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INFLATION EXPECTATIONS AND THE ECB'S PERCEIVED INFLATION OBJECTIVE: NOVEL EVIDENCE FROM FIRM-LEVEL DATA

by Marco Bottone*, Alex Tagliabracci* and Giordano Zevi*

Abstract

In this paper we use a unique dataset to study how awareness of the formulation of the ECB's inflation aim, defined as "below, but close to, 2%", shapes the inflation expectations of a representative set of Italian firms. In particular, we show that in the period under consideration such awareness raises firms' inflation expectations by about 25 basis points at all time horizons with respect to the control group. In the recent period of low inflation, this finding implies that being informed about the ECB's aim stabilizes firms' inflation expectations at higher levels, closer to its target. However, this occurs at the expense of a lower correspondence of such expectations with ex-post realized inflation, especially on short-term horizons. When explicitly asked, the majority of firms indicates the ECB inflation aim as being between 1.0% and 1.5%, while just a few of them see it as between 1.7% and 1.9%. This result might be related to the difficulty of interpreting the "below, but close to" formulation, and suggests that a precise definition of the ECB's inflation aim could be easier to communicate and more likely to be properly understood.

JEL Classification: D22, E31, E52, E58.
Keywords: ECB's inflation aim, firms' inflation expectations, monetary policy, information treatments, survey data.
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Contents

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1 Introduction

The formulation of the European Central Bank (ECB)'s objective is unique in the context of central banking. It is composed of two main parts: a definition of price stability, established by the Governing Council in 1998, i.e."*a year-on-year increase in the HICP for the euro area of below 2%"* and an inflation aim introduced after the 2003 strategy review, declaring that "*the Governing Council has clarified that, in the pursuit of price stability, it aims to maintain inflation rates below, but close to, 2% over the medium term*".[1]

The numerical vagueness of this formulation ("below, but close to, 2%") may have proved somehow problematic (e.g. Rostagno et al., 2019 and Corsello et al., 2021). A loosely-defined inflation target does not anchor long-term inflation expectations well and could hamper the effectiveness of monetary policy, especially in a context of low inflation, such as that of recent years (e.g. Armenter, 2017 and Gobbi et al., 2019).

Several clarifications provided by ECB officials over the years, partly provided to dispel uncertainty, have undoubtedly gone some way to doing so, but ultimately it is the perception of the target's formulation by economic agents, and its impact on their expectations and behaviour, which matters. The comprehension of the inflation objective is especially important for firms, which are price- and wage-setters and therefore key players in driving inflation dynamics. Coibion et al., 2020d confirm this, showing how information on current inflation shapes firms' inflation expectations, which then have a causal link with firms' economic decisions.

This paper employs a representative survey of Italian firms, i.e. the Bank of Italy's quarterly Survey on Inflation and Growth Expectations (SIGE, hereafter), to study two crucial questions related to the ECB's inflation objective: (i) what is the impact on inflation expectations of being informed about the target and (ii) what is the numerical interpretation of this target by firms. First, we exploit a unique treatment, introduced in 2017Q2 and replicated afterwards, to show the effects of repeatedly communicating the ECB's inflation aim on firms' inflation expectations. Second, we investigate how firms interpret the ECB's formulation of its inflation aim by means of a specific question included in the 2020Q1 wave of SIGE. In this wave, depending on the previous information they had, firms were required to give either a numerical quantification of

The views expressed in this article are those of the authors and do not necessarily represent the positions of Bank of Italy or of the Eurosystem.

We would like to thank Andrea Brandolini, Paolo Del Giovane, Silvia Fabiani, Romina Gambacorta, Yuriy Gorodnichenko, Alberto Locarno, Andrea Neri, Stefano Neri, Alfonso Rosolia, Alessandro Secchi and Roberta Zizza for their useful comments at different stages of this work. All the remaining errors are ours alone.

[1] All the major central banks have explicit numerical objectives for inflation, although their monetary policy frameworks differ in respect of the level, the horizon over which price stability is to be achieved and how their objective is formulated; currently many central banks set their target at or around 2%. The ECB launched a new strategy review in January 2020 with the objective of covering all aspects of monetary policy; this review is expected to be completed by the end of 2021.

the ECB's target or to provide a qualitative assessment of it. Importantly, by combining the answers on the perceived target with the information treatment on the ECB's inflation aim, and with another treatment that provides firms with the current inflation rate, we can investigate the differential effects of this information with respect to the (non-informed) control group.

The answers to our research questions are the following. First, firms treated with the statement of the ECB's target since 2017Q2 tend to display on average inflation expectations closer to 2% . More specifically, this target treatment has a sizeable level effect, shifting inflation expectations upwards by 25 basis points at any horizon. Inflation expectations of these target-treated firms are also more stable over time compared to those of the inflation treated ones. However, in a period of persistently low inflation, these expectations come at the cost of a lower correspondence between expected inflation and ex-post observed inflation. Second, firms' quantifications of the ECB's inflation aim are heterogeneous. The majority of firms believe that the aim is at 1.0% or 1.5%, therefore quantifying the "below, but close to, 2%" less close to 2% than in the ECB's official statements.[2] This holds true regardless of the information treatment they previously received. Consistently with this finding, a large majority of respondents considered the inflation rate for the euro area at the time of the survey (1.4%) to be broadly in line with the ECB's aim. Additionally, we find that receiving the question on the ECB target (which should focus attention on it) did not produce any lasting effects on the inflation expectations of the control group. This is confirmed by a comparison of firms in the control group that did and did *not* participate to the 2020Q1 survey and by exploiting some precious data on the test-taking behaviour during the survey interview, showing that the untreated firms did not revise their inflation expectations after being asked about the ECB's inflation aim. This evidence is consistent with previous results in the literature pointing to the need for a message to be repeated over and over before featuring in consumers or firms' information sets.

The contribution of this paper is threefold. First, we show how a unique information treatment on the ECB's target can shape firms' inflation expectations, by looking at properties such as the level, the dispersion and their accuracy. Second, we provide an explicit quantification of firms' perceptions of the "below, but close to, 2%" inflation aim targeted by the ECB. This evidence is unprecedented since, to our knowledge, this question was never directly asked to a representative set of firms but only to professional forecasters. Moreover, the ECB's particular definition of the inflation aim makes this question particularly relevant from a policy view-

[2]As regard the quantitative meaning of the inflation aim, when the first review of the strategy was presented to the press in May 2003, Otmar Issing (at the time ECB Chief Economist) declared: "*This close to 2 percent is not a change, it is a clarification of what we have done so far, what we have achieved - namely inflation expectations remaining in a narrow range of between roughly 1.7 and 1.9% - and what we intend to do in our forward-looking monetary policy*". In July 2019, president Mario Draghi provided a more precise numerical quantification as: "*I think I have said this many times, but now it's in the introductory statement – reaffirmed its commitment to symmetry around the inflation aim, which in a sense is 1.9 – it's close to, but below, 2%*".

point, compared with the same question asked for other central banks, whose inflation target does not raise interpretation issues. Third, the structure of the SIGE and the richness of its information allow us to experiment with the interplay of firms' awareness of both the central bank's target and the current rate of inflation, two aspects that, to our knowledge, have never been considered together in previous studies.

The finding that the ECB's inflation aim is not perceived as being numerically very close to 2% is an important result from a policy perspective. It indicates a difficulty in interpreting the "below, but close to" formulation, and suggests that a more precise definition of the ECB's inflation aim could be easier to communicate and more likely to be properly understood. The evidence that the "ECB target treatment" brings inflation expectations closer to the target and make them more stable, but determines a lower correspondence with ex-post observed inflation, is also important from a policy view-point, and calls for a careful calibration of the communication on both monetary policy objectives and inflation developments.

The rest of the paper is structured as follows. Section 2 reviews the existing studies and literature analysing the knowledge and understanding of monetary policy from survey data. Section 3 illustrates our survey design and the structure of its information treatments and questions. Section 4 shows the quantitative effects of these treatments on firms' inflation expectations and Section 5 describes the results of the question on the ECB's target. Section 6 uses the evidence from the previous sections to provide some indications of what we learnt from this experiment with respect to the understanding of firms' expectation formations and to gather some precious results for the conduct of the monetary policy. Section 7 briefly concludes.

2 Literature Review

Over the last years several central banks have taken a major step forward to improve the communication of their policy actions towards the general public with an explicit effort to be more clear about their target and intended strategy to achieve them. Against this background, there is a growing body of literature investigating the public knowledge of the central banking policies, not only in terms of objectives, but also with regard to tools and the conduct of monetary policy.

In particular, a number of works test consumers' perceptions about such policies; the evidence in firms' surveys is however much more limited.[3] This despite understanding the conduct

[3]The literature on households' surveys, which is centered on the United States, finds that only a small share of consumers has some knowledge on FED objectives. For instance, Binder and Rodrigue, 2018 show that families are in general not aware of the central bank inflation aim. Indeed, 48% of households declare that they know the FED inflation target, but only half of them say that it corresponds to 2%. Similarly, Coibion et al., 2019 use a large online survey to show that only about 20% of families were correct in stating the FED target. In terms of new implemented policies, one recent example is Coibion et al., 2020a that show very little effect of the new FED's announcement of its new strategy of average inflation targeting on households' inflation

of central banks' monetary policy is undoubtedly relevant for firms, since their business plans are generally oriented to a medium-to-long horizon and their expectations have a causal impact into economic decisions.

One important example concerns New Zealand, whose central bank was the first to adopt an explicit inflation-targeting framework in 1990. Although this strategy has been in place for about three decades, some studies show the poor knowledge of the central bank's policies among businesses. For instance, Kumar et al., 2015 find that firms' managers are unable to properly identify which is the inflation aim pursued by the New Zealand Reserve Bank. Later, Coibion et al., 2018 document businesses' inflation expectations derived from surveys conducted in New Zealand between 2013 and 2016. They show that firms provided with information on the numerical value of the central bank's inflation target changed their short- and long-run inflation forecasts towards the central bank's objective, but this treatment had only temporary effects (especially on short-term expectations). In a follow-up treatment, firms were asked explicitly about their beliefs on the central bank's target, and partitioned according to their answer, before being briefed about the correct target. Firms that were initially well informed about the target had economic forecasts that were unaffected by the treatment, while the remaining firms revised down their inflation forecast when provided with the right target.

Similar results are found for the Federal Reserve (FED) policy in the United States. Even if the FED announced its numerical inflation target already in 2012, Coibion et al., 2020c use a large survey conducted in April 2018 to show that such objective is ignored by a large share of US businesses (around 60% of the respondents) and only a small fraction (around 25%) is familiar with the correct 2% target.

