median is 8.65% in the period under analysis. As a reference, the expected inflation rate for the next 12 months horizon is 8.89% in average and 8.70% in median. The inflation rate during the period was systematically above the central bank's target. In average the inflation rate was 8.00% during the period, with a maximum of 11.00% and a minimum rate of 5.24%. Figure 2 shows the annual inflation rate, the median of the inflation expectations for the monetary policy horizon and the upper bound of the inflation target of the central bank. The median inflation expectation is highly correlated with the observed inflation rate, but it seems to be stickier than the observed rate, particularly when inflation falls.

The short-term interest rate is 9.76% on average for the whole period. During the first part, i.e. before July 2013 when the interest rate was the policy instrument, the average short-term interest rate was 7.87%. Since July 2013, i.e. during the period in which monetary aggregates are used as policy instrument, the short-term interest rate averages 11%.

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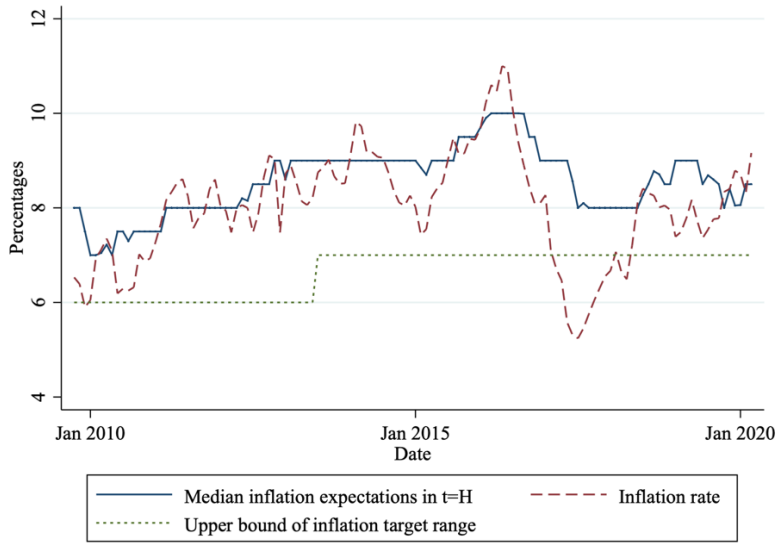

Figure 2: Inflation expectations and inflation rate

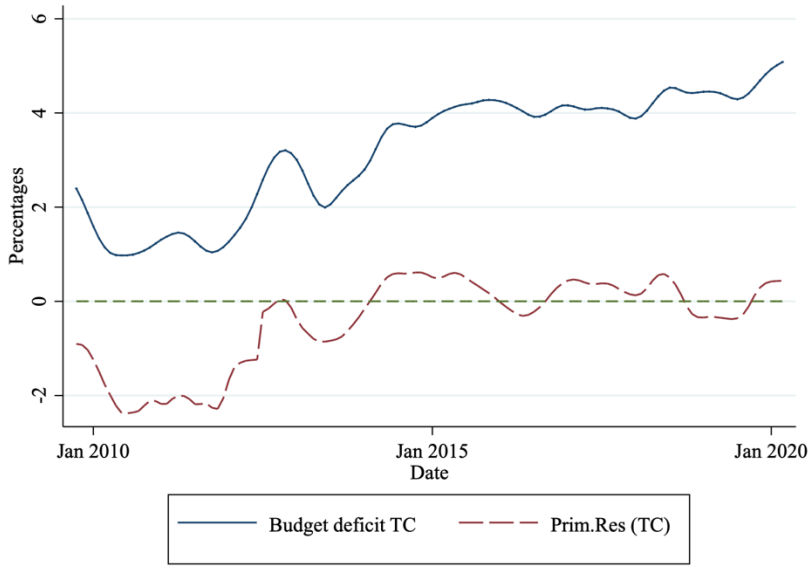

Figure 3: Budget deficit to GDP (trend-cycle component)

As discussed in Section 3.2, to analyze the relation of fiscal policy and firms' inflation expectations we consider the budget deficit as a percent of GDP as the most relevant variable. Figure (3) presents this fiscal variable and one of its components: the primary budget deficit. Until 2013 the Uruguayan Government had primary budget surpluses. Since then the primary result is nearby to zero, while the budget deficit increased substantially, representing around 5% of GDP at the end of the sample period. In average, budget deficit to GDP is 2.98% during the period under analysis. Gross public debt to GDP averages 62.84% during the period under analysis. Figure (4) in Appendix B shows the increasing path of this variable through time.

