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The Impact of Providing Information about the ECB's Instruments on Inflation Expectations and Trust in the ECB: Experimental Evidence*

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Abstract

We use a random controlled trial among Dutch households to analyze whether communication about monetary policy instruments impacts inflation expectations and trust in the ECB. All participants in the survey receive information about the ECB's goal, but only a subset also receives information about *how* the ECB tries to achieve this. Our results suggest that individuals who are informed about policy instruments have inflation expectations closer to the ECB's target inflation than individuals who only receive information about the ECB's objective. Our evidence also indicates that communication about the ECB's instruments does not impact average trust in the ECB.

JEL Codes: D12; D84; E52; E58
Key words: central bank; communication; general public; trust; RCT

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1 Introduction

Nowadays, central banks not only communicate to financial markets but also to the general public. As central banks have become more independent over time, they have to pay closer attention to explaining what they do and why. Informing society became even more important after central banks introduced controversial unconventional monetary policy instruments (Blinder et al. (2017)). Christine Lagarde, president of the European Central Bank (ECB), even considers the general public as "a new frontier" for central bank communication, arguing that: "Central banks have to be understood by the people whom they ultimately serve. This is a key to rebuilding trust".

Apart from accountability, communication with the general public is also important because it may help achieving price stability (Binder (2017)). Several studies report that communicating the central bank's inflation target helps to anchor inflation expectations (Binder and Rodrigue (2018); Coibion et al. (2019a)). As the public's perceptions of actual inflation are often wrong, providing information on inflation may also move inflation expectations closer to the central bank's target (Binder and Rodrigue (2018); Coibion et al. (2019a); Rumler and Valderrama (2020)). Next to anchoring of inflation expectations, communication with the general public could be used to stabilize economic conditions when nominal interest rates reach their effective lower bound. By raising expected inflation through communication, the real rate of interest can be reduced (Coibion et al. (2019b)).

Whereas the impact of central bank communication on financial markets has been extensively researched (Blinder et al. (2008)), the effects of central bank communication to the population at large have only recently drawn attention. Most studies in this line of research have two elements in common: they focus on the impact of communication on inflation expectations and use a random controlled trial (RTC) to isolate the effect of receiving information about the central bank on inflation expectations. These studies show that receiving information moves inflation expectations closer to the inflation target of the central bank. However, there is no consensus about *what* the public should be informed. Evidence suggests that inflation expectations shift towards the inflation target when people receive information about: current inflation (Binder and Rodrigue (2018); Coibion et al. (2019a)), the inflation target of the central bank (Binder and Rodrigue (2018); Baerg et al. (2018); Coibion et al. (2019b)) and, the central bank's inflation forecasts (Coibion et al. (2019b)). Furthermore, such information treatments may

change individuals' purchase decisions (Coibion et al. (2019a)).[1]

Our first contribution is to enhance knowledge about *what* the public should be informed about to steer inflation expectations. More specifically, this study examines whether communication about both the ECB's goal and monetary policy instruments is more effective than providing only information about its goal. Similar to Baerg et al. (2018), we embed a vignette experiment into a survey to identify the impact of providing information. First, each participant receives information about the inflation target of the ECB and current inflation. Next, the participants are randomly assigned across four groups. Three of these groups receive additional information about a particular instrument of the ECB. Before and after receiving this treatment, the respondents were asked about their inflation expectations. We test the effect of providing information about policy instruments on expectations by comparing the treatment groups' answers before and after presenting the text snippet to those of the control group which did not receive this information.[2]

Our second contribution is that we examine the effect of central bank communication on trust in the central bank. Public trust enhances the political legitimacy of central banks (Bordo and Jonung (2003)). Furthermore, public trust may help central banks to achieve price stability as a higher level of trust is reported to lead to more accurate individual inflation forecasts (Rumler and Valderrama (2020)) and inflation expectations which are closer to the central bank's inflation target (Christelis et al. (2020)). To the best of our knowledge, previous papers using a RCT have not analyzed the impact of central bank communication on trust.

In fact, there is only scant research into the effect of central bank communication on trust in the central bank. According to Haldane (2017), communication can increase the level of knowledge about the central bank, which may increase public trust. There is some evidence that knowledge

[1] But there is also evidence questioning the effectiveness of central bank communication. In contrast to financial market participants and professional forecasters, households and firms seem to have a low desire to be informed by the central bank (Van der Cruijsen et al. (2015) and are relatively inattentive to information concerning monetary policy and inflation dynamics, notably in a low-inflation environment (Coibion et al. (2020)).

[2] In a related study, D'Acunto et al. (2020) argue that communication has an impact on expectations (in their case about future income instead of inflation expectations as in our work) when it focuses on policy targets and objectives rather than on monetary policy instruments. Their evidence is based on a randomized information-provision experiment on a representative sample of Finnish men who all read policy statements coming from the twitter account of the Governor of the Bank of Finland. What varied across conditions was whether the (real) tweets consisted of target- or instrument-based policy communication.

about the central bank enhances trust. For instance, using a public opinion survey among German households conducted in 2011, Hayo and Neuenkirch (2014) find that respondents with knowledge about the ECB have more trust in the ECB than respondents who do not have this knowledge. Likewise, Mellina and Schmidt (2018) report that knowledge about the mandate of the ECB is an important driver of trust. However, there is little support that communication to the public increases knowledge about the central bank. In fact, Haldane and McMahon (2018) report that knowledge about the central bank has remained stable in the past twenty years in the UK, despite the Bank of England's increased focus on communication to the public. Coibion et al. (2019b) report that in their survey among US households almost forty percent answered that the Federal Reserve was targeting an inflation rate of 10 percent or more, which suggests a pervasive lack of knowledge on the part of households about the objectives of the Federal Reserve. Likewise, Van der Cruijsen et al. (2015) find that the public has little knowledge about the ECB's inflation objective.

Our study contributes to this strain of research by examining the relationship between communication about ECB policy instruments and trust in the ECB. In line with Christelis et al. (2020), we ask participants in our survey to indicate how much they trust the ECB before and after the information treatment. By comparing the answers to these two questions, we can identify the impact of communication on trust in the ECB.

Our analysis is based on data collected using the Dutch Household Survey (DHS).[3] The data used in this paper has several advantages over the use of the Eurobarometer data which has frequently been used for research on trust in the ECB (Ehrmann et al. (2013), Farvaque et al. (2017), and Bursian and Fürth (2015)). First, the DHS provides detailed information on respondents' characteristics, such as their education level, gender, and employment situation for which we can control. Second, we can control for respondents' knowledge about the ECB's objectives and their financial sophistication. This is important as several studies suggest that financial literacy is important: more knowledgable individuals have inflation expectations that are more realistic, more accurate and more in line with the central bank's inflation target (Van der Cruijsen et al. (2015); Baerg et al. (2018). The main drawback is that our data refer to only one country and is not longitudinal, so that we cannot include time series for macroeconomic

[3]The DHS is a panel initiated in 1993 by CentERdata, a research institute affiliated with Tilburg University and sponsored by De Nederlandsche Bank, i.e. the Dutch central bank. The DHS has been used extensively in previous studies (see, for example, Mosch and Prast (2010) or Christelis et al. (2020)).

variables.[4] However, we construct variables reflecting respondents' knowledge about inflation and their employment status and test whether these variables affect trust in the ECB.[5]

We perform multiple robustness checks on our data to ensure our study's validity. As our sample differs significantly from the Dutch population at large on some observable characteristics (age, income and education level) we checked whether re-weighting would change our conclusions; it did not. Furthermore, we address the possibility that being a DHS panelist could affect individuals' knowledge of the ECB. We identify two possible channels: (i) DHS panelists who participated in prior studies about monetary policy could have better knowledge and (ii) respondents who are living together with another DHS panelist could discuss issues raised in the questionnaire before answering all questions. We do not find any evidence for these channels. Respondents who live with another DHS panelist and individuals who participated in the DHS when Van der Cruijsen et al. (2015) conducted their study do not have better knowledge about the ECB.