A possible explanation for this poor knowledge of the central bank's target is proposed by Cavallo et al., 2017, that rationalize agents' inattention as the result of a long period in a low-inflation environment. Indeed, as argued by Frache and Lluberas, 2019, the central bank's aim is instead relatively well known by firms operating in countries with high inflation such as Uruguay, pointing to the different informational needs in low- and high-inflation regimes. Interestingly, firms in the US, in New Zealand and in Uruguay all tend to assign to their central bank a higher target than the actual one, with a distribution of responses generally skewed towards relatively high values of inflation, although to a different degree between countries.

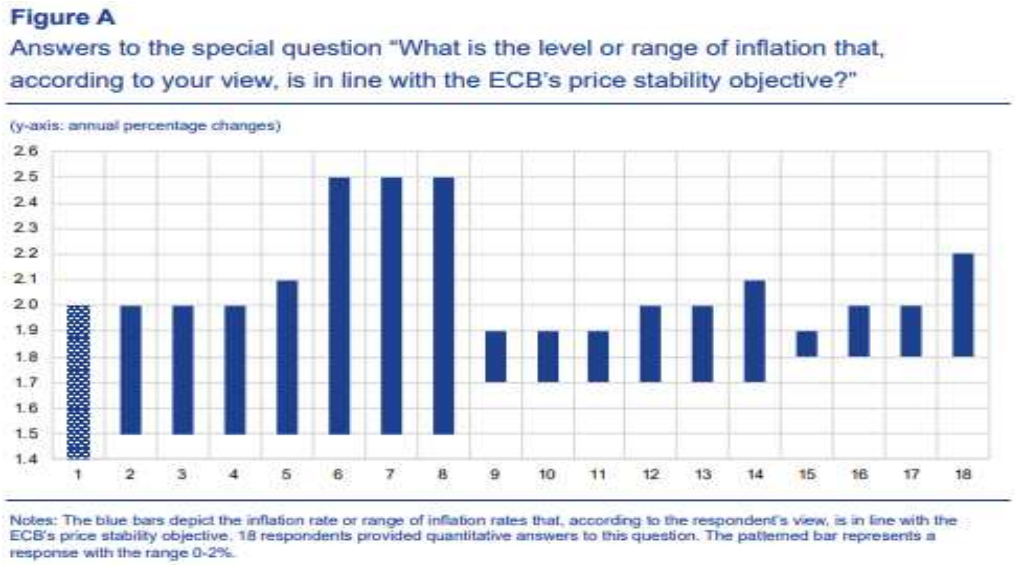
Regarding the conduct of monetary policy in the euro area, the ECB operates pursuing an inflation-targeting strategy since its creation in 1998. Only few studies have analysed the public familiarity of the ECB's policies.[4] In October 2020 the ECB Survey of Professional Forecasters

expectations, unless they receive targeted information treatment.

[4]The few existing works are mainly restricted to households' expectations. One example is van der Cruijsen et al., 2015 who use a Dutch consumer panel to show that a significant share of respondents was not able to correctly identify the ECB activities and objectives. Interestingly, families with better knowledge of the central bank's objectives have on average more realistic inflation expectations. Exploiting the same Dutch survey, Christelis et al., 2020 find that about 40% of respondents report that they do not know the ECB's inflation

(SPF) assessed participants' quantitative understanding of the ECB's inflation aim by including the following question: *"What is the level or range of inflation that, according to your view, is in line with the ECB's price stability objective?"*. Figure 1 shows the responses: nearly all respondents to the question believed the objective to be flexible, i.e. a range, rather than a single point value. Although there was some heterogeneity, the median respondent interpreted the ECB's price stability objective as 1.7-2.0%, as these are the lower and higher limits of the range. However, professional forecasters represent a very selected group of ECB watchers, well

Figure 1: Special question included in the ECB SPF 2020Q4



Source: `https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/pdf/ecb.spf2020q4~dab5d8085d.en.pdf`

versed in reading among the lines of monetary policy announcements and with high financial skills. They are generally aware of the interplay between market participants' perception of the ECB's inflation aim and its actions, and their expectations plausibly reflect some elaborated beliefs on the ability and will of the ECB to reach its stated target.

The Bank of Italy's Survey on Inflation and Growth Expectations (SIGE), that we use in this paper, has already been exploited for understanding the mechanism of formation of firms' expectations and the effects of information treatments.[5] With respect to the conduct of the monetary policy, Bottone and Rosolia, 2019 explore the short-term degree of sensitivity of firms' expectations to monetary policy shocks. More broadly, Coibion et al., 2020d study the causal effect of inflation expectations on firms' economic decisions. They show that providing

aim.

[5]Bartiloro et al., 2019 provide a complete description of the survey and study the determinants and the cyclical properties of the cross-sectional heterogeneity of firms' inflation expectations. Another similar work is Conflitti and Zizza, 2020 which delves into how Italian firms form their inflation expectations, especially in terms of wage pass-through to prices. Cecchetti et al., 2021 summarize the research done on the SIGE dataset at the Bank of Italy.

information about the last available inflation rate generates an exogenous variation in inflation expectations, which leads them to raise their prices and increase demand for credit, even when policy rates are stacked at the effective lower bound.

3 Survey design and information treatments

The Survey on Inflation and Growth Expectations (SIGE), which began in the fourth quarter of 1999, is run quarterly by the Bank of Italy on a sample of about 1,000 manufacturing, service and construction firms with at least 50 employees. The sample is stratified by sector of activity, firm size and geographical area.[6] The data collection process lasts about three weeks during the last month of the reference quarter. The survey collects sentiment information on aggregate cyclical developments, on firms' real and financial conditions as well as on point expectations on consumer inflation and own product price dynamics.

It is worth emphasizing that the question on consumer inflation expectations has had the same wording for all the firms only until 2011Q4, namely:

> "*In [last observed month] the consumer price inflation, measured by the 12-month change in the harmonized index of consumer prices was [. . .] per cent in Italy and [. . .] per cent in the euro area. What do you think it will be in Italy in 6, 12, 24 months and 3-5 years ahead?*".[7]

Subsequently, different information treatments have been assigned for random subgroups of firms. A first randomization was introduced in 2012Q1 when 2/3 of respondents continued receiving, in the first part of the question, the information about the latest available official figure (defined as the "inflation-treated" group) while the remaining firms did not receive any information (i.e. the "not-treated" or "untreated" group). A second randomization was finally introduced from the 2017Q2 survey wave when, for 1/5 of the sampled firms, the question wording featured the statement of the ECB's inflation aim (labelled as the "ECB target treated" or "target-treated" group):

> "*The European Central Bank has as an objective the maintenance of the 12-month change in the harmonized index of consumer prices in the euro area below, but close to, 2 per cent in the medium term. What do you think consumer price inflation in Italy, measured by the 12-month change in the harmonized index of consumer prices, will be in ...?*".

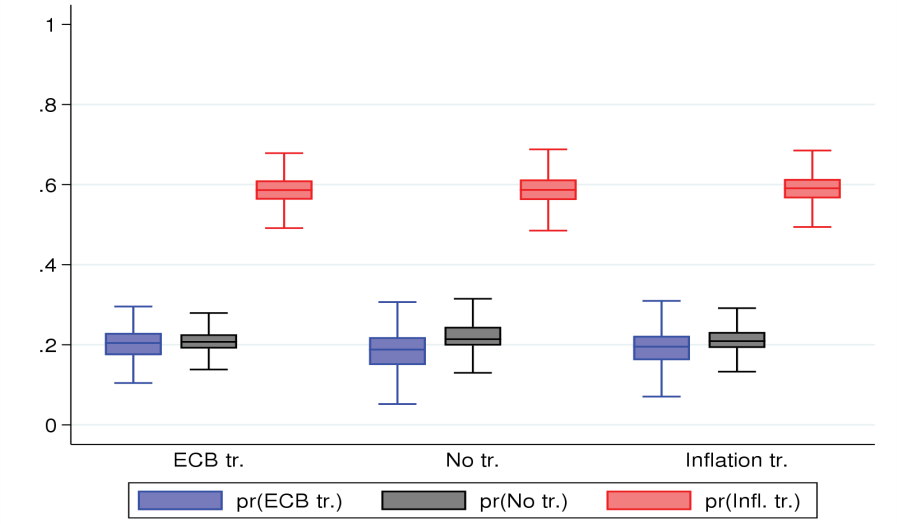
[6]The survey has a panel structure with a refresh share of about 20% in each wave. The possible non-response bias is accounted for by means of a weighting post calibration technique (raking). In the following paragraphs a unitary weight is assigned to all firms as this allows to better represent the uniqueness of individual expectations and personal interpretations of the ECB target. The results obtained with the use of weights do not differ substantially from those shown here.

[7]From the very beginning of the survey, only expectations at 12 months were asked. Inflation expectations at 24 months were introduced in 2009; those at 6 months in 2010 and those between 3 and 5 years in 2014.

Consequently the "inflation-treated" and the "not-treated" groups have shrunk respectively to 3/5 and 1/5 of the sample. It is worth noting that the firm-level randomization has remained substantially stable over the years, implying that each firm always belongs to the same original random subgroup.

A fundamental concern about the treatment procedure is the effective randomization of each sub-group. Indeed, the validity of the analyses in the next paragraphs strongly relies on this randomization to assign the observed mean differences in the three sub-groups to the specific treatment received. To assess the conditional independence of the treatment on the observable firms' characteristics, Figure 2 displays the box plots of the predicted probability of receiving a given treatment against the actual event. For each sub-group, predicted probabilities are estimated by a logit model for the event of being treated on the log of employees and on dummies for industry, area and size class. The probability distribution among treatment groups are statistically equal, implying that it generally holds that P(receive treatment X|being treated X) = P(receive treatment X|being treated Y) = P(receive treatment X|being treated Z), i.e. the observable firm's characteristics considered do not help predict the assignment of a given treatment.

Figure 2: Predicted probability of receiving a specific information treatment



Source: Authors' calculations on SIGE micro data on the sample 2017Q2-2020Q1. *Note*: Box plots of the estimated predicted probability (logit model) of receiving a given treatment against the actual event.

Moreover, to shed light on firms' interpretation of the ECB's inflation target a new experiment was introduced in the 2020Q1 wave, as described in Figure 3. Specifically, 2/3 of the firms in the "inflation-treated" group (therefore 2/5 of all firms) were asked to report their qualitative evaluation of the coherence of the current euro area inflation rate with respect to the ECB target; the remaining set of firms were asked to report the numerical interpretation

of the ECB statement, which is not reported in the question so that only the "target-treated" group surely knows it.[8] The Appendix reports the exact wording of these questions and the time series of the information on Italian and euro area price variations contained in the question wording of the inflation treated firms (see Figure 13).