Finally, Table (1) in Appendix B shows descriptive statistics of other macroeconomic variables that are used to check the robustness of the results: foreign exchange rate depreciation and volatility, GDP growth, unemployment rate and EMBI. Figure (5) in Appendix B shows the

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evolution of unemployment and the GDP growth during the period. Given that the unemployment rate is relatively sticky through the period under analysis, we use the rate of growth of the unemployment rate in the regressions.

4. Empirical analysis

4.1. Main regression model and extensions

The main regression model for inflation expectations that we estimate in this paper is the following:

$$E_{it}(\pi_H) = \beta_1 E_{it-1}(\pi_H) + \beta_2 F_{t-2} + \beta_3 Controls_{it} + \varepsilon_{it}, \quad (1)$$

where Eit (π_H) is the inflation expectation for the monetary policy horizon (H) of firm i in period t, F_{t-2} is the last observed data about fiscal policy outcomes that is available to firms when making inflation expectations at date t (fiscal variables have a lag of two months), and Controlsit is a set of control variables. Estimation is done with the Generalized Method of Moments (GMM) in order to account for the high persistence of inflation expectations. In all models we include the auto-regressive term.

In a benchmark estimation of Equation (1) we use the trend-cycle component of the last observed values of the budget deficit as a percent of GDP (2 months prior) as the fiscal variable, F_{t-2}.[8] The budget deficit to GDP is widely accessible to the general public and receives huge attention in the media and specialized press. An extended practice in Uruguay is that fiscal statements, their coverage in the news and in reports by professional analysts focus on this variable and its recent trend. Hence, the trend- cycle component of observed budget deficit to GDP should be positively and highly correlated to firms' expectations of that variable.[9] In robustness check estimations of Equation (1) we use other fiscal variables instead of the budget deficit to GDP. First we assess whether surprises on fiscal policy outcomes matter by using a measure of the unexpected budget deficit. This measure is defined as the difference between the observed and the trend-cycle component of the budget deficit. Second, we use the gross debt as a percentage of GDP.

As for control variables, in all estimations we include firm fixed effects and time fixed effects: a year fixed effect in order to account for an eventual learning of the firms in the prediction of inflation, and a monthly fixed effect to control the intra-annual seasonality of the variables included in the regression. Other control accounts for the diminishing rate of response to the IES through time, which affects the composition of inflation forecasters. More precisely, we introduce the number of responses to the IES in each month. Finally, we control for the change in the policy target and instrument occurred in June 2013 by introducing a dummy variable taking the value of one since July 2013. As a robustness analysis, we also include a series of macroeconomic control variables.

We extend the main regression model of Equation (1) to account for monetary policy variables and also include interaction terms between monetary and fiscal variables.

More precisely, we estimate five extensions to account for: the credit channel of monetary policy by including the short-term interest rate; the interaction between the short-term interest rate and the budget deficit; the contractivity stance of monetary policy; the interaction between

[8] Trend-cycle components are computed using X12-ARIMA.

[9] For instance, the coefficient of correlations between the budget deficit as a percent of GDP and its expectation by professional forecasters is 0.89.

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contractivity stance and budget deficit; and the interaction between both monetary policy variables and the budget deficit.

We care about endogeneity concerns. In particular, monetary policy variables, i.e. the short-term interest rate and the monetary contractivity index, are endogenous to inflation expectations. We follow Arellano and Bond's methodology, which takes the lags of the endogenous variables as instruments. We also introduce as instruments the last 12 months' time average variation of the expectations on costs and on inflation made by firms.

