Inflation Literacy, Inflation Expectations, and Trust in the Central Bank: A Survey Experiment

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Abstract

This paper studies the causal effect of inflation literacy on inflation expectations using a randomized control trial (RCT) on a representative sample of the German population. We find that general and non-numerical information about inflation and monetary policy improves respondents' inflation literacy and their trust in the central bank relative to the control group. It also causes a higher likelihood that respondents provide inflation predictions, but does not affect the quantitative levels of the predictions. In the second step, respondents are randomly provided with different quantitative information treatments about inflation. Those who received the initial literacy treatment do not react differently to the quantitative information in terms of the level of their inflation forecasts, but they react more strongly to some treatments regarding their reported forecast uncertainty and trust in the central bank. This suggests that general knowledge about inflation and monetary policy is relevant for inflation expectations via indirect factors such as uncertainty and trust.

Keywords: Inflation literacy, inflation expectations, trust in the central bank, survey experiment, randomized control trial (RCT).

JEL classification: E52, E31, D84.

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1 Introduction

Central banks are increasingly engaging in direct communication with the public to build trust and to guide and anchor inflation expectations in the population by explaining monetary policy decisions (Blinder et al., 2022). However, many consumers struggle with understanding concepts such as inflation and how monetary policy works (Burke and Manz, 2014; van der Cruijsen et al., 2015; Haldane et al., 2020). Given this context, what kind of communication strategy would be effective in improving public literacy about inflation and monetary policy? And would improving consumers' inflation literacy affect their inflation forecasts and help them better to incorporate quantitative information into their expectations?

We study these questions in a survey experiment with a representative sample of German consumers, who are randomly subjected to two consecutive information treatments: In the first step, half of the respondents are randomly selected to receive a 1-minute reading text with general information about inflation and monetary policy. In this *literacy* treatment, we briefly explain how inflation/deflation is measured and its relationship with personal consumption, savings, borrowing, and investment. The text is completed with a short introduction about the Eurosystem including both the Bundesbank and the ECB, the primary goal of the Eurosystem in general terms, and the main monetary policy instruments. Note that in this text, we only focus on explaining the basic economic intuition of inflation and monetary policy, but do not provide any numerical information about the level of inflation rates or the inflation target. We then ask all respondents some test questions to measure inflation and financial literacy as well as their point predictions on perceived and expected inflation and the inflation target of the ECB.

In the second step, we randomly split the population into five groups. One group acts as control group with no further information, while the other groups receive one of the following numerical information treatments on inflation: (1) the inflation target of the ECB, (2) the inflation target of the ECB and an additional text about the ECB's commitment to take into account the effect of climate change, (3) the current inflation rate for Germany, and (4) the current inflation rate for Germany and the Bundesbank's inflation projections over the next three years. Note that within each of the five treatment groups, some respondents received the initial *literacy* treatment, and some did not. We then use probabilistic questions to measure posterior perceived and expected inflation, as well as individual forecast uncertainty. Our survey is completed with questions on trust in the ECB and the Bundesbank. This two-step set-up allows us to evaluate, first, the causal effect of the *literacy* treatment on consumers' literacy, their prior inflation predictions and their trust in the central bank[1], and second, to investigate how consumers incorporate the quantitative information treatments into posterior inflation predictions,

[1]Note that the pure effect of the *literacy* treatment on trust in the central bank is estimated only within the control group that did not receive further information in the second step.

forecast uncertainty as well as trust and whether there are interaction effects with the *literacy* treatment.

We ran the survey experiment on a representative internet-based panel of 4,000 German households during March 1-11, 2022 via *Bilendi & respondi*, one of the major institutions in data collection for market research in Europe. We also conducted a follow-up survey after three months, from June 14 to July 11, 2022, to assess the medium-term effects of the treatments on literacy, inflation forecasts, and trust in the central bank.

The construction of our experiment allows us to join several strands of the literature and test whether the findings in each also hold when they are combined in a joint experiment: First, in several surveys better knowledge about inflation and monetary policy is shown to correlate with higher trust in the central bank and with more accurate inflation forecasts, but the direction of causality cannot be identified in these studies (Hayo and Neuenkirch, 2014; van der Cruijsen et al., 2015; Afrouzi et al., 2015; Mellina and Schmidt, 2018; Haldane et al., 2020; Rumler and Valderrama, 2020; Stanislawska and Paloviita, 2021; Brouwer and de Haan, 2022b; Christelis et al., 2020). For instance, van der Cruijsen et al. (2015) show in a Dutch consumers survey that better knowledge about the ECB monetary policy objectives correlates with more accurate inflation expectations. Rumler and Valderrama (2020) present correlational evidence that Austrian households, who are more inflation literate, give more accurate inflation expectations, but are also less certain when making inflation predictions. Brouwer and de Haan (2022b) find that financial literacy is positively correlated with trust in the ECB and Christelis et al. (2020) demonstrate that trust in the ECB correlates negatively with consumers' inflation expectations.