Figure 3: 2020Q1 survey structure and information treatments

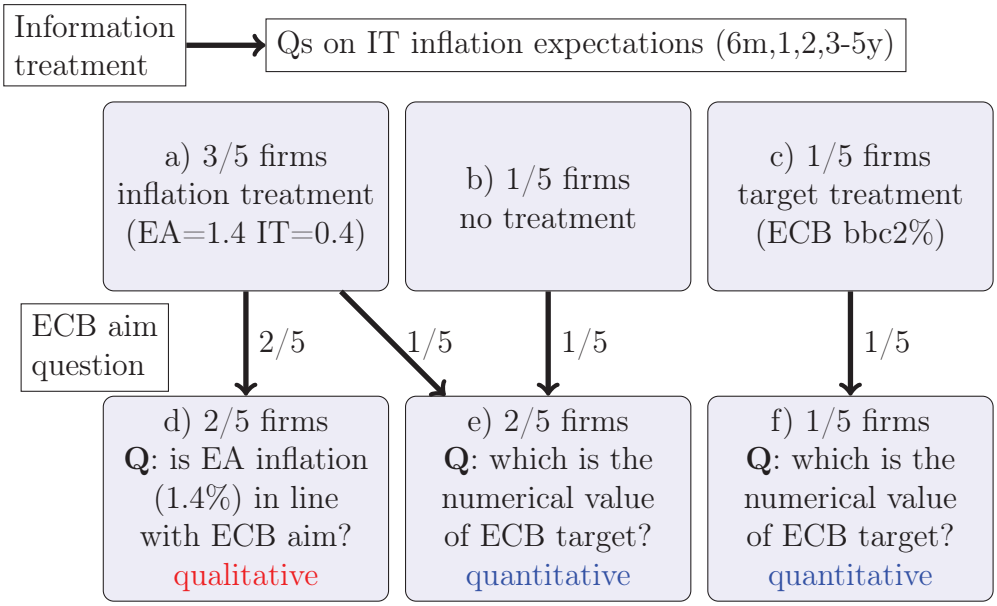


Table 1 shows, among the different treatments, the distribution of the effective sample (i.e. the share of sampled firms receiving that specific question) and the non-response rate (i.e. the share of firms leaving the question unanswered). Compared to the theoretical sample (20%) the effective "target-treated" group is somewhat smaller in favour of the "not-treated" group; the "inflation-treated" group is broadly as expected (60%). The distribution of the sample among the sectors of economic activity is very homogeneous. As for the breakdown by geographical area and size, the differences do not generally exceed 5 percentage points. Overall, the non-response is very contained, especially considering the severe conditions under which the 2020Q1 survey was conducted, due to the diffusion of the Covid-19 virus in the Northern part of Italy. We believe that the economic developments in this period could have an impact on firms' expectations, such as on economic growth or expected inflation, but we do not see a strong reason for them to immediately and directly affect the perception of the ECB's inflation target (see Angeletos et al., 2020).

[8]It is worth noting that the questions on inflation expectations based on the three random sub-sample continued even after the 2020Q1, when the specific question on the target were asked to all firms. However, since this specific question could have partly influenced firms' knowledge of the phenomenon, in the first part of the paper we use the data only up to 2020 Q1, while in Section 6 we also consider what happened after that quarter.

Table 1: Non-response rate in the 2020Q1 survey

Question on inflation expectation	Inflation treatment				No treatment		ECB target treatment		Whole Sample
Question on ECB inflation aim	Opinion on distance from the target		Numerical interpretation of the statement						
	% Effective sample	% Non response	% Effective sample	% Non response	% Effective sample	% Non response	% Effective sample	% Non response	N
Geographical Area									
North West	40.9	0.6	19.5	3.0	25.6	1.2	14.0	0.0	164
North East	43.4	0.0	13.8	0.0	30.1	2.6	12.8	1.0	196
Centre	37.0	0.6	13.6	1.9	37.0	1.9	12.3	0.6	162
South	48.8	1.9	17.3	2.5	21.6	0.0	12.3	0.6	162
Sector									
Industry	42.4	0.8	16.9	1.7	28.4	2.0	12.4	0.6	356
Services	42.7	0.6	14.9	1.8	29.0	0.9	13.4	0.6	328
Number of employees									
50-199	45.0	0.8	15.6	1.7	26.0	0.8	13.4	0.8	358
200-999	40.3	0.4	16.0	1.2	31.3	2.9	12.3	0.0	243
Over 999	38.6	1.2	16.9	3.6	32.5	0.0	12.0	1.2	83

Source: Authors' calculations on SIGE data for 2020Q1.

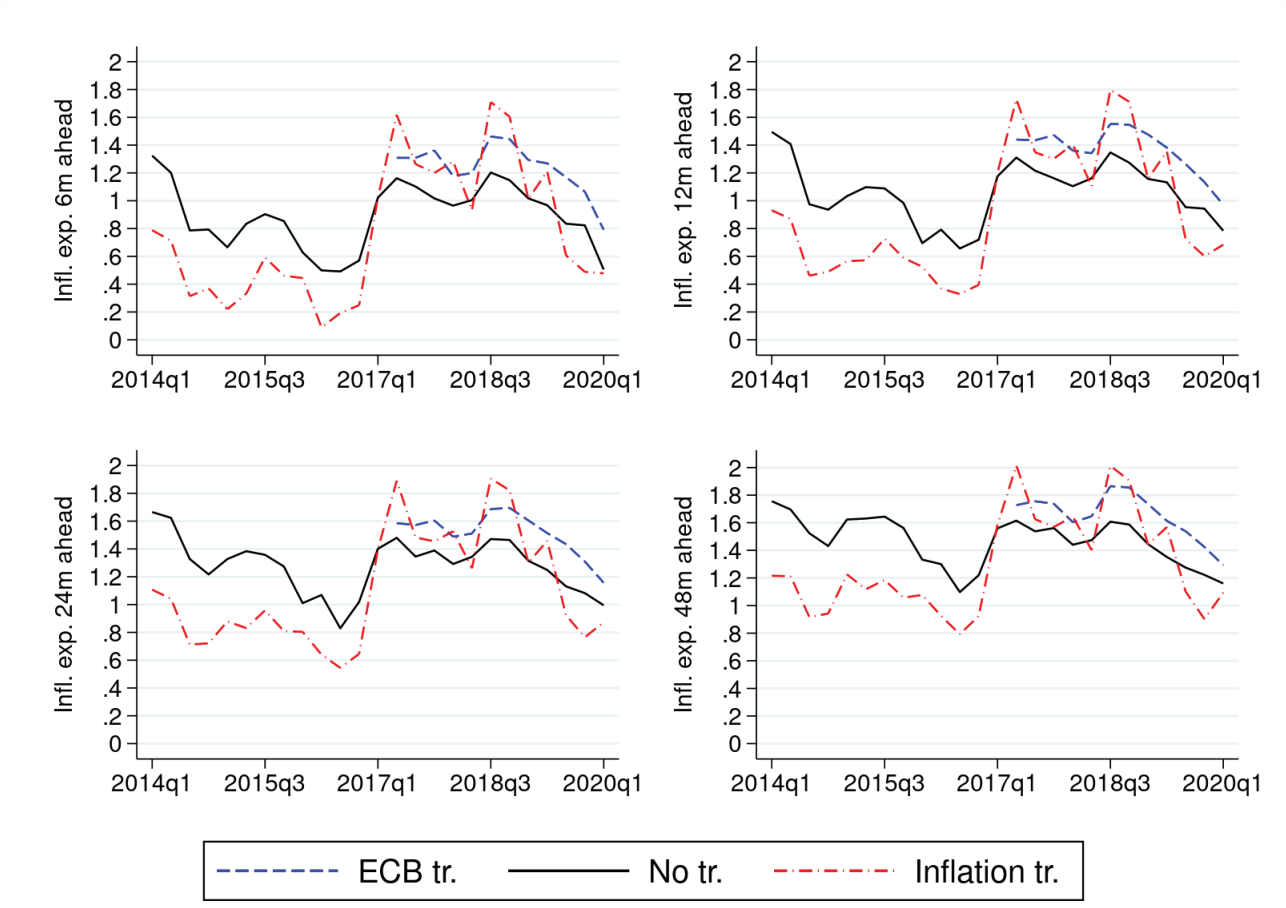
4 The effects of information treatments

This section shows that information treatments matters in shaping the respondents' inflation expectations. In particular, four pieces of evidence emerge. First, "inflation treated" firms tend to provide expectations that are close to the value of current inflation, no matter which is the time horizon the expectation refers to. Consequently, expectations collected from this group are on average less stable through time and less dispersed in the cross section than those from the remaining firms. Second, with respect to businesses that were not given any information ("not treated"), those which were communicated the ECB's target ("target treated") display inflation expectations that in the 2017Q2-2020Q2 period are on average higher (about 25 basis points) and closer to 2%. This difference is broadly stable through time. Third, among the expectations of the "target treated" firms, extreme values, especially very low ones, are less frequent. Indeed, it is the missing mass on low values that determines the higher average with respect to the "not-treated" group. Fourth, both the current inflation rates and the ECB's inflation aim act as attractors for firms in the "inflation treated" and "target treated" group, respectively. Since the latest inflation data points are known to be good predictors for future inflation in the short term, the above facts imply a communication trade off for the policy maker when current inflation is far from the target: stressing the information about current inflation would improve the accuracy of firms inflation forecasts, but would reduce the stability of their expectations. Full details about these findings are provided in the following subsections.