4.2. Results

Benchmark estimation results for the main regression model are in column M1 of Table (2) in Appendix C. The coefficient of the fiscal variable, i.e. the trend-cycle component of the budget deficit to GDP, is positive and statistically significant at the 1% level. This positive correlation between the budget deficit and the inflation expectations of firms in Uruguay is the main finding of this paper. It implies a positive relationship between the deterioration in a key outcome of the fiscal policy and a key variable in an inflation targeting regime. Overall, this result provides empirical evidence supporting that, under normal circumstances, monetary policy may face more challenges to maintain inflation expectation anchored when the fiscal outcome worsen, implying a negative link between fiscal and monetary policies.

In the first extension to the main regression model we introduce the short-term interest rate as an explanatory variable (column M2). The results of the previous para- graph hold and the coefficient for the fiscal variable changes only slightly. Moreover, this is the case through all the extensions that we present in Table (2). The coefficient of the short-term interest rate is of the short-term interest rate is statistically significant at the 1% level and has the expected negative sign. Monetary policy seems to be effective in influencing inflation expectation through the credit channel because an increase in the short-term interest rate is negatively correlated with firms' inflation expectations.

We introduce the interaction of the short-term interest rate and the budget deficit to GDP (see model M3) in an attempt to find evidence on whether or not one of the variables attenuates the effect of the other. Finding a positive and statistically significant coefficient could be interpreted as evidence that, on average during the period under analysis, the short-term interest rate acting through the credit channel of monetary policy was not sufficient to fully revert the negative impact of fiscal policy on inflation expectations.

Nevertheless, monetary policy also affects inflation expectations through other channels. In order to assess the relevance of monetary policy communication, we introduce the monetary contractivity index as explanatory variable in model M4. The monetary contractivity index has the expected negative sign and is statistically significant at the 1% level. Hence, a contractive tone in the communication of the central bank reinforces the interest rate channel of monetary policy. The coefficient of the budget deficit to GDP remains robust to introducing the monetary contractivity index, confirming the importance of this fiscal variable for the formation of inflation expectations. The interaction of the budget deficit to GDP with the monetary contractivity index is, however, statistically non-significant (see model M5).

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Table 2: Inflation expectations and budget deficit to GDP

	M1	M2	M3	M4	M5	M6
(1) Expected inflation rate	0.189***	0.184***	0.179***	0.166***	0.166***	0.164***
	(0.027)	(0.028)	(0.028)	(0.029)	(0.029)	(0.029)
(3) Budget deficit to GDP	0.488***	0.493***	0.486***	0.475***	0.478***	0.457***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
(2) Short term interest rate		-0.108***	-0.100***	-0.071***	-0.070***	-0.084***
		(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
(2)x(3)			0.156***			
			(0.022)			
(4) Monetary contractivity index				-0.137***	-0.130***	-0.113***
				(0.010)	(0.011)	(0.011)
(3)x(4)					-0.015	
					(0.011)	
(2)x(3)x(4)						-0.057***
						(0.013)
Obs.	37,934	37,934	37,934	37,934	37,934	37,934
N-Groups	560	560	560	560	560	560
Ar1-p	0.000	0.000	0.000	0.000	0.000	0.000
Ar2-p	0.367	0.421	0.530	0.506	0.534	0.546
Hansen-p	0.864	0.866	0.868	0.871	0.871	0.844

Statistical significance: * 10%, ** 5%, *** 1%.
Huber-Eicker-White standard errors are reported in parenthesis.

Finally, model M6 in the last column in Table (2) assesses the relative power of monetary policy through both the credit (or interest rate) and the communication channels to attenuate the impact of the budget deficit on inflation expectations. We find a coefficient for the interaction of these three variables that is negative and statistically significant at the 1% level. Overall, this result implies that the combined effect of these variables is correlated with a reduction of inflation expectations towards the target range. The previous results do not imply, however, that monetary policy was effective to put the inflation rate in the target range. As it can be seen in Figure (2), both the inflation rate and the median of inflation expectations were above the upper bound of the inflation target range for most of the period under analysis. Nevertheless, inflation expectations remain relatively stable and out of a continuously increasing path that would be expected if its positive correlation with the budget deficit to GDP were not attenuated by a negative correlation introduced by monetary policy.