Second, Burke and Manz (2014) show in an incentivized lab experiment that more literate consumers make better use of information for their inflation forecasts and provide more accurate forecasts, but their treatments are not designed to *generate* literacy.

Third, several survey experiments find that providing consumers or firm managers with quantitative information on current or projected inflation or on the inflation target causes them to adjust their forecasts towards this information, but these studies typically do not account for inflation literacy (Coibion et al., 2018; Binder and Rodrigue, 2018; Coibion et al., 2022; Dräger et al., 2022; Brouwer and de Haan, 2022a). Brouwer and de Haan (2022a) also study whether information treatments affect trust in the central bank in addition to an effect on inflation forecasts and find in their set-up that information about monetary policy instruments affects inflation expectations, but not trust in the ECB.

Our experimental design allows us to test whether inflation literacy can be influenced with information and to estimate the causal effects of inflation literacy on inflation expectations and trust in the central bank. In addition, we can measure the extent to which induced literacy affects the way how additional information is incorporated into expectations or trust, where again the experimental structure allows to identify causal effects.

The results for the control group indicate that consumers' understanding of inflation and monetary policy is generally lacking: Over 50% of the respondents in the control group were only able to answer two out of five basic multiple-choice questions correctly, covering topics such as the definition of inflation, inflation's impact on real consumption, monetary policy objectives and instruments, and the effects of monetary policy on inflation. Additionally, roughly one-third of respondents were unable to provide point predictions for perceived and expected inflation. Only around one-third of respondents were aware that the European Central Bank's (ECB) primary objective is to maintain price stability, and merely 20% of the survey participants in the control group correctly identified the ECB's inflation target at 2%.

Our experiment shows that the provision of general information about inflation and monetary policy in the *literacy* treatment increases the average inflation literacy score by 20%. The effect is sizable and highly statistically significant, and remains significant in the follow-up survey after three months. Moreover, those who received the *literacy* treatment are significantly more likely to provide predictions on perceived and expected inflation. However, the *literacy* treatment has no effect on the *level* of perceived and expected inflation quantitatively. This suggests that general information about inflation and monetary policy makes consumers more confident in their ability to predict inflation, but does not affect the level of predictions. Moreover, respondents in the *literacy* treatment express significantly higher trust in both the ECB and the Bundesbank, conditional on providing inflation predictions, but the effect is only significant in the first wave. In contrast to the results in Burke and Manz (2014), van der Cruijsen et al. (2015) or Rumler and Valderrama (2020), we thus do not find that experimentally induced literacy causes more accurate inflation predictions. Nevertheless, consumers gain from receiving the general information in terms of their confidence in making inflation forecasts and their trust in the central bank.

Does higher inflation literacy also enable consumers to better incorporate quantitative information into their inflation forecasts? We find that consumers update their inflation predictions in response to the quantitative information treatments, but this effect is not stronger for those who received the *literacy* treatment in the first step. In particular, the information on inflation in January 2022 (the latest available data at the time of our survey) improved the accuracy of the inflation nowcast with respect to inflation realized in February 2022, but again this effect is independent of the *literacy* treatment. However, the *literacy* treatment does interact with the quantitative information treatments in terms of their effect on the uncertainty of inflation predictions and on trust in the central bank. On average, respondents in the *literacy* treatment report higher uncertainty on posterior expected inflation, in line with the evidence in Rumler and Valderrama (2020). However, those who received both the *literacy* treatment and the information on either the ECB inflation target or the current inflation rate report lower uncertainty. Similarly, consumers in the *literacy* treatment on average report higher trust in both the ECB and

the Bundesbank, but this effect is reduced if they receive additional information about the target or about current inflation. This implies that respondents who receive the *literacy* treatment are better able to understand that current inflation in the beginning of 2022 was far from target, which had implications for their trust in the monetary policy institutions.

The remainder of the paper is organized as follows. Section 2 presents the survey experiment and data, Section 3 presents the results of the *literacy* treatment, Section 4 discusses the interaction between the *literacy* treatment and further information treatments, and Section 5 concludes.