4.1 Level effect

Inflation in the euro area and in Italy has been on average very weak in the 2014-2019 period (0.9 and 0.6%, respectively). However, there has been some significant volatility, with euro area monthly (year-on-year) inflation rates fluctuating from -0.6% in 2015 to 2.3% in 2018. These outcomes offer the necessary variability in the information provided to firms before eliciting their expectations, allowing to study how changes in actual inflation have reflected on the expected rate of prices growth. Figure 4 shows the evolution of average inflation expectations by treatment groups. Each panel in the chart refers to one time horizon: 6-months ahead, 12,

Figure 4: Mean of inflation expectations for different treatments' types



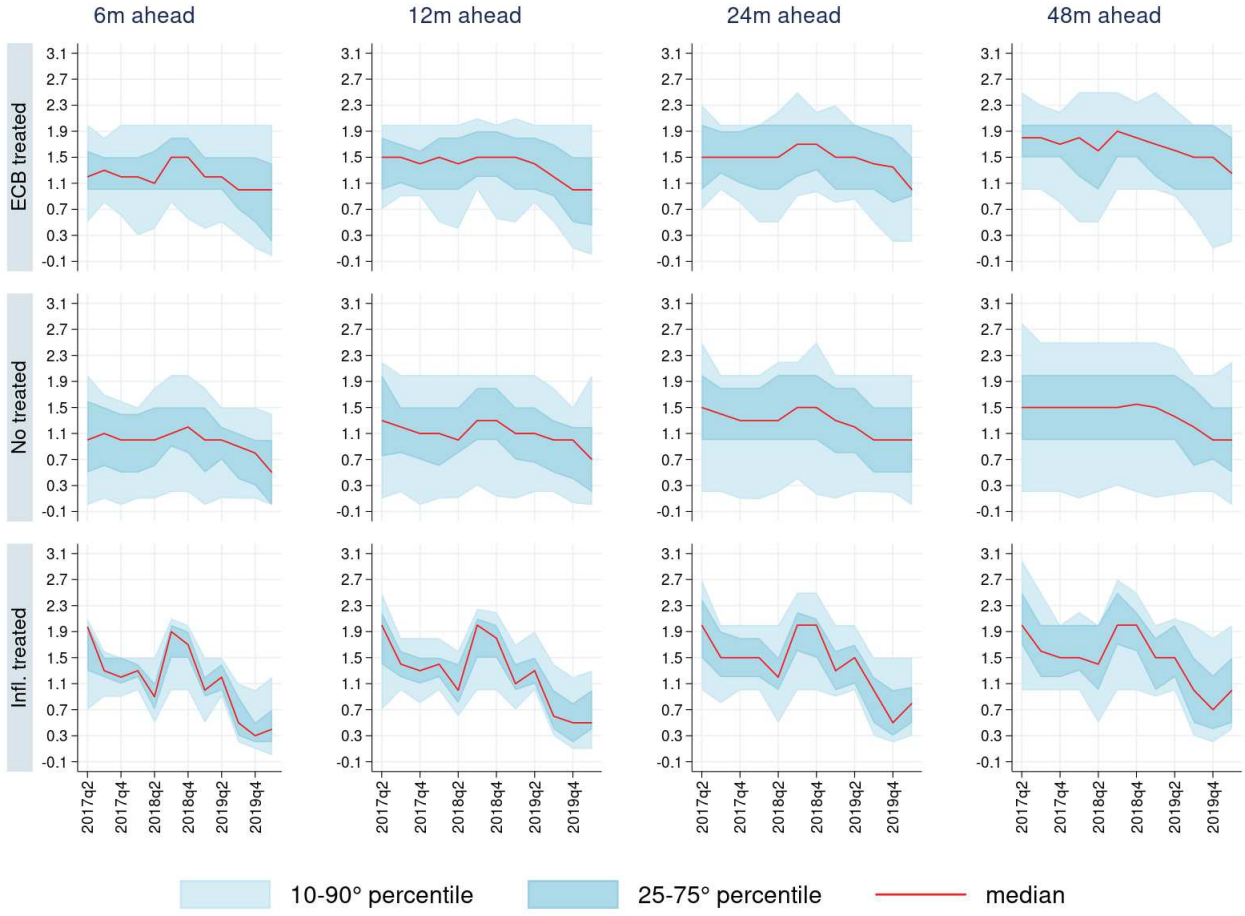
Source: Authors' calculations on SIGE data. Each line represents the mean of the point expectations at different horizons for each group of firms.

24 and between 36 and 60-months ahead (indicated as 48-months for convenience). Results are clear-cut: compared to firms which were not given any information, the "inflation treated" businesses display an adaptive behaviour, for example increasing expectations as the headline HICP inflation rose from 0.2% in July 2016 to 2.0% in February 2017 sustained by rising energy prices (notably core inflation was stable at around 0.8-0.9% throughout the period). For this group, information on current inflation reflects directly on longer-term expectations,

too. Overall their expectations are therefore much more volatile through time with respect to the control group.

Since 2017Q2, the first wave in which the "target treatment" was administered, businesses in this group display average expectations that are about 25 basis points higher on all time horizons with respect to the "not-treated" firms. This higher average is driven by the higher left tail of the expectations distribution, which suggests that information on the target discourages forecasts of very low inflation (see Figure 5).

Figure 5: Distribution of inflation expectations for different treatments' types



Source: Authors' calculations on SIGE data.

The fact that the difference in the average expectation is *positive* is likely connected to the low inflation experienced in the euro area in the period considered. Indeed, it is plausible that, had inflation been persistently and significantly above the ECB's aim, the "target treated" group would have shown lower (and closer to 2%) expectations than the control group.[9] This

[9]Importantly, the magnitude of the difference between the "ECB target treated" and the "not-treated" is broadly stable over time. This excludes the presence of a significant *agreement* bias, that would lead a portion of target-treated firms to answer with a value very close to 2% in any case to please the interviewer. If this was the case, in fact, the difference would adjust according to the gap between the level of current and past inflation and 2%.

descriptive evidence is confirmed by a regression of inflation expectations $\pi^e_{i,t+t|t}$ on treatment dummies D_{ECB} and D_{Infl} (the "not-treated" group is the reference category), also interacted with current inflation, and controls including time dummies and firms characteristics X_t (size, sector and geographical area of activity):

$$\pi^e_{i,t+t|t} = \alpha + \beta_1 D_{ECB} + \beta_2 D_{Infl} + \beta_3 D_{ECB} \times \pi_t + \beta_4 D_{Infl} \times \pi_t + \omega X_t + \epsilon_{i,t}. \quad (1)$$

Results from Table 2 show that between 2017Q2 and 2020Q1 businesses which were communicated the ECB's inflation aim shifted their expectations upwards, between 22 and 29 basis points depending on the horizon, with respect to the "not-treated" group. On the other hand, "inflation-treated" firms displayed lower inflation expectations, driven by the weakness of actual inflation. To control for the variability in current inflation, we include an interaction term which indeed is statistically significant only for the "inflation-treated" firms.

Table 2: Effects of treatments on inflation expectations over different horizons

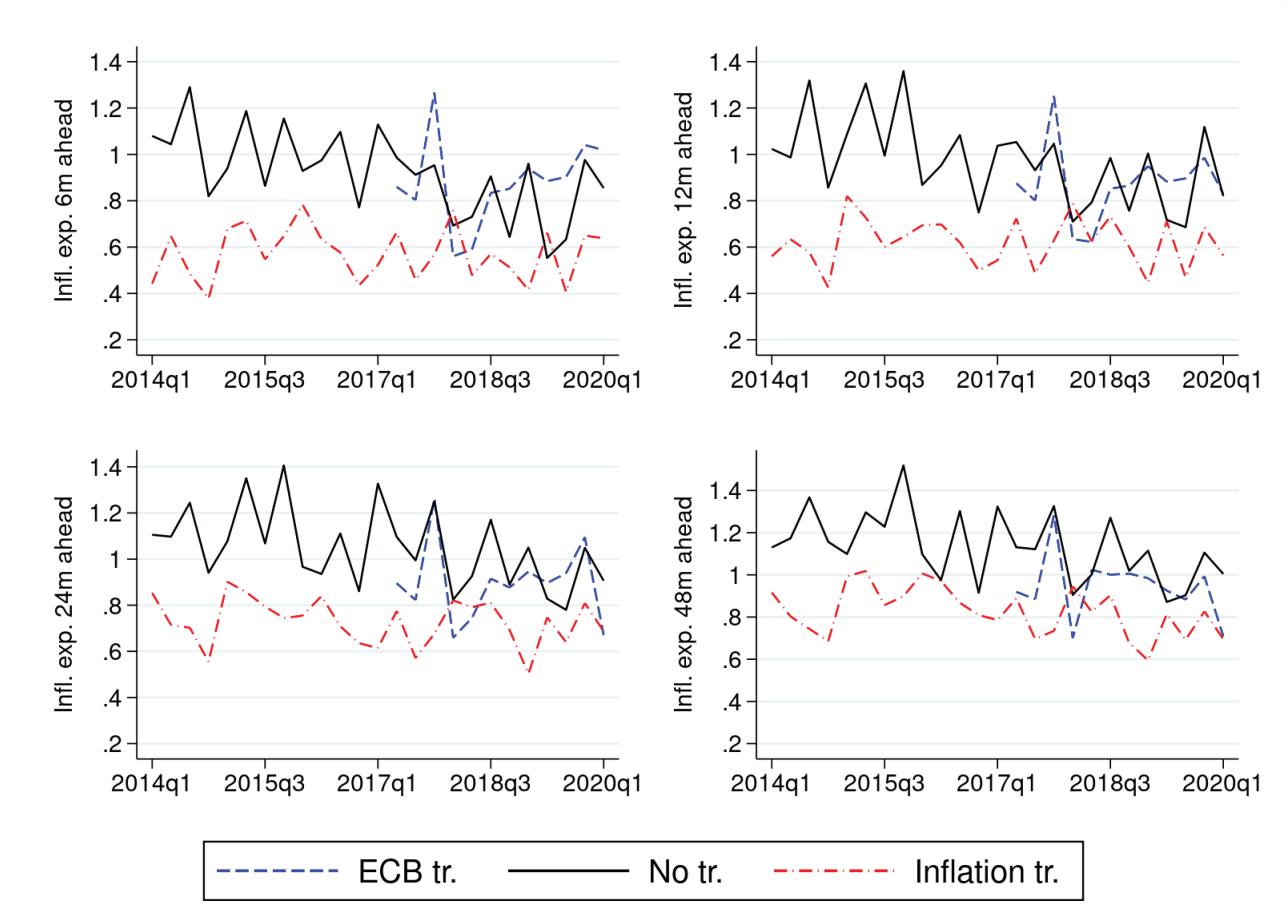
	(1) IT6	(2) IT12	(3) IT24	(4) IT48
ECB tr.	0.289***	0.255***	0.254***	0.216***
	(0.000)	(0.000)	(0.000)	(0.000)
Inflation tr.	-0.334***	-0.343***	-0.334***	-0.308***
	(0.000)	(0.000)	(0.000)	(0.000)
$ECBtr. \times \pi_t$	-0.0278	-0.0167	-0.0323	-0.00214
	(0.461)	(0.677)	(0.461)	(0.964)
$Infl.tr. \times \pi_t$	0.450***	0.436***	0.407***	0.374***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	1.092***	1.245***	1.441***	1.580***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	10179	10179	10179	10179
R^2	0.192	0.161	0.127	0.104

Source: Authors' calculations on SIGE data. *Note*: P-values in parentheses. $*p < 0.05, **p < 0.01, ***p < 0.001$. All regressions include dummies for industry, area and size class.

4.2 The impact on the forecast dispersion

Figure 6 shows the cross-sectional standard deviation of the expectations over the sample period. The distribution for "inflation-treated" firms is less dispersed at almost any point in time and for all expectation horizons (as shown by Bartiloro et al., 2019) than those for "target treated" and "not treated" businesses. For each treatment group and at each point in time, the standard deviation increases slightly with the expectation horizon, with a more significant rise between the 2-years ahead and the 3-to-5 years ahead.