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4.3. Robustness checks

In order to assess the robustness of the main results we perform a series of checks. Tables (3) and (4) in Appendix C show the regression results of substituting the budget deficit to GDP for the unexpected budget deficit to GDP and the gross public debt to GDP respectively. Overall, the qualitative results that were highlighted in the previous section also hold when considering alternative fiscal variables (see columns R1 to R12 in the tables), contributing robustness check evidence of the importance of fiscal policy outcomes on monetary policy through the inflation expectation channel.

The results show that the unexpected budget deficit to GDP and the gross public debt to GDP affect inflation expectations. Interestingly, the coefficients for these two fiscal variables (0.074 and 0.108 respectively) are sensibly smaller than the estimated coefficient for the budget deficit to GDP (0.488). This could be interpreted as evidence that the latter fiscal variable has greater power to affect inflation expectations. As commented in Section 3.2, this result could be explained by the fact that public discussion about the fiscal situation generally focuses on the level of the budget deficit expressed as a percentage of GDP, while other fiscal variables receive relatively less attention. Overall, this result confirms our prior of considering the budget deficit to GDP as a relevant fiscal variable to assess the impact of fiscal policy when firms make their expectations.

In models R13 to R19 that are presented in Table (5) we introduce different macroeconomic variables that could have an impact on firms' inflation expectations: FX depreciation, FX volatility, GDP growth, unemployment, and the Uruguayan country risk (EMBI Uruguay). The coefficient associated to the budget deficit to GDP, i.e. the benchmark fiscal policy variable, remains statistically significant at the 1% level and with a similar order of magnitude than in the main regression model through all the robustness checks. Interestingly, while the budget deficit to GDP preserves its significance, other macroeconomic variables are also statistical significant and the coefficient have the expected signs. In a highly dollarized economy like Uruguay, the exchange rate depreciation and volatility are correlated with firms' inflation expectations. Additionally, a higher GDP growth and lower unemployment rate are positively correlated, and a higher country risk, which is consistent with a higher debt service in a context of fiscal deficits, is positively correlated with inflation expectation.

5. Final remarks

Inflation expectations play a crucial role in an inflation targeting regime. Monetary policy aims to anchor inflation expectations in order to achieve its target, but this task may be affected by other public policies. In this paper, we find robust empirical evidence of a positive correlation between the budget deficit and the gross debt to GDP with the inflation expectations of firms. This result implies interdependence between fiscal and monetary policies. More precisely, monetary policy may face more challenges to maintain inflation expectation anchored when the fiscal outcomes worsen.

Nevertheless, the empirical evidence indicates that monetary policy has been effective to attenuate the distortions introduced by fiscal policy on inflation expectations during the period under analysis. Inflation expectations remain relatively stable and out of a continuously increasing

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path that would be expected if its positive correlation with the budget deficit to GDP were not attenuated by a negative correlation introduced by monetary policy.

Among fiscal variables, the budget deficit to GDP appears as the most relevant in affecting inflation expectations. This fiscal variable, together with other macroeconomic variables, receive great attention in the news, public discussion and among professional analysts. The budget deficit may be capturing a set of macroeconomic determinants of inflation expectations. In this regard, the budget deficit is a macroeconomic variable that calls the attention of large part of the population, including firms, and thus it could serve as a summary of the fiscal context.

More work is needed in order to explain the determinants behind these results. Some progress has been done regarding fiscal dominance, which is defined as the financing of budget deficits by money creation. Bucacos (2022) finds evidence of a mild degree of fiscal dominance in Uruguay during the period 1999 to 2019. This is consistent with the existence of clear rules where the central bank cannot finance more than 10% of the previous year's budget deficit.

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Appendix

A Monetary contractivity index: assessment of strings

- In order to assess the contractivity tone of each string of text selected from the monetary policy statements, we assign scores according to the following criteria:
- When the monetary authority emphasizes to control inflation as its priority, we assign a very contractive score (+2).
- When the monetary authority shows worries about inflation, we assign a contractive score (+1).
- When the monetary authority expresses that inflation is not a main priority, we assign an expansive score (-1).
- When the monetary authority shows worries about economic activity, we assign a very expansive score (-2).
- When the monetary authority emphasizes that inflation or inflation expectations are low or had gone down, we assign an expansive score (-1).
- When the monetary authority maintains the same inflation target, we assign a neutral score (0).
- When the monetary authority changed the monetary policy rate, we assign a very contractive or a very expansive score depending on the direction of the change (-2 or 2).
- When the monetary authority makes explicit the contractionary character of the monetary policy stance, we assign a contractive score (+1).
- When the monetary authority claims that monetary policy is or has been slightly contractive but the real monetary stance is expansive we assign an expansive text(-1). However, if there is not a clear bias in the monetary policy stance we assign a neutral score (0).