2 Survey Experimental Design and Data

We conducted the survey on an internet-based panel of 4,000 German consumers during March 1-11, 2022 via *Bilendi & respondi*. This is a representative sample of the German population with respect to age, gender, income, and region. After 3 months, from 14 June to 11 July 2022, we ran a follow-up survey with 2.851 respondents from the first wave. Following Binder (2020), in both survey waves, respondents are only allowed to take the survey if they responded affirmatively to the following question:

> We care about the quality of our data. In order for us to get the most accurate measures of your knowledge and opinions, it is important that you thoughtfully provide your best answers to each question in this survey. Do you commit to thoughtfully provide your best answers to each question in this survey?

In the first wave, after a set of questions designed to elicit consumers' demographic characteristics, the survey sample is randomly split, and 50% of respondents receive a 1-minute reading text containing general and non-numerical information on inflation and monetary policy. This is the *literacy* treatment:

> Inflation is the percentage increase in the general price level. This means that 1 Euro buys less than it did 12 months ago. By contrast, a fall in general prices is called "deflation". Inflation is usually measured using the index of consumer prices and comparing prices today with prices 12 months ago. The index of consumer prices measures prices of a basket of selected goods and services, such as rent, energy, food and drink, transport, health, education and durable goods like furniture, computers or household appliances.
>
> High inflation has economic costs, for instance reducing the purchasing power of those with fixed incomes or savings. However, people with debt, for instance households with a mortgage, also benefit from inflation, since inflation reduces the value of their debt. Low and stable inflation is regarded as optimal for the economic development, since low inflation encourages investment, while keeping down the economic costs of inflation. Deflation is detrimental for economic development because with prices falling, there is an incentive to not consume or invest today, but

rather wait to see if prices will fall further. This can cause a recession with rising unemployment.

Since Germany is part of the Euro area, its monetary policy is decided by the Eurosystem, consisting of the European Central Bank and the national central banks like the Bundesbank. The Eurosystem is responsible for keeping prices stable throughout the Euro area over the medium term. This means that average inflation over a period of 1-3 years should be low and stable. The Eurosystem can achieve this by setting interest rates and/or by buying securities from banks.

Next, we ask all respondents some test questions about inflation, monetary policy, and financial literacy. Most of these questions are taken and/or slightly modified from Burke and Manz (2014) and Lusardi and Mitchell (2011). We construct an index of inflation literacy for each consumer as the sum of the number of correct answers on five questions about (1) the definition of inflation, (2) inflation and real consumption, (3) objectives of monetary policy, (4) monetary policy instruments, (5) macroeconomic policy and inflation. Following Lusardi and Mitchell (2011), we construct an index of financial literacy as the number of correct answers on three questions on: (1) inflation and real consumption, (2) interest rate compounding, and (3) risk diversification.

We then ask respondents about their point predictions regarding inflation over the previous 12 months, as well as inflation expectations in the next 12 months and in the next 3 years, and the annual inflation target of the ECB over the medium run. These point predictions are evaluated with respect to the single effect of the first *literacy* treatment, and serve as prior expectations for the additional information treatments in the second step.

In the next step, we randomly split the sample again, this time into five groups. One group acts as control group and does not receive any further information. The other four groups receive four different information treatments, all of which are numerical and relate to inflation. The intention of the second round of information treatments is to study whether respondents who received the general information in the first step, are also better able to incorporate additional information into their forecasts.

Each treatment group receives one of the following information:

- Treatment 1 shows the inflation target of the ECB (*ECB target*):

  Since its strategy review enacted in July 2021, the European Central Bank (ECB) is committed to setting its monetary policy to ensure that inflation stabilizes at its 2% target in the medium term. This target is symmetric, meaning that the ECB considers negative and positive deviations from this target as equally undesirable.

- Treatment 2 shows the inflation target of the ECB and the ECB's commitment to taking account for the effect of climate change on the stability of the financial system (*ECB targetplus*):

> Since its strategy review enacted in July 2021, the European Central Bank (ECB) is committed to setting its monetary policy to ensure that inflation stabilizes at its 2% target in the medium term. This target is symmetric, meaning that the ECB considers negative and positive deviations from this target as equally undesirable.
>
> In addition, the ECB is now committed to accounting for the effect of climate change on the stability of the financial system.

- Treatment 3 shows the inflation rate in Germany in January 2022, that is the most recent available inflation rate at the time of the first wave of our survey (*current Inf.*):

> The inflation rate in Germany, measured as the year-on-year change in the consumer price index, was measured at +4.9% in January 2022. Since 1994, inflation rates across German federal states have been very close to each other.

- Treatment 4 shows the inflation rate in Germany in January 2022 as well as the Bundesbank inflation projections in the next three years (*current plus forecast Inf.*):

> The inflation rate in Germany, measured as the year-on-year change in the consumer price index, was measured at +4.9% in January 2022. The Bundesbank inflation projections, published in December 2021, forecast average inflation in Germany at 3.6% in 2022, 2.2% in 2023 and 2.2% in 2024.