Figure 6: Standard deviation of inflation expectations for different treatments' types



Source: Authors' calculations on SIGE data. Each line represents the standard deviation of the expectations at different horizons for each group of firms.

Interestingly, in the 2017Q3-2020 period, the dispersion of expectations on shorter horizons remains on average broadly stable for the "inflation-treated" group while it increases for the "target-treated" businesses. The latter outcome plausibly reflects the interplay between the overall decline of actual inflation rates and the anchor to expectations provided by the ECB's inflation aim. Indeed, looking at the distribution of 6-months ahead expectations, the very slight decline in the median comes with a clear movement of the lower tail towards smaller values (see Figure 5). For the "inflation treated" group, instead, the downward trend in inflation is controlled for by the information on current inflation rates, which act as a catalyst for their expectations and moves the whole distribution closer to zero.

Looking at longer-horizons, and focusing once again on the "target-treated" group, there is no increase of dispersion on the 3-to-5 years ahead forecasts, in line with the evidence for the other groups. Over time, the downward shift of the distribution still keeps always the 25^{th} percentile above 1.0% (at its lowest point it is about 0.5% for the inflation treated and the not treated firms).

4.3 Forecast accuracy

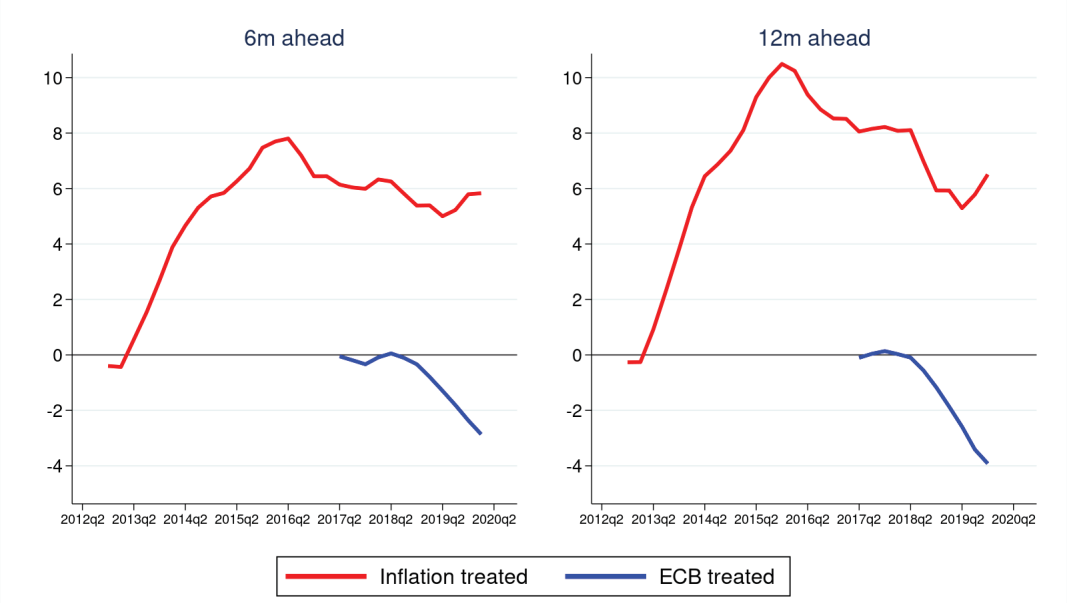
Current inflation rates are generally good predictors for future inflation in the short term; for firms that are provided such information, they are also correlated with short- and long-term expectations. Therefore, "inflation-treated" firms have on average an advantage in predicting short-term future inflation with respect to the "not-treated" businesses. On the other hand, "target-treated" firms display average expectations that are equally stable but closer to 2% than "not-treated" businesses. This is true for all horizons, despite the fact that the ECB's inflation aim refers to the medium term (and, in principle, only such horizon should be affected). Therefore, if current inflation rates are far from 2%, this puts this group of firms at a disadvantage from a forecasting point of view. In other words, in the short term (6 months-ahead) there is a trade-off between the accuracy of firms inflation forecasts and the stability of their inflation expectations.

To show the evolution of the relative accuracy between groups over time, we plot in Figure 7 the cumulative sum of squared errors difference, at time t^*, described in equation 2 below:

$$CSSED_{i,t^*} = \sum_{t=t_0}^{t^*} (e^2_{not-treated,t} - e^2_{treated,t}) \tag{2}$$

where e_t represents the average forecast error in period t for the horizon h, defined as $\pi^e_{t+t|t} - \pi_{t+h}$, and *treated* is equal to 1 for firms who are either target-treated or inflation-treated. The results

Figure 7: Cumulative sum of squared errors difference with respect to the not-treated group



Source: Authors' computations on SIGE data. Each line represents the CSSED of each treated group with respect to the not-treated group. Values of CSSED above (below) zero indicate that the treated firms perform relatively better (worse) than the not treated ones.

should be read as follows. Values of CSSED above (below) zero indicate that the treated firms perform relatively better (worse) than the not-treated ones. As time progresses, positive (negative) changes represent improvements (decline) in the relative performance of the treated groups vis-a-vis the not-treated firms.

Focusing in particular on the 6-months ahead expectations (left panel), the outcomes are clear: from 2012 to 2016 "inflation treated" businesses steadily improved their forecasting performance with respect to the "not treated" ones. This result does not come as a surprise: these firms, on average, are adding some valuable piece to their information set and this allows them to forecast better. This is true until 2016. Since then, the performance of the two groups is broadly similar and even the non-informed businesses do slightly better in some periods. Exceptionally low and decreasing rates of current inflation are not anymore helpful in predicting the future growth rate of prices.

"Target-treated" firms tell us a different story: starting from early 2018, the treatment clearly worsens their forecasts accuracy. The anchoring of these firms' expectations towards 2% (even if it should be referred to the medium term) produces a progressively larger disconnect from the realized path of inflation.

Overall, when it comes to forecasting six months-ahead inflation, the best performers over the last two years are the uninformed firms, almost matched by the "inflation treated" ones; the "target treated" do poorly, hence confirming the trade-off between stability of expectations and accuracy of predictions. The narrative is broadly similar for the 12 months-ahead horizon, except for the fact that the inflation treated forecasts improved more strongly up to 2016 and since then deteriorated more significantly with respect to those formulated by not informed businesses.

5 Firms' interpretation of the ECB's inflation aim

In this section we discuss the answers provided by firms to two ad-hoc questions introduced in the first quarter of 2020 on the ECB's inflation aim.[10] The objective is to measure firms' perceptions of the ECB's target after years of information treatments in a low-inflation environment. We then study the relationship between firms' long-term inflation expectations and their perceptions of the target to obtain some information as regard to the understanding of monetary policy.

[10]The special question introduced in 2020Q1 was meant to help clarifying firms' perception of the current monetary policy.

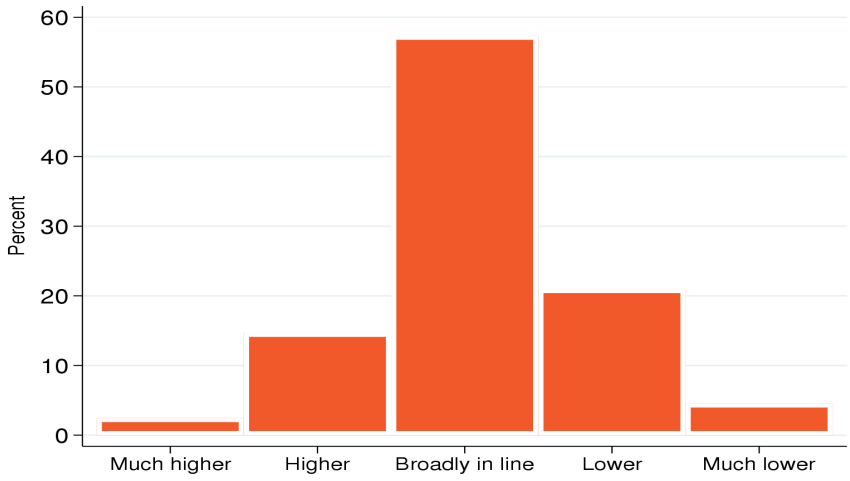
5.1 Qualitative responses

We start describing the replies to the qualitative question regarding the coherence between the inflation rate in the euro area as released in January 2020, which was at 1.4% and was given as the inflation treatment, and the numerical value of the ECB's inflation aim as perceived by firms. Specifically, firms are asked the following question:

> "*In your opinion, compared with the price stability objective pursued by the ECB, consumer price inflation in the euro area in January (1.4%) was:. . . ?*".

The set of answers included five options, ranging from "much higher" to "much lower".[11] Figure 8 shows the share of answers for each option. Almost 60% of the respondents believe that 1.4% is broadly in line with the ECB's inflation aim. The fraction of firms who assess 1.4% as higher (or much higher) than the target and that of those who hold it lower (or much lower) are broadly balanced. Interestingly, both pieces of evidence suggest that the set of firms which were asked this qualitative question had in mind an inflation target certainly below 2% but not "close" to this value, as meant by the ECB.

Figure 8: Qualitative responses on the ECB's inflation aim



Source: Authors' computations on SIGE data. The question was formulated as follows: "*In your opinion, compared with the price stability objective pursued by the ECB, consumer price inflation in the euro area in January (1.4%) was:. . . ?*". Each bar represents the share of firms for each proposed qualitative answer.