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B Descriptive statistics and figures

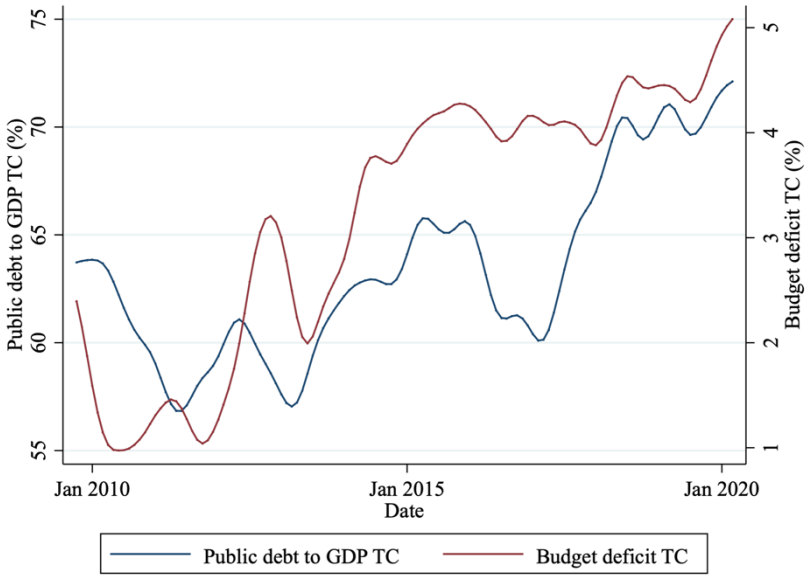

Figure 4: Gross public debt to GDP

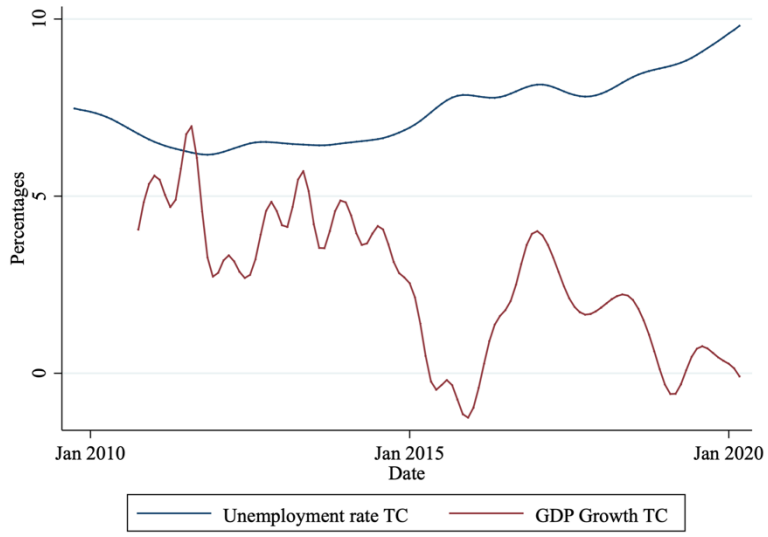

Figure 5: GDP growth and unemployment rate (trend-cycle component)

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Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Expected inflation rate in $t = H$	46,580	8.95	2.06	5.00	25.00
Short-term interest rate	126	9.76	2.60	6.25	15.66
Monetary contractivity index	126	0.28	0.29	-0.33	1.00
Budget deficit to GDP	126	2.98	1.30	0.44	5.11
Gross public debt to GDP	126	62.84	4.04	55.99	71.44
FX depreciation	126	0.48	2.43	-5.11	13.93
FX volatility	126	0.10	0.19	0.00	1.78
GDP growth	126	2.79	2.09	-1.49	7.96
Unemployment rate	126	7.25	1.00	5.60	10.80
EMBI	126	179.06	39.88	98	304