Our results suggest that providing information about the inflation target and monetary policy instruments affects inflation expectations more than solely providing information about the inflation target. Individuals who also receive information about monetary policy instruments adjust their inflation expectations more towards the ECB target. This result is driven by individuals who are between forty and seventy years old. Our evidence does not indicate that communicating about the ECB's instruments affects average trust in the ECB.

The rest of the paper is structured as follows. The next section provides an overview of the research design. Section 3 describes the data used, while section 4 shows the results for the impact of the information treatment on respondents' inflation expectations and trust in the ECB. The final section concludes.

[4]Some previous studies based on aggregated Eurobarometer data suggest that inflation and unemployment affect trust in the ECB (Roth and Jonung (2019)).

[5]The problem of not having longitudinal data could be especially troublesome due to the exceptional circumstances caused by the COVID-19 pandemic which could lead to low external validity. However, we find no indications that COVID-19 has a substantial impact on respondents' answers. Several questions in our survey have been raised in previous rounds of the DHS and the answers given in previous surveys are very similar to those in our questionnaire.

2 Research design

2.1 Panel

We collected data using an (internet) questionnaire, which was distributed among DHS participants.[6] A total of 3,449 members received this questionnaire on May 18, 2020 and were given fourteen days to respond. Compared with surveys conducted by telephone or mail, the response rate to continuous internet-based surveys is usually very high. In our case, the response rate was eighty percent, which corresponds to 2,749 individuals.

De Nederlandsche Bank (DNB), i.e. the Dutch central bank, regularly conducts research via the DHS (for example, Van Rooij et al. (2011); Van der Cruijsen et al. (2015)). As a result, the knowledge of respondents may not be representative as prior questionnaires may have provided participants with information or caused them to search for more information about monetary policy. Therefore, we examined whether participation in the survey used by Van der Cruijsen et al. (2015) increased respondents' knowledge about the ECB.[7] We found no evidence that participants in the survey used by Van der Cruijsen et al. (2015) have better knowledge about the ECB's mandate than other respondents.[8]

Participants' financial compensation is not based on the number of correct answers to the questions. Panelists receive a fixed amount for completing the questionnaire which is a standard approach in this type of survey research (see, for example, Binder and Rodrigue (2018)). This lack of financial incentive could cause our participants to rush through the questionnaire and merely scan through the information treatments. However, we do not find that removing the 5% of individuals who answered the questionnaire the quickest changes our conclusions (see Appendix B).

Forty percent of DHS panelists belong to a household of which at least one other member is also participating in the DHS. Therefore, a possible concern is that such respondents inform each other about the ECB or that talking about the questionnaire might cause them to search for more infor-

[6] Panel members are Dutch individuals aged sixteen years and older who have been selected to give a representative view of the Netherlands. Section 3.1 compares the characteristics of the DHS survey participants to the Dutch population as a whole.

[7] We use the study of Van der Cruijsen et al. (2015) to test whether participation in prior surveys influences individuals' knowledge because these authors used an identical question as the present study to measure respondents' knowledge about the ECB mandate and because 28% of the current DHS panelists participated in the survey done by Van der Cruijsen et al. (2015).

[8] See Appendix A for the estimation results.

mation before participating in this experiment. We test whether respondents who live in the same household with another DHS panelist who had already filled in this questionnaire have more accurate knowledge about the ECB. We find no evidence for this effect (see Appendix A).

2.2 Experimental design

The questionnaire consists of nine questions.[9] Seven of these questions were asked before respondents received information about the ECB.

Three questions assess the (self-reported) knowledge about the ECB. First, we asked participants to rate their knowledge about the ECB on a five-point scale ranging from very low to very high. Besides these answer options, participants could also answer "I don't know". Second, we tested the respondents' knowledge about the mandate of the ECB using the same approach as Van der Cruijsen et al. (2015). We presented eleven statements about the ECB's mandate of which some are incorrect. For each statement, participants were asked to indicate whether it is correct, incorrect or that they do not know. The variable *knowledge mandate* is the number of correct answers. Finally, we presented six statements about the ECB's instruments and asked respondents to indicate for each instrument whether the ECB can use it. The variable *knowledge instruments* is the number of correct answers to this question.

Identical to Van der Cruijsen et al. (2015), we also asked individuals to report their political orientation. They could select one or more of the five predescribed political orientations (liberal, conservative, Christian-democrat, socialist, progressive), indicate that they have not thought about it or use a text field to describe their political orientation if the aforementioned options do not apply. We added this question because Van der Cruijsen et al. (2015) find that individuals who report having no ideology have less realistic inflation expectations than individuals who have an ideology. Participants who have a right-wing orientation (either liberal or conservative) have inflation expectations that are more realistic than participants with other ideologies. Similar results are reported by Ehrmann et al. (2013).

The next two questions invited individuals to indicate their trust in other European institutions. Similar to Farvaque et al. (2017), we asked participants to rate their trust in the European Commission (EC) and the European Parliament (EP) on a ten-point scale which ranges from very low to very high. These questions were included as Farvaque et al. (2017) and

[9] Appendix C provides all relevant questions raised in the survey.

Ehrmann et al. (2013) find that individuals who trust other European institutions also trust the ECB more. The variable *trust European institutions* is the average of these two answers.

The final two questions before the text snippet measured respondents' trust in the ECB and their inflation expectations. Similar to Christelis et al. (2020), we asked respondents to indicate their trust in the ECB on a ten-point scale ranging from very low to very high. We used the same approach as Baerg et al. (2018) to ask individuals about their inflation expectations. In this approach, individuals are not asked directly about their expected annual inflation rate but receive a hypothetical situation to make the question easier to understand. We choose this approach as research has shown that many individuals find the concept of inflation hard to grasp (Leiser and Drori (2005)). Our hypothetical situation is identical to the one used by Baerg et al. (2018). Respondents had to indicate what the monthly expenditures on typical purchases for food, goods, and services such as groceries, clothes and a hair-cut will be next year if a person currently spends 1500 euros per month on these items. Response options range from "less than 1500 euros" to "1650 euros or more". Each response option reflected a one-percentage-point higher rate of annual inflation, but at this stage respondents are not informed about this.

Next, *all* respondents received a text which provides information about the ECB's inflation target and actual inflation.[10] We described the ECB's objective numerically ("inflation close to but below 2%") as Baerg et al. (2018) find that quantitative information about the goal of the ECB has a more substantial effect on inflation expectations than qualitative information (like "price stability"). Furthermore, the text explained that the inflation rate had been below the target rate in the past few years and that the ECB, therefore, strives to raise inflation. This information is similar to that used by (Coibion et al. (2019b)), who find that providing information about current inflation reduces individuals' inflation expectations. The following text has been provided to all respondents:

> **General information** The most important goal of the European Central Bank is an inflation rate of (close but below) 2% in the euro area in the medium term. In other words, the ECB's goal is that prices increase with a maximum of 2% in the euro area as a whole. The last few years, however, the inflation was

[10] To avoid that respondents would change their initial answers, it was no longer possible for survey participants to return to previous questions from this point onward.

below the target rate of 2%, and therefore the ECB strives to increase inflation.

After this general information, each individual was randomly assigned to one of four groups. The first group did not receive any additional information (control group); the other three groups received an additional vignette, explaining a particular instrument of the ECB (interest rate setting, negative interest rates and asset purchase program). The vignettes were as follows:

> **Interest rate policy:** Banks deposit part of their money on an account at the European Central Bank and they receive interest on this. One of the ways the European Central Banks tries to keep inflation close to 2% is by changing the level of this interest. Banks earn less money on the amount they deposited at the European Central Bank when the interest rate is reduced. Therefore, banks are inclined to withdraw money from their account at the ECB and to use it for other purposes. Because this money is used for other purposes (for instance, granting loans to firms), the economy is stimulated, which causes the inflation rate to increase.

> **Negative interest rate policy:** Banks deposit a part of their money on an account at the European Central Bank and they receive interest on this. One of the ways the European Central Banks tries to keep inflation close to 2% is by lowering the level of this interest rate to a negative level. Banks then have to pay money over the amount they deposited at the European Central Bank. Therefore, banks are inclined to withdraw money from their account at the ECB and to use it for other purposes. Because this money is used for other purposes (for instance, granting loans to firms), the economy is stimulated, which causes the inflation rate to increase.