5.2 Quantitative responses

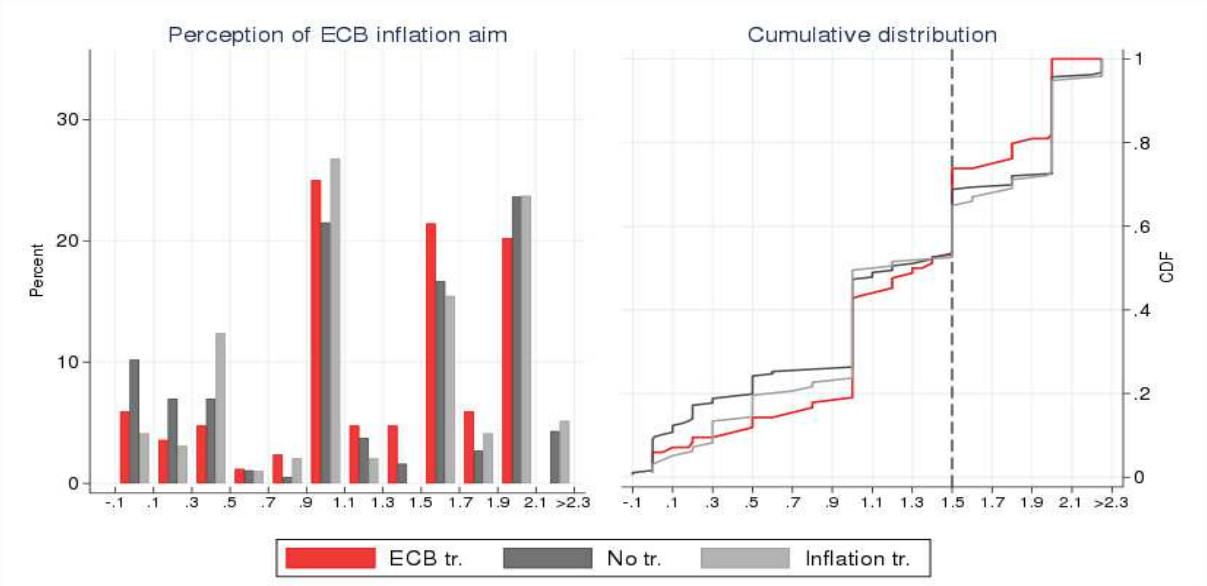
Following the description of the treatments in Figure 3, all the remaining firms (besides those in the previous section) were asked to quantify numerically the ECB inflation target. We

[11] Therefore if a firm selected the option "much higher" it implied that the ECB target was considered much lower than 1.4%.

illustrate the results for two groups of such firms: the first includes those with "no treatment" or with an "inflation treatment", but without any information about the target in the previous stage ("not target-treated"); the second one includes those that received the "below, but to close to, 2%" treatment ("target-treated" firms). The wording of the question was slightly different. If firms had received no information on the target beforehand the question was: "*In your opinion, what is the consumer price inflation rate in the euro area that best represents the price stability objective pursued by the ECB?*". If firms were target-treated, it was: "*In your opinion, what is the consumer price inflation rate in the euro area that best represents the ECB's objective described in the previous question?*".

Figure 9 displays the probability distribution of the answers (left panel) and the corresponding cumulative distribution (right panel). Beliefs about the inflation target are heterogeneous. The target is perceived as being below or equal to 1% by almost half of the firms (in both

Figure 9: Quantitative responses on the ECB's inflation aim by treatment groups



Source: Bank of Italy, SIGE. Note: comparison between groups E and F in Figure 3. Each bar represents the share of firms whose quantitative answer falls inside the bins defined on the x axis. The two distributions plotted in the chart are not statistically different.

groups) and below or equal to 1.5% by around 70% of them. The average answer is far from 2%: 1.21% and 1.31% for "not treated and inflation treated" respectively, while it is 1.26% for "target-treated" firms. Only about 25% of the "not target-treated" and 20% of the "target-treated" respondents place the ECB's inflation target at exactly 2 percent. About 5% of the "not target-treated" have in mind a target above it. Values given in the answers are heaped at around round numbers, with no significant mass in the 1.7-1.9% interval or at the 1.9% point, which at different points in time, emerged as quantifications of the target by ECB's officials.

It is worth noting that, among firms that are "not target-treated", being informed about the last inflation figure has almost no effect on the indicated numerical target. The distribution

of answers is broadly similar for firms that in the previous stage were provided with the last available inflation rate (light grey) and for those that were not (dark grey), except for the lowest decile. Looking more in depth at the treatment effects, Table 3 shows that the perception of the ECB target is also not statistically different between not target-treated and target-treated firms. We interpret this outcome as indicating that all firms are somewhat aware of the ECB's target of keeping inflation below 2%, and that the "target-treatment" is not able to produce, on average, any significant quantitative effect pushing the target perceptions close to the 2% threshold.

Table 3: Effect of the treatments on the ECB target interpretation

	Difference between target interpretation						
	P10	P25	P50	Mean	Mean*	P75	P90
ECBtr.	0.233	0.160	0.110	0.046	0.091	-0.188	-0.188
	(0.132)	(0.145)	(0.407)	(0.646)	(0.324)	(0.136)	(0.136)
Infl.tr.	0.330*	0.063	-0.001	0.096	0.086	-0.023	-0.023
	(0.027)	(0.549)	(0.995)	(0.320)	(0.329)	(0.849)	(0.849)

P-values in parentheses. $*p < 0.05, **p < 0.01, ***p < 0.001$. The numbers represents the differences with respect to the not-treated group at different percentile of the distribution.

All in all, these results suggest that Italian firms have heterogeneous beliefs about the ECB's target and their interpretation of "below, but close to, 2%" is quantitatively lower (1.0 to 1.5%) than the ECB's stated inflation aim.

5.3 The level-anchoring of inflation expectations

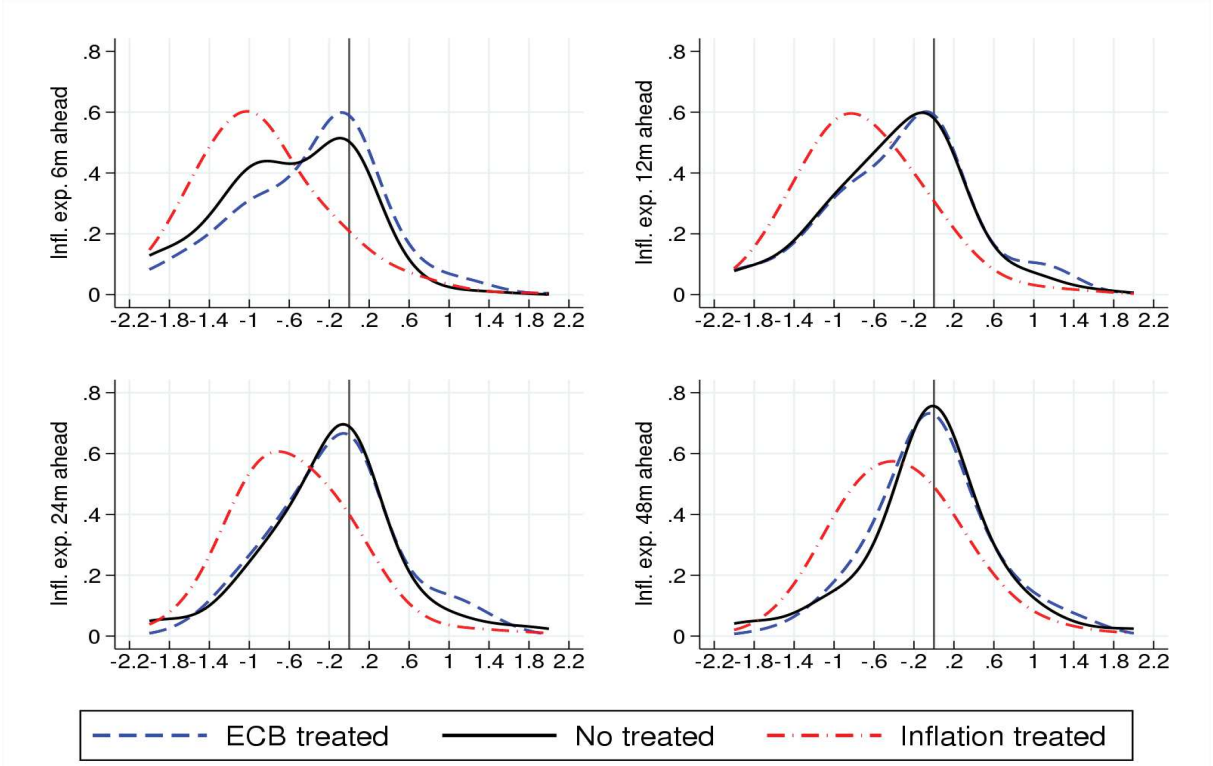
In this section we employ the 2020Q1 survey to shed more light on the level-anchoring of firms' expectations to ECB's inflation aim. By level anchoring, the literature refers to expectations that stay fixed at the central bank's target regardless of any movements in actual inflation (see e.g. Ball and Mazumder, 2011). Specifically, for each firm we calculate the value $dI_i = E(\pi_{i,t+h}) - I(T_i)$, where $E(\pi_{i,t+h})$ and $I(T_i)$ are respectively the $t+h$-months ahead inflation expectation and the target interpretation of firm i. This difference, especially for expectations at longer horizons, is of great importance for monetary policy since this is one of the cleanest measures of firms' expectations anchoring to the ECB target.

The richness of our dataset allows us to calculate this measure of anchoring using only values directly indicated by firms, so that we do not need any assumptions, neither on the precise interpretation of the target nor on the inflation expectations. The availability of both measures at the individual firm level represents an advantage for the understanding of the firms' heterogeneity along both directions. Furthermore, by exploiting the treatments implemented in

the survey, we can also analyse whether and to what extent the different pieces of information provided to each subgroup play a role in shaping firms' level-anchoring.

Figure 10 shows the kernel distributions of the difference dI_i by treatment group at all the available horizons. It is immediate to observe that while the distributions of "not-treated" and "ECB-treated" are overall quite similar, reaching their mode in an interval very close to zero, those of the "inflation-treated" are clearly different, reflecting lower inflation expectations, especially over the shorter horizons. On the contrary, all the distributions have in common the positive skewness (i.e. expectations below the target), which becomes less prominent as the time horizon lengthens.

Figure 10: Anchoring by information treatment



Source: Bank of Italy, SIGE. Each line represents the distribution of the differences between long-term inflation expectations and the ECB target perceptions.

The regression of dI_i on the dummies for the information treatments D_{ECB} and D_{Infl} (and some standard control variables), i.e.:

$$dI_i = \alpha + \beta_1 D_{ECB} + \beta_2 D_{Infl} + \boldsymbol{\gamma} X_i + \varepsilon_i. \tag{3}$$

allows us a deeper understanding of the differences just elicited. As for the previous section, we perform both mean and several (unconditional) quantile regressions to have a full picture of the differences between treatments along the entire distribution.

Table 4 shows the results, where the constant term represents the value of the "not treated" group. The quantiles and the mean of the distributions of this last group, although never statistically different from zero, have lower absolute values as the forecast horizon increases, suggesting a stronger anchoring in the long term. "Inflation-treated" firms have a significantly different behaviour compared with "not-treated" firms. In particular, while the 25^{th} percentile and the mean of the former are more distant from zero, the 75^{th} percentile approaches it slightly, suggesting a left shift of their entire distributions compared with that of the not-treated firms. On the contrary, the "target-treated" show a dissimilar distribution only on the shorter forecast horizons that push the left tail closer to zero. The minor differences on the longer horizons go still in the direction of bringing the distributions values even closer to zero, although this is not statistically significant.