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C Robustness check results

Table 3: Robustness: Unexpected budget deficit to GDP

	R1	R2	R3	R4	R5	R6
(1) Expected inflation rate	0.239***	0.236***	0.229***	0.215***	0.215***	0.209***
	(0.026)	(0.027)	(0.027)	(0.028)	(0.028)	(0.028)
(3) Unexpected budget deficit to GDP	0.040**	0.045***	0.052***	0.043***	0.043***	0.026
	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
(2) Short term interest rate		-0.093***	-0.085***	-0.055***	-0.057***	-0.077***
		(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
(2)x(3)			0.175***			
			(0.021)			
(4) Monetary contractivity index				-0.146***	-0.156***	-0.102***
				(0.010)	(0.011)	(0.011)
(3)x(4)					0.026**	
					(0.011)	
(2)x(3)x(4)						-0.099***
						(0.013)
Obs.	37,934	37,934	37,934	37,934	37,934	37,934
N-Groups	560	560	560	560	560	560
Ar1-p	0.000	0.000	0.000	0.000	0.000	0.000
Ar2-p	0.142	0.158	0.218	0.195	0.173	0.245
Hansen-p	1.000	1.000	1.000	1.000	1.000	1.000

Statistical significance: * 10%, ** 5%, *** 1%.
Huber-Eicker-White standard errors are reported in parenthesis.

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Table 4: Robustness: gross debt to GDP

	R7	R8	R9	R10	R11	R12
(1) Expected inflation rate	0.069**	0.069*	0.068*	0.068*	0.068*	0.064*
	(0.035)	(0.035)	(0.036)	(0.035)	(0.036)	(0.035)
(3) Gross debt to GDP	0.108***	0.108***	0.108***	0.107***	0.107***	0.106***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
(2) Short term interest rate		-0.036*	-0.062	-0.036*	-0.036*	-0.059***
		(0.021)	(0.505)	(0.022)	(0.022)	(0.022)
(2)x(3)			0.000			
			(0.008)			
(4) Monetary contractivity index				-0.005	-0.009	-0.029***
				(0.010)	(0.011)	(0.010)
(3)x(4)					0.009	
					(0.012)	
(2)x(3)x(4)						-0.001***
						(0.000)
Obs.	37,934	37,934	37,934	37,934	37,934	37,934
N-Groups	560	560	560	560	560	560
Ar1-p	0.000	0.000	0.000	0.000	0.000	0.000
Ar2-p	0.434	0.426	0.423	0.420	0.420	0.354
Hansen-p	1.000	1.000	1.000	1.000	1.000	1.000

Statistical significance: * 10%, ** 5%, *** 1%.
Huber-Eicker-White standard errors are reported in parenthesis.

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Table 5: Robustness: Macroeconomic variables

	R13	R14	R15	R16	R17	R18	R19
(1) Expected inflation rate	0.184***	0.183***	0.184***	0.183***	0.183***	0.157***	0.133***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)	(0.030)
(3) Budget deficit to GDP	0.493***	0.474***	0.491***	0.493***	0.474***	0.518***	0.436***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.034)
(4) FX depreciation		-0.011***					-0.055***
		(0.003)					(0.004)
(5) FX Volatility			-0.036				0.092**
			(0.035)				(0.041)
(6) GDP growth				0.110***			0.238***
				(0.030)			(0.034)
(7) Unemployment					-0.057**		0.019
					(0.025)		(0.029)
(8) EMBI						0.004***	0.007***
						(0.000)	(0.000)
Obs.	37,934	37,934	37,934	37,934	37,935	37,672	36,978
N-Groups	560	560	560	560	560	560	556
Ar1-p	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ar2-p	0.421	0.421	0.427	0.424	0.422	0.978	0.394
Hansen-p	0.866	0.870	0.870	0.872	0.861	0.821	0.838

Statistical significance: * 10%, ** 5%, *** 1%.
Huber-Eicker-White standard errors are reported in parenthesis.

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