> **Asset purchase program:** Banks provide loans to consumers, firms or countries. A loan granted to a country is also called a government loan. With such a government loan a bank lends money to a country. The country repays the loan after a certain period and, until that moment, will have to pay a (yearly) compensation to the bank (interest). One of the ways the European Central Banks tries to keep inflation close to 2% is by

> purchasing government loans from banks. Banks do not have to wait until the country repays them, but instead, are repaid immediately by the European Central Bank. Banks can use this money for other purposes. Because the money is used for other purposes (for instance, granting loans to firms), the economy is stimulated, which causes the inflation rate to increase.

Finally, all respondents were asked again about their inflation expectations and how much they trust the ECB. Before answering these questions, the respondents received the instruction that it is not important whether they give the same answer as the first time. Similar to Baerg et al. (2018), respondents were now also reminded of their answer to the previous question about inflation and were informed what their answer implied for the annual inflation rate. This was done to make it easier for participants to compare their answer to the ECB's inflation target which was provided to all participants in the general text.

3 Overview of data

3.1 Demographic characteristics

Table 1 provides information on the demographic characteristics of the respondents. The majority of respondents is female, in her mid-fifties, living with a partner and not higher-educated. For this study's external validity, respondents' demographic characteristics should be representative of the Dutch population at large. Table 1 also shows the averages for the Dutch population (provided by Statistics Netherlands (CBS)). Table 1 suggests that our sample differs significantly from the Dutch population on several dimensions. The average age of the participants in the survey is seven years higher, gross household income is 28% lower and the education level of respondents is eight points higher. These differences between the DHS and the Dutch population at large are comparable to those reported by Van der Cruijsen et al. (2015) who also used the DHS in 2009 to gather data. Similar to these authors, we checked whether re-weighting observations changes our conclusions. This turned out not to be the case (see Appendix D for more details).

3.2 Inflation expectations

Figure 1 shows the distribution of inflation expectations in our sample. Before receiving information, 29% of the respondents expect inflation to be

Table 1: Demographic characteristics

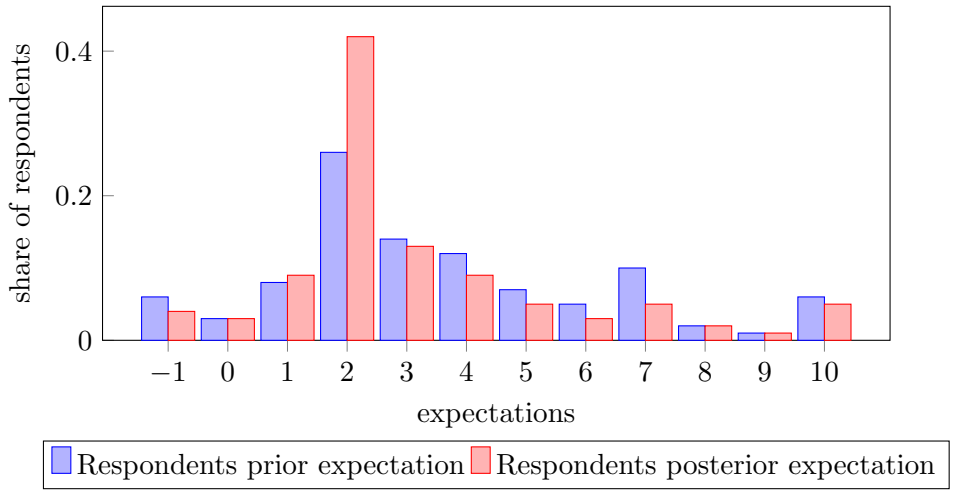
	Survey mean	Population mean
Male	49%	49%
Age	55.6	48.4
Household size	2.3	2.2
Monthly gross household income *(in €1,000)*	4.35	6.0
Partner *(1 = living together with partner)*	70%	62%
City Weighted average *(1 = rural, 5 = highly urbanized)*	3.0	3.2
Education *(1 = higher educated)*	40%	30%

Source for Population Means: Statistics Netherlands (CBS). For income and education data from 2019 was used as data of 2020 was not yet available. **Notes:** Education is coded as 1 if higher vocational education and/or university education was the highest degree, and 0 if otherwise.

in line with the inflation target of the ECB (2%). Only 17% percent of the survey participants have expectations that are below this target even though inflation was less than 2% in seven out of the last ten years in the Netherlands. Moreover, many individuals expect inflation to be substantially higher than actual inflation. For example, 27% of the participants expect inflation to be 5% or higher in the next twelve months. In addition, the distribution shows a small spike at 7%, which corresponds to the answer that an individual has to pay 1600 euros in the next year. As this is the first of the answers provided that rounds up to the next hundred (from 1500 to 1600), this response option may have attracted more attention. Baerg et al. (2018) find a similar spike.

As mentioned earlier, respondents were asked for their inflation expectations before and after receiving information. As shown in Figure 1, the provision of information had a profound impact on respondents' expectations: 51% of the participants changed their expectations. In section 4.1, we test whether individuals who not only received information about the ECB target but also about monetary policy instruments have expectations which are closer to the ECB target than individuals who only received information about the inflation objective of the ECB.

Figure 1: Inflation expectations of survey participants



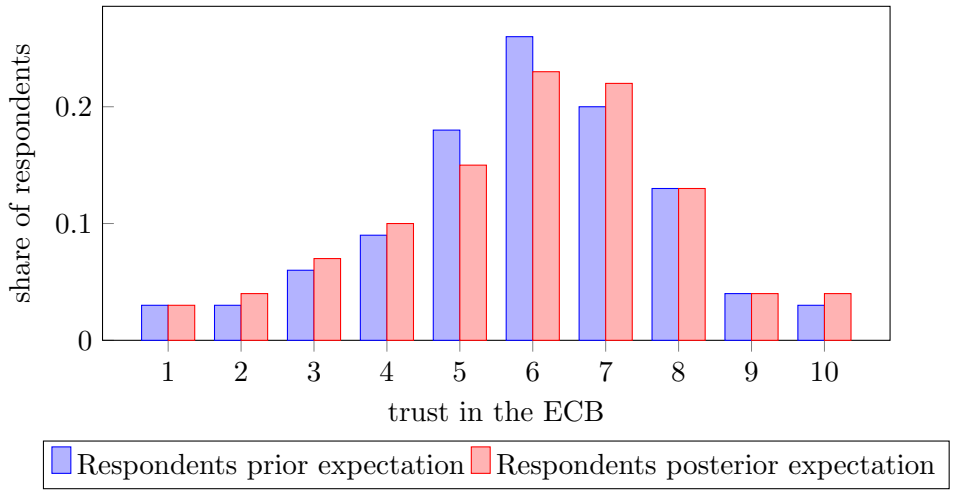
Note: This histogram shows the distribution of inflation expectations of the respondents. This question has been answered twice by all participants: before and after receiving information about the ECB (prior and posterior expectations, respectively). The numbers shown refer to inflation expectations of all respondents.

3.3 Trust

Christelis et al. (2020), who asked DHS participants about their trust in the ECB in 2015 using the same question as the present study, report a mean of 4.7 for trust in the ECB, whereas in our survey average trust amounts to 5.7. Furthermore, the standard deviation in our survey is lower (1.8 versus 2.1). This suggests that trust in the ECB has increased between 2015 and 2020. In our survey, individuals were asked twice about their trust in the ECB. Figure 2 shows trust in the ECB before and after receiving information. The figure does not suggest a clear difference in trust in the ECB before and after respondents received information. In section 5, we test whether there is a significant effect of our treatment on trust in the ECB.

The survey also asked participants about their trust in the European Parliament and the European Commission on a ten-point scale. Average trust in the ECB is slightly higher than trust in the European Commission (5.2) and the European Parliament (5.1). Similar to Ehrmann et al. (2013) and Farvaque et al. (2017), we find that respondents' trust in the ECB is highly correlated with trust in the European Commission (0.76) and the

Figure 2: Respondents' level of trust in the ECB



Note: This histogram shows the distribution of respondents' trust in the ECB. Respondents had to rate trust in the ECB on a scale from very low (1) to very high (10). This question has been answered twice by all participants: before and after receiving information about the ECB (prior and posterior expectations, respectively). The numbers shown refer to trust in the ECB of all respondents.