Table 4: Magnitude of de-anchoring along the distribution

	Infl. exp. 6m ahead				Infl. exp. 12m ahead			
	P25	Median	Mean	P75	P25	Median	Mean	P75
ECB tr.	0.119	0.308*	0.227+	0.244+	0.052	0.131	0.106	0.113
	(0.373)	(0.048)	(0.080)	(0.062)	(0.696)	(0.303)	(0.291)	(0.281)
Inflation tr.	-0.399*	-0.274+	-0.147	-0.212+	-0.358*	-0.122	-0.226*	-0.200*
	(0.010)	(0.078)	(0.238)	(0.067)	(0.024)	(0.341)	(0.021)	(0.039)
Constant	-0.734	-0.839	-0.594	0.559	-0.279	-0.361	-0.222	0.525
	(0.249)	(0.178)	(0.266)	(0.215)	(0.676)	(0.464)	(0.593)	(0.160)
	Infl. exp. 24m ahead				Infl. exp. 48m ahead			
ECB tr.	0.070	-0.003	0.070	0.024	0.042	-0.009	0.021	-0.007
	(0.599)	(0.970)	(0.411)	(0.748)	(0.714)	(0.885)	(0.806)	(0.936)
Inflation tr.	-0.453**	-0.235**	-0.269**	-0.185**	-0.368**	-0.122+	-0.209*	-0.096
	(0.003)	(0.003)	(0.004)	(0.009)	(0.007)	(0.051)	(0.026)	(0.249)
Constant	-0.758	0.005	-0.154	0.268	-0.098	0.132	0.014	0.220
	(0.203)	(0.986)	(0.639)	(0.342)	(0.813)	(0.568)	(0.962)	(0.491)

Source: Bank of Italy, SIGE. P-values in parentheses. $*p < 0.05, **p < 0.01, ***p < 0.001$.

All in all, these results suggest that while the data on recent inflation tend to create - even for longer horizons - a disconnect between expectations and the interpretation of the target, the communication of the target contributes only marginally to the reduction of this difference which, even in absence of any information, appears to be overall low and centered at zero.

6 What did firms learn? And what did we learn?

Based on our previous results, this section focuses two main issues: first, we test whether the question on the ECB's inflation aim had some sort of "learning" effects on the not-treated

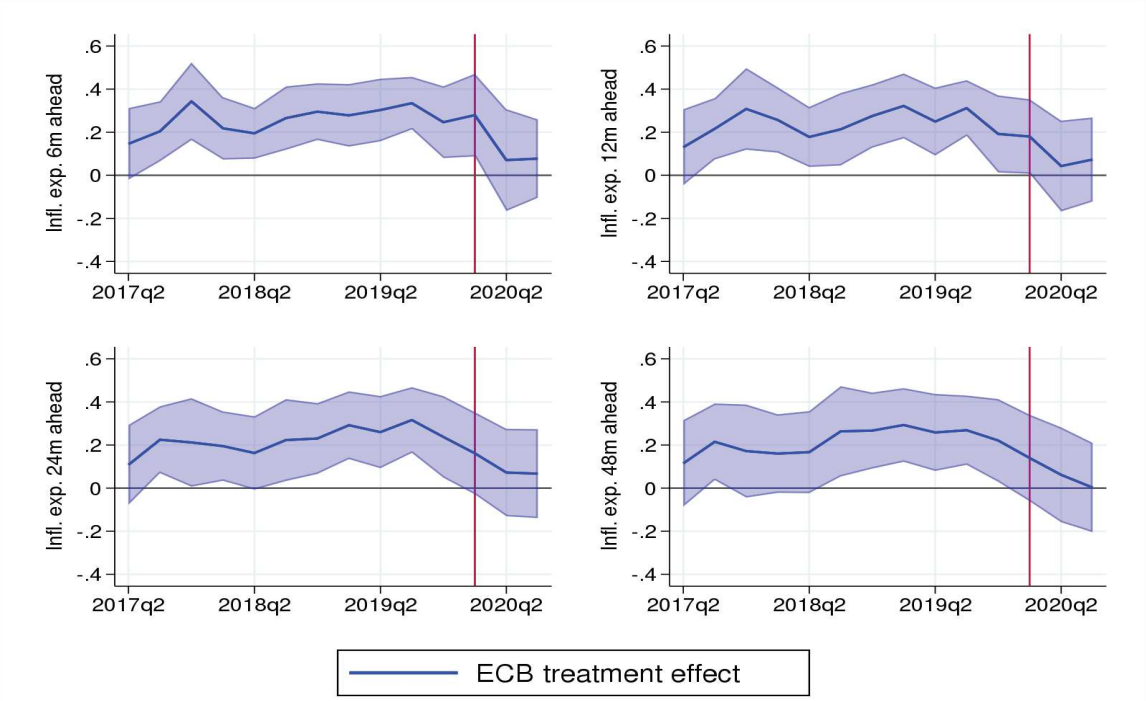
group after 2020Q1. Second, we elaborate on what we have learnt on firms' behaviour from the use of these information treatments. We then conclude by providing some considerations for future applications.

6.1 Firms' behaviour after the ECB target question

The question on the quantification of the ECB's inflation aim included in the 2020Q1 survey may have affected the information set of the control group. Indeed, the set of not-treated firms might have learnt some relevant information about the ECB objective: if they previously ignored the inflation aim ("below, but close to, 2%"), the 2020Q1 survey made them aware of it and as a consequence reduced the level-difference of inflation expectations with respect to the "target-treated" group.[12]

To test this hypothesis, we analyse whether the average 25 basis points difference between the target-treated and the not-treated firms documented in Section 4.1 is still present after 2020Q1. Figure 11 illustrates the results for all the forecast horizons. Interestingly, the average

Figure 11: Average ECB treatment effect over time



Source: Bank of Italy, SIGE. The shaded areas represents the 95% confidence bands. The red vertical line corresponds to the period (2020Q1) of the question on the ECB's inflation aim.

difference between inflation expectations (represented by the blue line) decreases after 2020Q1

[12]This is the case for instance shown in Coibion et al., 2018 which document that managers changed their inflation expectations towards the central bank's numerical target after becoming aware of it.

at all horizons. In other words, the 25 basis points gap which had been present from 2017Q2 to 2020Q1 appears smaller and not statistically significant afterwards.

In order to investigate if a role was played by other potential factors in driving this result[13], we explore more in detail the behaviour of the "not-treated" group by exploiting the relevant share of firms (close to 50%) included in the 2020Q2 and 2020Q3 surveys that did *not* participate in 2020Q1. Therefore, testing the differences between non-treated firms before and after 2020Q1 could offer a more genuine interpretation of the effects of the introduction of the question. Table 5 presents the main results of a quantile regression estimated for the surveys conducted before and after 2020Q1. It shows that the differences are not statistically significant at any horizon (for convenience we report here only the results for 2 and 3-5 years) and in any part of the distribution, namely for the 25^{th} and 75^{th} quantiles. This finding supports the idea that the question on the ECB target included in 2020Q1 did not have persistent effects in the following surveys and that the reason behind the narrowing of the gap between "ECB-treated" and "not-treated" groups is likely connected to other factors, such as the Covid-19 crisis which could have affected inflation expectations, regardless of the information treatment.

Table 5: Differences in expectations between not-treated firms included and not included in 2020Q1

	Infl. exp. 24m ahead			Infl. exp. 3-5Y ahead			Share
	P25	Mean	P75	P25	Mean	P75	%
2019Q2	-0.022	-0.109	-0.116	0.167	-0.177	-0.036	51.9
	(0.877)	(0.355)	(0.478)	(0.353)	(0.193)	(0.846)	
2019Q3	0.123	0.175	0.100	0.111	0.145	0.157	51.8
	(0.285)	(0.151)	(0.398)	(0.418)	(0.259)	(0.172)	
2020Q2	0.135	0.002	0.293^{+}	0.155	0.044	0.157	56.6
	(0.300)	(0.990)	(0.084)	(0.258)	(0.772)	(0.353)	
2020Q3	0.049	-0.039	0.132	0.034	-0.004	0.109	53.2
	(0.677)	(0.788)	(0.318)	(0.832)	(0.979)	(0.437)	

P-values in parentheses. $*p < 0.05, **p < 0.01, ***p < 0.001$. All regressions include fixed effects for area, size and sector. The column "Share" refers to the fraction of not-treated firms included in 2020Q1 which were also present in the previous or the following surveys.

We finally explore the hypothesis that the question on the ECB target had an immediate and direct impact on firms' responses to the 2020Q1 questionnaire. This could happen because the

[13]2020 was an exceptional year because of the pandemic and the attenuation in the expectations difference could also be related to the potential effects of the Covid-19 shock on firms' beliefs. Bottone et al., 2021 use the same SIGE micro data to study firms' inflation expectations and their pricing strategies during the pandemic, pointing out that firms' reaction to this unprecedented shock was very muted and mostly dependent on the more recent inflation figures.

survey is conducted online via personal computers and participants can always go backwards in the questionnaire and modify their previous responses. As possible consequence, the non-target treated firms could have changed their initial inflation expectations once they are asked to quantify the ECB's target. Table 6 shows the percentage of cases in which the participants changed their responses for short-term and long-term inflation expectations. The shares are very modest, namely between 1 and 3% depending on the horizon (top panel) and do not show a systematic upward correction of inflation expectations (bottom panel). Besides, there are no significant differences between 2019Q4 and 2020Q1. These considerations suggest that the question on the ECB target, which was formulated in the questionnaire after those on inflation expectations, did not alter the beliefs on inflation expectations for all groups, especially those not exposed to the information on the ECB target.

Table 6: Variations in inflation expectations during the questionnaire

	Infl. exp 12m ahead				Infl. exp 48m ahead			
	ECB tr.	No tr.	Infl. tr.	Total	ECB tr.	No tr.	Infl. tr.	Total
	% Changes in expectations							
2019Q4	3.1	1.6	1.3	1.6	3.1	3.8	2.7	3.1
2020Q1	3.4	1.5	1.0	1.5	2.3	4.1	3.5	3.5
	% of expectations increase							
2019Q4	50.0	60.0	12.5	35.3	25.0	33.3	17.6	24.2
2020Q1	33.3	33.3	50.0	40.0	50.0	37.5	0.0	16.7

Source: Bank of Italy, SIGE. The first two rows collect, for each quarter, the percentage number of firms who changed the initial answer given for the inflation expectation questions before sending the questionnaire. The last two rows show, among the firms who changed their answer, the percentage of those who increased the level of their initial inflation expectation.

To sum up, our evidence suggests that the additional question introduced in 2020Q1 did not produce any significant information effect for the control group ("not treated").

6.2 Lessons for future applications

The specific information treatment implemented in the different SIGE waves since 2017Q2 has some merits besides the exploration on how firms form their inflation expectations. Specifically we see the outcomes in this work as a useful touchstone for the findings in Candia et al., 2020 on businesses' inflation forecasts.