European Parliament (0.72).

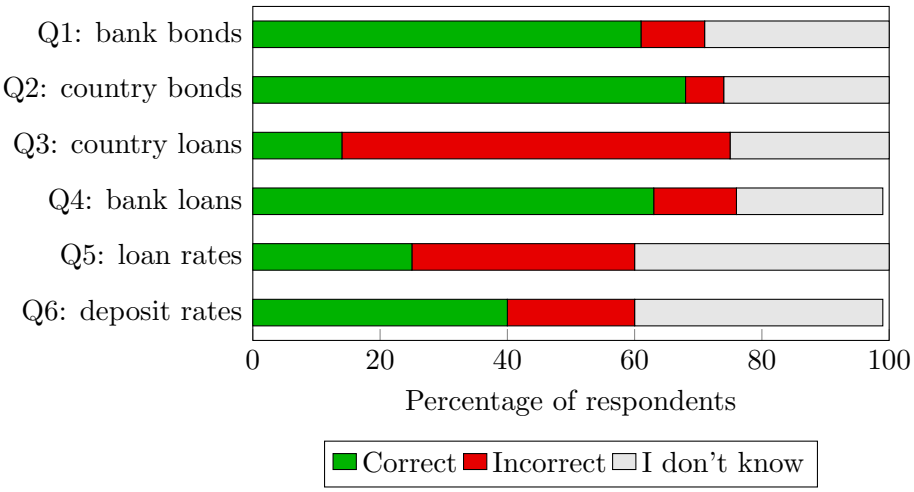
3.4 Knowledge about the ECB

As explained in section 2.2, we tested participants' knowledge about the ECB by showing them statements about the mandate and policy instruments of the ECB and asking them to indicate which of these statements are true.

Figure 3 shows the respondents' answers to the statements about the instruments of the ECB. Three instruments were are often correctly identified, namely the ECB sets the interest rate at which banks deposit money at the ECB, the ECB lends money to banks, and the ECB determines the interest rate of these loans. However, 65% of the respondents individuals incorrectly believe that the ECB lends money to countries.

The answers to the questions about the mandate are shown in Figure 4. The statement that the main objective of the ECB is price stability received by far the highest percentage of correct answers (65%). Details about the inflation target are less well known. Notably, few respondents know that the ECB does not define its objective in terms of inflation in each euro area

Figure 3: Understanding of ECB's instruments: Distribution of answers per question



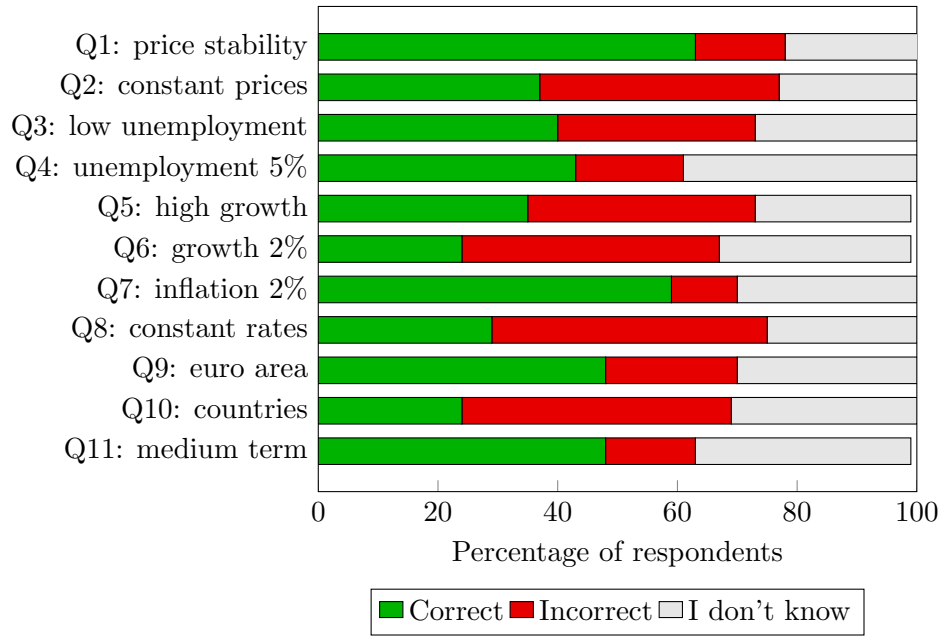
Note: The horizontal bars denote the percentage of correct (green) and incorrect (red) assessments of the six statements on the ECB's instruments (see appendix C for the full statements). The light gray bars denote the percentage of respondents who answered "I don't know".

country. The (false) statement that the ECB's objective applies to all euro area countries separately (statement ten) received the lowest score of correct answers.

As explained in section 2.2, the statements to test individuals' knowledge about the mandate of the ECB are identical to those used by Van der Cruijsen et al. (2015). These authors posed these statements to the members of the DHS in 2009. Surprisingly, the percentages of individuals who correctly identify whether a statement is (in)correct are very similar in both studies for all statements. Similar to the findings of Haldane and McMahon (2018) for the Bank of England, our results thus suggest that knowledge about the ECB has remained stable despite the ECB's increased focus on communication to the public.

A majority of respondents indicate that they have (very) poor to neutral knowledge about the ECB. Figure 5 shows the average number of correct responses grouped by participants' self-reported knowledge level. It seems that our participants are able to correctly assess their knowledge: the higher their self-assessed knowledge is, the higher their actual knowledge about the

Figure 4: Understanding of ECB's goals: Distribution of answers per question



Note: The horizontal bars denote the percentage of correct (green) and incorrect (red) assessments of the eleven statements on the ECB's main objective (see appendix C for the full statements). The light gray bars denote the percentage of respondents who answered "I don't know".

ECB.[11] This result is in line with the work of Van der Cruijsen et al. (2015) who find a similar relation between individuals' actual knowledge about the ECB's mandate and their self-assessed knowledge.

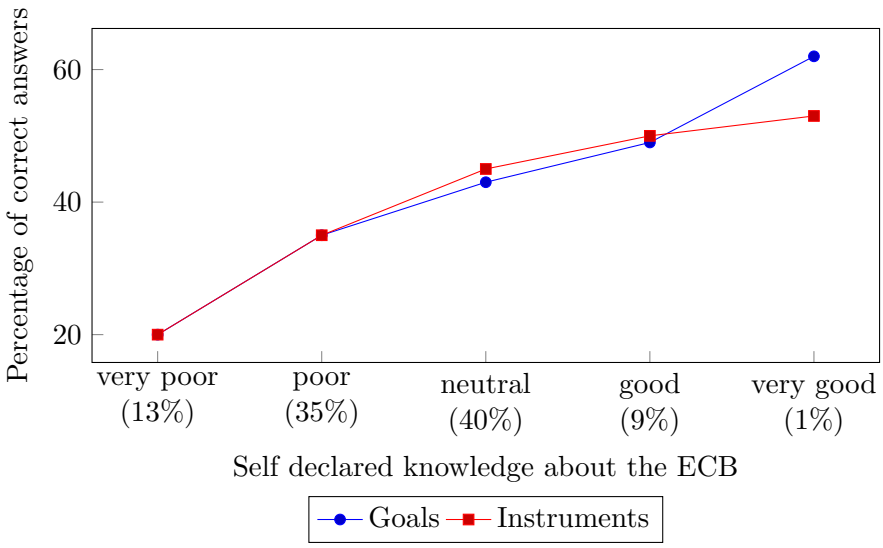
4 Treatment effect on inflation expectations

4.1 Difference between expectations and ECB target

We first test whether respondents who receive information about ECB instruments have inflation expectations which are closer to the ECB target than respondents who do not receive this information. We calculate the

[11] Appendix E shows the correlation between the self reported level of knowledge about the ECB, knowledge of the ECB's mandate and knowledge of the instruments used by the ECB.

Figure 5: Actual vs. self declared knowledge



Note: Response shares are shown in parentheses (2.7% of respondents indicated that they do not know their knowledge level of the ECB). The dots represent the average number of correct answers to the question.

absolute difference between the inflation expectation of individual i and the ECB target rate as:

$$D^i = |E_i\pi - 2| \tag{1}$$

We estimate the following model:

$$D^i_{\text{posterior}} = \alpha + \beta_j \times \text{Treatment}_{i,j} + \gamma \times D^i_{\text{prior}} + \eta \times X + \varepsilon_i \tag{2}$$

Where $D^i_{\text{posterior}}$ is the absolute distance of the inflation forecast of individual i and the ECB inflation target after receiving information. Treatment is a dummy which is one if individual i received treatment j, where j indicates whether information was provided about the ECB's interest rate policy, negative interest rate policy or asset purchase program. D^i_{prior} is the absolute difference between the inflation expectation of individual i and the ECB inflation target before receiving information. The vector with control variables X includes several demographic characteristics such as age, gender, income, ideology, knowledge about the ECB, and trust in the ECB and trust in other European institutions.

The estimation results as shown in Table 2 suggest that individuals who received information about the interest rate policy or negative interest rate policy have inflation expectations which are closer to the inflation target of the ECB. These results remain significant and similar in size when various control variables are added.[12] The effect of information on the interest policy is stronger (0.29) than the effect of information on negative interest rates (0.16). A possible explanation for this difference could be that individuals find the concept of negative interest rate more difficult. [13] The effect of the asset purchase program treatment is insignificant.

Table 2: Effect of treatment on distance between inflation expectations and target rate of ECB

	(1)	(2)	(3)	(4)
Treatment:				
- Interest rate	-0.24***	-0.24***	-0.23***	-0.24***
policy	(-2.85)	(-2.86)	(-2.82)	(-2.86)
- Negative interest	-0.15*	-0.15*	-0.15*	-0.15*
rate policy	(-1.79)	(-1.79)	(-1.80)	(-1.81)
- Asset purchasing	-0.09	-0.09	-0.09	-0.08
program	(-1.08)	(-1.09)	(-1.03)	(-0.91)
Inflation expectation:				
Prior	0.62***	0.61***	0.60***	0.59***
	(30.05)	(29.60)	(28.71)	(27.79)
Demographic characteristics:				
- Male	0.23***	0.26***	0.25***	0.25***
	(3.76)	(4.23)	(4.07)	(3.71)
- Age	0.00**	0.01***	0.01***	0.01***
	(2.32)	(3.58)	(3.22)	(3.57)
- Education	-0.22***	-0.14**	-0.11	-0.09
	(-3.26)	(-2.15)	(-1.61)	(-1.32)
- Social Status	0.07***	0.06**	0.05*	0.04
	(2.61)	(2.21)	(1.85)	(1.41)

[12]Individuals who responded that they do not know their knowledge level of the ECB are dropped when the control variable *self reported knowledge* is added (3.7% of observations). By doing so, this variable runs from one (very low) to five (very high). We take a similar approach in other regressions where this variable is added.

[13]There is some evidence to support this interpretation. The DHS includes a question asking respondents to evaluate the survey. Individuals who received the negative interest treatment indicated that they found the questionnaire hard to answer; for the other treatment groups, we did not find such an effect. See Appendix F for more information.

- Unemployed	0.21	0.24	0.18	0.11
	(0.81)	(0.91)	(0.70)	(0.44)
- Income (x1000)	-0.00	-0.00	-0.00	0.00
	(-0.52)	(-0.42)	(-0.50)	(0.18)
- Financial decision	-0.12	-0.11	-0.10	-0.08
maker	(-1.58)	(-1.54)	(-1.37)	(-1.09)
- Partner	0.00	0.00	-0.00	-0.03
	(0.06)	(0.05)	(-0.05)	(-0.32)
- Household size	0.03	0.01	0.02	0.02
	(0.81)	(0.48)	(0.59)	(0.76)
- City	0.01	0.01	0.01	0.01
	(0.43)	(0.39)	(0.29)	(0.46)
Ideology:				
- None		0.46***	0.43***	0.31***
		(5.54)	(5.20)	(3.59)
- Right wing		0.14**	0.12*	0.12*
		(2.08)	(1.79)	(1.88)
Level of trust:				
- ECB			-0.05*	-0.05*
			(-1.84)	(-1.70)
- EU institutions			-0.04	-0.04*
			(-1.38)	(-1.65)
Knowledge level:				
- Self-reported				0.09**
				(2.21)
- Mandate				-0.02
				(-1.19)
- Instruments				-0.07***
				(-2.63)
N	2724	2724	2724	2624
R^2	0.465	0.472	0.477	0.485

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: This table shows the estimation results of equation 2 and is used to test whether informing individuals about a particular instrument of the ECB affects the distance between an individual's inflation forecast and the ECB target rate.The dependent variable is the absolute difference between the inflation expectation of an individual and the ECB target rate. The variables of interest are the three treatments dummies: *Interest rate policy*, *Negative interest rate policy* and *Asset Purchasing program*. These dummies are one if an individual received information about how this particular instrument works. Section 2.2 shows the various treatment texts.

4.2 Heterogeneity among individuals

Section 4.1 showed that, on average, individuals who received the treatment regarding the ECB's (negative) interest rate policy have inflation expectations which are closer to the ECB inflation target than individuals who did not receive the treatment. Here we explore whether the treatment effect depends on individual characteristics, namely gender, age and actual knowledge about the ECB. Table 3 shows the effect of the treatment for various subsets of our sample, using the same model as in section 4.1.

We find mixed evidence for gender. The results suggest a significant effect of the interest rate policy treatment on the inflation expectations of women, whereas the effect on the inflation expectations of men is insignificant. For the other treatments, we find no significant differences. This result is partly in line with the work of Coibion et al. (2019b) who find that women adjust their inflation forecasts more than men when they receive information about the central bank's target rate or the current inflation rate.

The evidence on how knowledge about the ECB's instruments affects our treatment's effect is also mixed. We find a significant effect for the interest rate policy treatment for individuals who have below median knowledge on the ECB instruments, while we do not find a significant effect for individuals with above median knowledge. However, the effect of the negative interest rate treatment is the other way around: it is significant for individuals with above median knowledge and insignificant for individuals with below the median knowledge.

Table 3: Effect of treatment on distance between inflation expectations and target rate of ECB

	Gender		Age			Knowledge instruments	
	Female	Male	Under 40	Between 40 and 70	Above 70	Below-Median	Above-Median
Treatment:							
- Interest rate policy	-0.45***	-0.04	-0.09	-0.38***	-0.03	-0.38***	-0.12
	(-3.51)	(-0.38)	(-0.50)	(-3.45)	(-0.16)	(-2.61)	(-1.18)
- Negative interest rate policy	-0.14	-0.14	0.10	-0.20*	-0.24	-0.01	-0.20**
	(-1.04)	(-1.35)	(0.56)	(-1.82)	(-1.41)	(-0.06)	(-2.04)
- Asset purchasing program	-0.07	-0.10	0.22	-0.22**	-0.04	-0.09	-0.07
	(-0.57)	(-0.88)	(1.14)	(-2.01)	(-0.22)	(-0.60)	(-0.72)
Constant	0.30	0.11	0.69	0.47	-0.41	0.65*	-0.45
	(0.88)	(0.34)	(1.36)	(1.11)	(-0.40)	(1.71)	(-1.34)
Observations	1271	1353	549	1446	629	1017	1607
R^2	0.424	0.565	0.441	0.509	0.498	0.477	0.483
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: see table 2 for more information on the estimation method and a full list of the control variables.

Finally, we find that age matters for the effect of our treatment. We find a significant effect for all of our treatments for individuals aged between forty and seventy and no significant treatment effect for the other age groups. A possible explanation could be that different generations prefer different ways to acquire new information. For instance, there is a body of literature suggesting that Millennials (those born after 1980) prefer other learning methods than the generations before them (see, for instance, Skiba and Barton (2006)). However, more research is needed to test whether this could explain the different treatment effects among age groups.