In our case the main randomized control trial applied to Italian firms is the introduction of the ECB target treatment for a subset of businesses in 2017. In the following three years, with respect to firms devoid of any survey-provided information, the "target treated" group have responded by rising their inflation expectations, by increasing over time (rather than decreasing) the dispersion of their forecast, by reducing their forecasting accuracy and the sensitivity of

their longer-term prediction with respect to shorter-term ones. Our understanding is that these effects are internally coherent and suggest that overall firms have perceived this piece of information as being valuable for forming their expectations.

An increase in inflation expectations by roughly 25 basis points should not be downplayed. Indeed, for the United Kingdom Boneva et al., 2016 find that, in response to £50 billion of QE, firms' price and wage inflation expectations increased by 22 basis points, which could give a rough approximation for the value of the information about the target. This is particularly strategic in times of low inflation and interest rates, when forward guidance and other communications strategies become key in the central banks toolbox. Coibion et al., 2019 show that, when targeting the broader public (consumers and businesses) rather than professional forecasters or financial market operatives, "*simple messages about the central bank's inflation target have implications about real interest rates -via inflation expectations- that dwarf those typically found for monetary policy announcements*". Overall, our results pile up with other previous evidence in strengthening this message.

A separate question is how these effects play out through time and how they interact with current developments in inflation. The latter are news which might or might not be included in firms' information set when they formulate their expectations, and this is dealt with in the previous section with regard to non treated respondents. When focusing on "target-treated" firms, we follow the Candia et al., 2020 playbook, and implement a repetition of the message through the survey waves to the same firms. This counteracts the decaying effect of the information as times passes by, which is found in the literature and is compatible with the relatively scarce impact of a one-off information, as seen in the previous section.

We also focus on the ECB's inflation aim rather than its instruments such as the level of interest rate or the size of asset purchases. As shown by Angeletos and Sastry, 2020 and Coibion et al., 2020b, communication on the policy targets should be perceived more clearly than those on instruments and have a stronger impact on inflation expectations. On the other hand, we are not able to tailor the message neither according the receivers' features, nor to the macroeconomic scenario (say low or high growth or inflation periods) or the specific questions asked (e.g. provide different treatments according to the expectations' horizon). More powerful treatments would be needed and we leave them for future advances in the questionnaire design and our research.

Finally, the lessons learned with respect to the impact of current inflation on longer-term expectations and the accuracy of firms' forecasts should not be overlooked. They caution the central bank, for example, in putting excessive emphasis on current inflation data. Firms better informed on current inflation, in fact, show long-term expectations with higher volatility over time and less cross sectional dispersion, which are not necessarily helpful features in conducting monetary policy. Therefore, as a first step, repeated communication on target and possibly on

long- term inflation projections (which are more stable than current rates) would help anchor firms' expectations and would likely yield superior outcomes from the policymakers point of view. Such strategy, however, would likely imply worse firms' forecast accuracy, which affects negatively the economy by blurring the firms' optimal dynamic decisions (e.g. regarding financing options, investment, etc.). In a second step, then, more refined communication tools should be engineered, able to discriminate short-to medium term developments, where information on current inflation is valuable, from longer term ones, where the inflation target and the projections should be in the spotlight. The engineering of such strategies, also discussed in Candia et al., 2020, in the case of Italian firms are left for future research.

7 Conclusions

This paper exploits a unique survey conducted on a representative panel of Italian firms to document new evidence on how information treatments shape firms' inflation expectations and their perceptions of the ECB's inflation aim.

First, we use two specific information treatments, one connected to realized inflation and one related to the formulation of the ECB target, to show that they both produce sizeable effects on inflation expectations at different horizons. While the former makes inflation expectations more closely correlated with the actual inflation dynamics (as previously shown by Bartiloro et al., 2019 and Coibion et al., 2020d), the latter shifts inflation expectations nearer to the ECB's inflation aim. In other words, these two treatments produce a quantitative trade-off in firms' forecasts between accuracy and stability. In an ideal framework, the central bank should be able to provide the firms with distinct and tailored information on both current inflation dynamics and its medium-term target.

Second, using an explicit question introduced in the 2020Q1 survey, we offer the first evidence of how firms interpret (for the target-treated firms) and perceive (for the not-treated firms) the ECB' inflation aim. We show that firms quantify the ECB formulation "below, but close to, 2%" with values that are actually not close to 2 percent, pointing more towards to 1% and 1.5% than to the inflation aim. We believe that this represents a very interesting case: the literature is generally focused on countries such as the U.S. in which the inflation target is unambiguously defined in numerical terms, therefore a question on the central bank's target refers essentially to its knowledge of the policy objective. By contrast, in the case of the ECB and its "below, but close to, 2%", it is not only important to know the inflation target but also to correctly interpret its numerical value.

Last, we provide some useful recommendations for future applications in firms' survey design. Following the suggestions proposed by Candia et al., 2020, we show that information treatments can indeed affect inflation expectations, and that these effects, which at first sight

may appear limited since they sum up to a few decimals, are similar to those generated by conventional and unconventional monetary policy decisions (Boneva et al., 2016). Moreover, our experiment points towards the importance of being simple and direct in communicating policy objectives. Implicitly, it also suggests a focus on targets rather than on instruments, which would be harder to convey (see e.g. Angeletos and Sastry, 2020 and Coibion et al., 2020b).

Future research should concentrate on tailoring the information treatments in order to improve the understanding of the ECB monetary policy. This seems fundamental in the context of the current ECB strategic review. Indeed, we provide new empirical evidence that firms are generally not heterogeneous in terms of their awareness of the ECB target, namely the *veil of inattention* appears to be pierced since there are no major differences in the perception of the inflation aim between the ECB target and the control group. Rather, the issue relates more to the quantification of the "below, but close to, 2%", which firms associate with lower values than those targeted by policymakers.

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Appendix

Figure 12: Survey questionnaire

SECTION B – General economic situation of the country

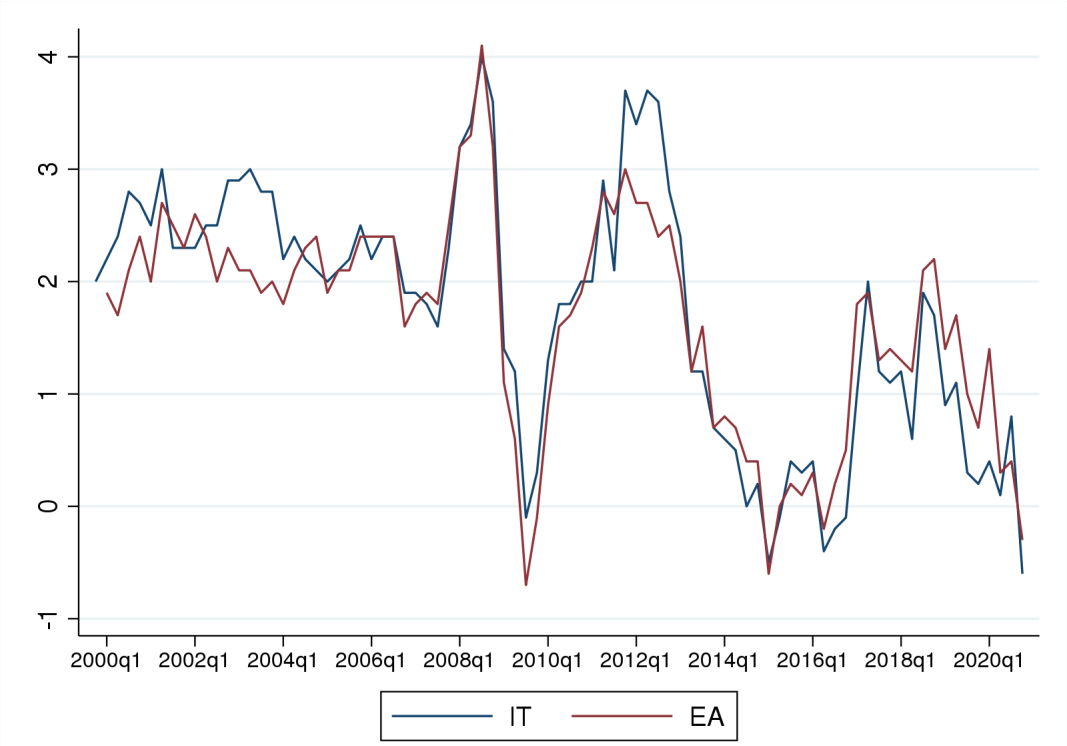
	...in September 2020?	...in March 2021?	...in March 2022?	... on average between March 2023 and March 2025?
B1a. (about 3/5 of the sample) In October consumer price inflation, measured by the 12-month change in the harmonized index of consumer prices was +0.4 per cent in Italy and +1.4 per cent in the euro area. What do you think it will be in Italy...	_|_|_|,|_|%	_|_|_|,|_|%	_|_|_|,|_|%	_|_|_|,|_|%
B1b. (about 1/5 of the sample) What do you think consumer price inflation in Italy, measured by the 12-month change in the harmonized index of consumer prices, will be...	_|_|_|,|_|%	_|_|_|,|_|%	_|_|_|,|_|%	_|_|_|,|_|%
B1c. (about 1/5 of the sample) The European Central Bank has as an objective the maintenance of the 12-month change in the harmonized index of consumer prices in the euro area close but below 2 per cent in the medium term. What do you think consumer price inflation in Italy, measured by the 12-month change in the harmonized index of consumer prices, will be...	_|_|_|,|_|%	_|_|_|,|_|%	_|_|_|,|_|%	_|_|_|,|_|%

B2a. (2/3 of respondents to question B1a) In your opinion, compared with the price stability objective pursued by the European Central Bank, consumer price inflation in the euro area in January was: ☐ Significantly higher ☐ Somewhat higher ☐ By and large in line with the objective ☐ Somewhat lower ☐ Significantly lower

B2b. (remaining 1/3 of respondents to question B1a and respondents to question B1b) In your opinion, what is the consumer price inflation rate in the euro area that best represents the price stability objective pursued by the European Central Bank? _\|_\|_\|,\|_\|%

B2c. (respondents to question B1c) In your opinion, what is the consumer price inflation rate in the euro area that best represents the European Central Bank's objective described in the previous question? (*enter a number between 0 and 2 per cent with one decimal place only*) _\|,\|_\|%

Figure 13: Realized inflation in Italy and euro area contained in the question wording for inflation-treated firms



Source: ISTAT and Eurostat. *Note*: The values provided in the questionnaire is the latest available and it usually refers to the headline HICP realized two months before the reference quarter. When final data was not available, preliminary releases are considered.