5 Effect of treatment on trust in the ECB

5.1 Average effect of treatment on trust in the ECB

Similar to the previous section on inflation expectations, we start by looking at average treatment effects using the following model:

$$T^i_{posterior} = \alpha + \beta_j \times \text{Treatment}_{i,j} + \gamma \times T^i_{prior} + \eta \times X + \varepsilon_i \qquad (3)$$

In which $T^i_{posterior}$ is trust in the ECB after receiving information, T^i_{prior} denotes trust before the information treatment and X is a vector of controls. The variable of interest is $\text{Treatment}_{i,j}$ which is one if an individual i received treatment j.

Table 4 shows the results. We find no significant effects for all treatments (T_i) or T_i, j which indicates that the additional information provided on the ECB instruments has no impact on trust in the ECB.

Table 4: Effect of treatment on level of trust in ECB

	(1)	(2)	(3)
Treatment:			
- Interest rate	0.04	0.04	0.04
policy	(0.91)	(0.87)	(0.81)
- Negative interest	0.02	0.02	0.02
rate policy	(0.42)	(0.49)	(0.48)
- Asset purchasing	0.06	0.06	0.06
program	(1.19)	(1.19)	(1.16)
Level of trust:			
- ECB	0.57***	0.57***	0.57***
	(24.23)	(24.31)	(24.56)

- EU institutions	0.41***	0.41***	0.41***
	(17.87)	(18.05)	(17.97)
Demographic characteristics:			
- Male	-0.05	-0.06*	-0.04
	(-1.40)	(-1.80)	(-0.99)
- Age	0.00	-0.00	0.00
	(0.22)	(-0.04)	(0.21)
- Education	-0.04	-0.05	-0.05
	(-0.99)	(-1.28)	(-1.21)
- Social Status	-0.02	-0.02	-0.02
	(-1.22)	(-0.95)	(-1.08)
- Unemployed	-0.30*	-0.31**	-0.30**
	(-1.95)	(-2.04)	(-1.99)
- Income (x1000)	-0.00*	-0.00*	-0.00*
	(-1.77)	(-1.96)	(-1.87)
- Financial decision	-0.02	-0.02	-0.01
maker	(-0.55)	(-0.59)	(-0.33)
- Partner	-0.00	-0.00	0.00
	(-0.04)	(-0.09)	(0.01)
- Household size	-0.00	-0.00	-0.00
	(-0.28)	(-0.24)	(-0.25)
- City	0.01	0.01	0.01
	(0.50)	(0.50)	(0.51)
Ideology:			
- None		-0.06	-0.07
		(-1.21)	(-1.56)
- Right wing		0.10**	0.10***
		(2.50)	(2.61)
Knowledge level:			
- Self-reported			-0.05**
			(-2.08)
- Mandate			0.01
			(1.03)
- Instruments			-0.02
			(-1.46)
N	2615	2615	2615
R^2	0.795	0.796	0.797

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: This table shows the estimation results of equation 3 and is used to test whether informing individuals about a particular instrument of the ECB affects the level of trust in the ECB. The dependent variable is the level of trust an individual has in the ECB. The variables of interest are the three treatments dummies: *Interest rate policy*, *Negative interest rate policy* and *Asset Purchasing program*. These dummies are one if an individual received information about how this particular instrument works. Section 2.2 shows the various treatment texts.

5.2 Heterogeneity among individuals

Similar to section 4.2, we examine whether our treatment effect differs among various subgroups of our sample. We, therefore, regress equation 3 on various subsets of our sample. The results are shown in Table 5.

We find some evidence that age matters for the effect of the treatments on trust in the ECB. The effect of the asset purchasing program treatment on individuals aged between forty and seventy is positive and significant. In other words, individuals in this age cohort who received this treatment trust the ECB more than individuals who did not receive any additional information about *how* the ECB tries to achieve price stability. The effect of the (negative) interest rate policy remains insignificant. This result is, partially, in line with the effect of our treatment on inflation expectations for which we found that age matters. However, more research is needed to find why we find this mixed evidence.

Furthermore, we find no evidence that gender or prior knowledge about the EBC's instruments matter for the effect of the treatments on trust in the ECB.

Table 5: Effect of treatment on distance between inflation expectations and target rate of ECB

	Gender		Age			Knowledge instruments	
	Female	Male	Under 40	Between 40 and 70	Above 70	Below-Median	Above-Median
Treatment:							
- Interest rate policy	0.01	0.06	0.02	0.06	0.04	0.02	0.04
	(0.20)	(0.95)	(0.17)	(0.97)	(0.84)	(0.22)	(0.72)
- Negative interest rate policy	0.02	0.03	-0.09	0.09	0.06	0.02	0.01
	(0.31)	(0.38)	(-0.79)	(1.44)	(1.06)	(0.22)	(0.13)
- Asset purchasing program	0.03	0.07	-0.03	0.14**	0.07	0.07	0.05
	(0.48)	(1.02)	(-0.26)	(2.11)	(1.23)	(0.90)	(0.76)
Constant	0.34*	0.56***	0.74**	0.44*	0.34*	0.27	0.60***
	(1.65)	(3.17)	(2.56)	(1.85)	(1.89)	(1.22)	(2.98)
Observations	1270	1353	548	1446	2104	1016	1607
R^2	0.740	0.836	0.773	0.812	0.804	0.762	0.816
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: see table 4 for more information on the estimation method and a full list of the control variables.

6 Concluding remarks

Nowadays, central bankers not only communicate with financial markets but also with the public at large. This reflects that central bankers believe that communicating with the public could increase their political legitimacy and may help them achieve their price stability goal. This growing attention for communication to the general public among policymakers is mirrored in increased attention for this issue in the academic world. However, a lot is still unknown: about *what* should the central bank inform the public? And can central bank communication also affect trust in the central bank?

This paper offers new insights into these questions by assessing the impact of providing certain information on monetary policy on individuals' inflation expectations and their trust in the ECB. We use a Random Controlled Trial (RCT) in which the treatment groups receive information about the ECB's price stability objective and actual inflation and a particular monetary policy instrument (interest rate policy, negative interest rate policy and asset purchasing program) of the ECB. The control group only received information about the ECB's price stability objective and actual inflation. Before and after receiving this information, individuals were asked about their inflation expectations and trust in the ECB. This way, we can identify the effect of providing information on inflation expectations and trust in the ECB.

We find evidence that providing information about *how* the ECB tries to achieve price stability affects individuals' inflation expectations. Compared to individuals who only receive information about the inflation target of the ECB, individuals who receive additional information about how the ECB tries to achieve this objective adjust their inflation expectations more towards this target. This suggests that central bank communication towards the general public may support policies aimed at price stability. Our results therefore deviate from the finding of D'Acunto et al. (2020) that providing information on instruments has no effect on expectations.

Our main finding that providing information about monetary policy instruments affects inflation expectations is in line with the optimistic tone of several recent studies on central bank communication with the general public. However, an important caveat is in order here. Just like most previous research on the impact of central bank communication with the general public, our evidence is based on a random controlled trial, which has the obvious advantage of strong identification. However, in a RTC set-up, it is ensured that participants get exposed to central bank communication, while in real life the public may be inattentive. In contrast to financial market partici-

pants and professional forecasters, households and firms seem to have a low desire to be informed by the central bank (Van der Cruijsen et al. (2015)) and are relatively inattentive to information concerning monetary policy and inflation dynamics. Consequently, if the public ignore central bank information and thus do not process it, communication cannot be effective. As Blinder (2018) puts it: "in truth, the part of central bank communication that matters most is the way policymakers communicate with markets and for a simple reason: market participants listen" (p. 569).

Finally, we do not find evidence that providing information about ECB instruments impacts average trust in the ECB. There are several possible explanations for this finding. A first possibility could be that individuals did not understand the provided information. However, this possibility seems improbable as we did find an effect of the information treatment on inflation expectations. A second option could be that the level of trust in the ECB is relatively rigid: a text is not sufficient to change peoples' feelings towards the ECB. For instance, studies in sociology stress the importance of "engagement" instead of merely providing information. Warren et al. (2014), for example, find that frequent engagement between the government and citizens via social media increases public trust. However, more research is needed to examine whether more frequent or more interactive communication increases trust in the central bank.

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Appendices

A Determinants of knowledge about the ECB prior to receiving the information treatment

It is crucial for the validity of our research that, before participating in the experiment, being a DHS panelist does not affect individuals' knowledge about the ECB. In the text, we described two possible channels through which DHS participation could influence individuals' knowledge: prior participation in a survey about monetary policy and living together with another DHS panelist. We construct, for both effects, a dummy. The variable *Prior participation* is one if an individual was already participating in the DHS before May 2009. We choose this date as the study of Van der Cruijsen et al. (2015) took place in June 2009. To isolate the effect of participating in the study of Van der Cruijsen et al. (2015), and not whether participating in the DHS in general increases knowledge about the ECB, we also add a control variable "weeks in DHS" which is the number of weeks an individual is participating in the DHS. The variable *Last in household* is one if individual i lives together with another DHS panelist who already finished the questionnaire before individual i started the survey.

We use the number of correct answers to the questions about the ECB's mandate as the dependent variable as this question was also asked by Van der Cruijsen et al. (2015). The results are shown in Table 6. The coefficients of both dummies are insignificant which indicates that both channels do not affect participants' knowledge about the ECB.

Table 6: Prior drivers of knowledge about the ECB's mandate

	(1)	(2)	(3)
Last in Household		-0.00	
		(-0.01)	
Participation before			0.20
May 2009			(0.80)
Weeks in DHS	0.00	0.00	0.00
	(1.58)	(1.58)	(0.08)
Demographic characteristics:			
- Male	0.90***	0.90***	0.90***
	(8.65)	(8.62)	(8.65)
- Age	0.02	0.02	0.02

	(1.34)	(1.34)	(1.34)
- Age^2	-0.00*	-0.00*	-0.00*
	(-1.74)	(-1.74)	(-1.73)
- Education	0.59***	0.59***	0.59***
	(5.04)	(5.04)	(5.06)
- Social Status	-0.15***	-0.15***	-0.15***
	(-3.12)	(-3.12)	(-3.13)
- Unemployed	-0.07	-0.07	-0.07
	(-0.18)	(-0.18)	(-0.20)
- Income (x1000)	0.00***	0.00***	0.00***
	(2.62)	(2.61)	(2.60)
- Financial decision	0.42***	0.42***	0.42***
maker	(3.56)	(3.48)	(3.60)
- Partner	-0.02	-0.02	-0.01
	(-0.12)	(-0.12)	(-0.10)
- Household size	0.00	0.00	0.00
	(0.06)	(0.06)	(0.03)
- House owner	-0.29***	-0.29***	-0.29***
	(-2.67)	(-2.67)	(-2.68)
- City	-0.06	-0.06	-0.06
	(-1.63)	(-1.63)	(-1.60)
Ideology:			
- None	-1.39***	-1.39***	-1.39***
	(-10.70)	(-10.69)	(-10.68)
- Right wing	0.35***	0.35***	0.35***
	(3.02)	(3.02)	(3.06)
Level of trust:			
- ECB	0.11**	0.11**	0.10**
	(2.55)	(2.55)	(2.54)
- EU institutions	-0.05	-0.05	-0.05
	(-1.26)	(-1.26)	(-1.25)
Knowledge level:			
- Self-reported	0.33***	0.33***	0.33***
	(6.50)	(6.50)	(6.50)
N	2748	2748	2748
R^2	0.201	0.201	0.201

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Notes: This table shows the effect of various characteristics of the individual on his knowledge about the mandate of the ECB. Knowledge about the mandate of the ECB is tested by asking an individual to indicate which statements, of a total set of eleven true and untrue statement, about the ECB's mandate are correct. Section 3.4 provides more details about the statements.

B Effect of removing individuals who spend little time on survey

Table 7 shows the result of estimating equation 2 when individuals are removed who belong to the 5% of the respondents who answered the questionnaire the quickest.

The effects are similar in significance and size as the results in table 2 when using the full sample.

Table 7: Effect of treatment on distance between inflation expectations and target rate of ECB

	(1)	(2)	(3)
Treatment:			
- Interest rate	-0.14	-0.12	-0.10
policy	(-0.47)	(-0.40)	(-0.32)
- Negative interest	0.30	0.29	0.28
rate policy	(0.99)	(0.96)	(0.91)
- Asset purchasing	-0.08	-0.09	-0.04
program	(-0.23)	(-0.29)	(-0.11)
Inflation expectation:			
- Prior	0.66***	0.64***	0.62***
	(10.11)	(9.87)	(9.41)
N	154	154	154
R^2	0.619	0.638	0.647
Control variables	Yes	Yes	Yes

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Notes: see Table 6 for a full list of the control variables which are used in the estimation.

C Questionnaire

This questionnaire is about the European Central Bank (ECB). The ECB is the central bank for the euro area's common currency: the euro. Since 1999, the euro has been introduced in 19 European countries.

Question 1.

Exercise 1.

How do you rate your own knowledge about the European Central Bank?

- ☐ very bad
- ☐ bad
- ☐ neutral
- ☐ good
- ☐ very goed
- ☐ I don't know

Exercise 2.

Please indicate to what extent you agree with the following statement. I have confidence in the European Central Bank

- ☐ strongly disagree
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐ strongly agree

Exercise 3.

The next question is about the European Commission and the European Parliament. Please indicate to what extent you agree with the following statements.

a) I have confidence in the European Commission

- ☐ strongly disagree
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐ strongly agree

b) I have confidence in the European Parliament

- ☐ strongly disagree
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐ strongly agree

Exercise 4.
How would you describe your political affiliation (you can give several answers)?

- ☐ Liberal
- ☐ Socialist
- ☐ Christian-democratic
- ☐ Conservative
- ☐ Progressive
- ☐ I have not thought about this
- ☐ Other, namely ...

We would like to get an insight into people's knowledge of the main objective of the European Central Bank (ECB). You don't have to look anything up, and it's not a problem if your answer is wrong.

Exercise 5.
Do you think that the following statements about the ECB's main objective are **true** or **false**? The ECB's main objective:

		true	not true	I do not know
(a)	...is price stability	☐	☐	☐
(b)	...is to keep prices constant	☐	☐	☐
(c)	...is low unemployment	☐	☐	☐
(d)	...is an unemployment rate of no more than 5%	☐	☐	☐
(e)	...is high economic growth	☐	☐	☐
(f)	...is economic growth of at least 2%	☐	☐	☐
(g)	...is an inflation rate of close to but below 2%	☐	☐	☐
(h)	...is to keep interest rates constant	☐	☐	☐
(i)	...should be achieved for the euro area as a whole	☐	☐	☐
(j)	...should be achieved for each euro area country	☐	☐	☐
(k)	...should be achieved in the medium term	☐	☐	☐

Exercise 6.

We would like to get an insight into people's knowledge of the instruments of the European Central Bank (ECB). You do not have to look anything up, and it is not a problem if your answer is wrong. Do you think that the following statements about the ECB's instruments are **true** or **false**? In order to achieve its main objective, the ECB can:

		true	not true	I do not know
(l)	increase or decrease the interest rates at which banks leave money on an account with the ECB	☐	☐	☐
(m)	increase or decrease the interest rates at which banks can borrow from the ECB	☐	☐	☐
(n)	grant loans to banks	☐	☐	☐
(o)	grant loans to euro area countries	☐	☐	☐
(p)	buy loans (bonds) issued by banks	☐	☐	☐
(q)	buy loans (bonds) issued by euro area countries	☐	☐	☐

Exercise 7.

With the next question we would like to know how you think prices will develop. A person currently spends 1500 on his/her basic needs such as food, clothes and visits to the hairdresser. Please indicate how much you think this person will have to spend in 12 months on his/her necessities such as food, clothes and hairdresser's if this person wants to buy in 12 months exactly the same as today.

- ☐ less than 1500 euros
- ☐ 1500 euros
- ☐ 1515 euros
- ☐ 1530 euros
- ☐ 1545 euros
- ☐ 1560 euros
- ☐ 1575 euros
- ☐ 1590 euros

☐ 1605 euros

☐ 1620 euros

☐ 1635 euros

☐ 1650 euros

Instruction for designer - not visible to respondent: Respondents at this point cannot go back to the previous screen. All respondents must see the following text.

The most important goal of the European Central Bank is an inflation rate of (close but below) 2% in the euro area in the medium term. In other words, the ECB's goal is that prices increase with a maximum of 2% in the euro area as a whole. The last few years, however, the inflation was below the target rate of 2%, and therefore the ECB strives to increase inflation.

Instruction for designer - not visible to respondent: Each respondent should be randomly assigned to one of four groups. Group one will proceed directly to the next question. The other groups should each see one of the texts below. Here the group number corresponds to the text received.

2. Banks deposit part of their money on an account at the European Central Bank and they receive interest on this. One of the ways the European Central Banks tries to keep inflation close to 2% is by changing the level of this interest. Banks earn less money on the amount they deposited at the European Central Bank when the interest rate is reduced. Therefore, banks are inclined to withdraw money from their account at the ECB and to use it for other purposes. Because this money is used for other purposes (for instance, granting loans to firms), the economy is stimulated, which causes the inflation rate to increase.]

3. Banks deposit a part of their money on an account at the European Central Bank and they receive interest on this. One of the ways the European Central Banks tries to keep inflation close to 2% is by lowering the level of this interest rate to a negative level. Banks then have to pay money over the amount they deposited at the European Central Bank. Therefore, banks are inclined to withdraw money from their account at the ECB and to use it for other purposes. Because this money is used for other purposes (for instance, granting loans to firms), the economy is stimulated, which causes the inflation rate to increase.]

4. Banks provide loans to consumers, firms or countries. A loan granted to a country is also called a government loan. With such a government loan a bank lends money to a country. The country repays the loan after a certain period and, until that moment, will have to pay a (yearly) compensation to the bank (interest). One of the ways the European Central Banks tries to keep inflation close to 2% is by purchasing government loans from banks. Banks do not have to wait until the country repays them, but instead, are repaid immediately by the European Central Bank. Banks can use this money for other purposes. Because the money is used for other purposes (for instance, granting loans to firms), the economy is stimulated, which causes the inflation rate to increase.]

Exercise 8.
Earlier you indicated that a person who currently spends 1500 euros on his/her necessities such as food, clothes and visits to the hairdresser must spend 12 months later [answer v7] in order to be able to buy the same products. This amounts to an annual inflation rate of [if (v7=1): less than 0/ if (v7 = 2): 0/ if (v7 = 3): 1/ if (v7 = 4): 2/ if (v7 = 5): 3/ if (v7 = 6): 4/ if (v7 = 7): 5/ if (v7 = 8): 6/ if (v7 = 9): 7/ if (v7 = 10): 8/ if (v7 = 11): 9/ if (v7 = 12): 10] percent.

After reading the text on the previous screen: how much do you think this person will have to spend in 12 months on his/her basic needs such as food, clothes and visits to the hairdresser if he/she wants to buy exactly the same in 12 months' time as he/she is buying today.

- ☐ less than 1500 euros
- ☐ 1500 euros
- ☐ 1515 euros
- ☐ 1530 euros
- ☐ 1545 euros
- ☐ 1560 euros
- ☐ 1575 euros
- ☐ 1590 euros
- ☐ 1605 euros
- ☐ 1620 euros

☐ 1635 euros

☐ 1650 euros

Exercise 9.
Please indicate again to what extent you agree with the following statement. It is not important whether you give the same answer or a different one from the one given earlier in the questionnaire.

I have confidence in the European Central Bank

☐ strongly disagree

☐

☐

☐

☐

☐

☐

☐

☐ strongly agree

D Re-weighting full sample

As shown in section 3.1 our sample differs significantly for some observable characteristics for the Dutch population at large. Re-weighting was performed using the STATA package "reweight" which is documented by Pacifico (2014) and which uses the method of Deville and Särndal (1992). We re-weight the sample based on the average age, income and education level of the Dutch population. The tables below report the results of regressing equation 2 using the re-weighted sample for both the whole sample and for various subsets. The effects are similar in significance and size as the results in section 4 and 4.2.

Table 8: Effect of treatment on distance between inflation expectations and target rate of ECB

	(1)	(2)	(3)
Treatment:			
- Interest rate	-0.23***	-0.23***	-0.23***
policy	(-2.76)	(-2.77)	(-2.75)
- Negative interest	-0.13	-0.13	-0.13
rate policy	(-1.55)	(-1.56)	(-1.59)
- Asset purchasing	-0.09	-0.09	-0.08
program	(-1.00)	(-1.02)	(-0.96)
Inflation expectation:			
- Prior	0.62***	0.61***	0.60***
	(30.42)	(29.95)	(29.01)
N	2724	2724	2724
R^2	0.468	0.475	0.480
Control variables	Yes	Yes	Yes

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Notes: see Table 6 for a full list of the control variables which are used in the estimation.

E Correlation tables

Table 9: Correlation between various measurements of knowledge about the ECB.

	Self-reported	Mandate	Instruments
Self-reported	1.00		
Mandate	0.20	1.00	
Instruments	0.21	0.61	1.00

Note: Self-reported is the self-indicated level of knowledge as indicated by the respondent, on a scale from one (very low) to five (very high). Mandate and Instruments are the number of correct answers about the statements presented about the ECB. See section 3.4 for more information.

F Effect of the treatment on understanding of the question

CentERdata included a short evaluation consisting of five questions after the questionnaire. One of these questions asked participants to indicate whether they found it hard to answer the questions on a scale from 1 (certainly not) to 5 (certainly yes). We use the answer to this question as the dependent variable and include, additional to several demographic characteristics, the treatment dummies (which were introduced in section 4) as the independent variable. We add these dummies to test how hard individuals found the treatment text to understand.

We use this approach since the evaluation did not include a question which specifically asked individuals to indicate how difficult they found the treatment text. However, as besides the treatment text, the survey was identical for all participants, it is likely that a significant effect for any of the treatment dummies should be interpreted as an indication of the perceived difficulty of the treatment text.

The results are shown in Table 10. We find a significant positive effect, at the 95% confidence level, for the negative interest dummy. The other treatment dummies are insignificant. This result suggests that individuals who received the negative interest treatment found the questions harder to answer than individuals in the control group.

Table 10: Characteristics of individual affecting perceived difficulty to answer the questions of this survey

	(1)	(2)
Treatment:		
- Interest rate policy		0.07
		(0.86)
- Negative interest policy		0.17**
		(2.14)
- Asset purchasing program		-0.02
		(-0.21)
Inflation expectation:		
- Prior	-0.00	-0.00
	(-0.37)	(-0.38)
Demographic characteristics:		
- Male	-0.50***	-0.51***
	(-8.53)	(-8.62)
- Age	0.01***	0.01***
	(5.88)	(5.91)
- Education	0.16**	0.16**
	(2.50)	(2.47)
- Social Status	-0.03	-0.03
	(-1.20)	(-1.27)
- Unemployed	-0.14	-0.16
	(-0.68)	(-0.79)
- Income (x1000)	0.00	-0.00
	(0.07)	(-0.01)
- Financial decision	-0.01	-0.00
maker	(-0.08)	(-0.00)
- Partner	-0.07	-0.07
	(-0.93)	(-0.93)
- Household size	-0.03	-0.03
	(-0.91)	(-0.91)
- City	0.03	0.03
	(1.39)	(1.36)
Ideology:		
- None	-0.24***	-0.24***
	(-3.26)	(-3.27)
- Right wing	0.02	0.03

	(0.36)	(0.42)
Knowledge level:		
- Self-reported	-0.20***	-0.20***
	(-7.58)	(-7.55)
- Mandate	-0.05***	-0.05***
	(-4.21)	(-4.19)
- Instruments	-0.10***	-0.10***
	(-4.39)	(-4.45)
N	2722	2722
R^2	0.117	0.120

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

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