We then ask all respondents again about their predictions about inflation perceptions and expectations, but avoid asking the same questions twice. Instead, we follow the design of the New York Fed Survey of Consumer Expectations: We elicit a full probability distribution of expectations by asking respondents assign probabilities to ten different bins of inflation/deflation rates as follows: [-12% or less], [-12%; -8%], [-8%; -4%], [-4%; -2%], [-2%; 0%], [0%; 2%], [2%; 4%], [4%; 8%], [8%; 12%], and [12% or more]. Following Coibion et al. (2022), we construct the weighted average and standard deviation of inflation perceptions and expectations for each respondent by using the midpoints of each bin and use the values of -14% and 14% when respondents allocate weights to bin for [-12% or less] and [12% or more] respectively. These expectations are the posterior predictions and are compared to prior point forecasts. Finally, we ask respondents about their level of trust in the ECB as well as the Bundesbank on a scale from 0 to 10.

In the follow-up survey, we do not include any information treatments, but simply re-sample respondents' inflation predictions and trust in the ECB as well as the Bundesbank and repeat the test questions about inflation and monetary policy to measure whether the treatments have longer-lasting effects. The exact survey questions are provided in the Appendix.

In our survey, we allow the respondents to choose the option of "do not know" to mitigate the issue of forcing them to give arbitrary answers when asking about inflation

predictions. We find that about a third of respondents choose the "do not know" answer for questions about inflation perceptions and expectations. Surprisingly, nearly half of the respondents said they do not know the ECB's inflation target, and among those who provided numerical predictions, only 37% answered correctly at 2%. This means that just about 20% of the surveyed population knows about the inflation target of the ECB.

As our paper aims to study simultaneously the treatment effects on the formation of inflation perceptions, short-and medium-run inflation expectations, as well as trust in the central bank, in the main analysis we exclude those who choose the option "do not know" to one of the variables of interest.

In our regression analysis, we control for a wide range of demographic characteristics, including age, education, gender, income, employment status, house owner, household size, and region. Our results generally remain unchanged if we exclude these demographic controls and are available upon request. To control for outliers, we mainly employ Huber robust regressions. Given that our surveys were conducted during a period with high and rising inflation (CPI inflation in Germany was 7.3% in March 2022, and 7.6% in June 2022), to additionally control the effect of outliers, we drop respondents who predict inflation lower than -1%. Note that in our designed survey, 14% is the maximum value of probabilistic inflation predictions, so to be consistent we also select those who have point inflation predictions less than or equal to 14%. We show these robustness checks results in the Appendix. In the main paper, we present our results using the sample without any restrictions on the value of inflation predictions.

Finally, in the Appendix, Table A1 shows very similar sample sizes across treatments and control groups. Table A2 also indicates that the distribution of demographic characteristics is almost identical between the control group and those who received the *literacy* treatment, confirming the randomness of our experiment.

Tables A3-6 and Figures A1-A3 show summary statistics and distributions of inflation literacy, inflation predictions, and trust in the central bank of the control group. On average, respondents who did not receive the *literacy* treatment answered 2 out of 5 test questions about inflation and monetary policy correctly and were able to answer 2 out of 3 financial literacy questions correctly. Regarding the inflation literacy test questions, the lowest share (27%) correctly answered a question about the relationship between monetary policy rates and inflation, while the highest share (77%) was able to correctly identify the definition of inflation. Only 52% answered the question about the ECB's inflation target. The median perception of the ECB target is correct at 2%, but the distribution is skewed to the right, with a mean estimate of the target being 4.25%. Trust in both the ECB and the Bundesbank are relatively low in the control group, with mean scores at 4.11 and 4.39, respectively.

3 The effect of providing general information about inflation and monetary policy

We estimate the causal effect of providing general knowledge about inflation and monetary policy on economic literacy and inflation predictions using the following equation:

$$Y_i = \alpha + \beta Literacy_i + \gamma X_i + \epsilon_i, \tag{1}$$

where *Literacy* is a dummy variable indicating whether consumer i received a 1-minute reading text about inflation and monetary policy; Y is the outcome of interest, measured right after providing the *literacy* treatment, including inflation literacy, financial literacy, and inflation point predictions; X is a vector of control variables and includes age, education, gender, income, employment status, house owner, household size, and region. β is our coefficient of interest.

3.1 The effect on inflation literacy

Table 1 shows the treatment effect on the index of inflation literacy, measured as the number of correct answers to five questions about (1) the definition of inflation, (2) inflation and real consumption, (3) objectives of monetary policy, (4) monetary policy instruments, (5) macroeconomic policy and inflation. The Table also presents the treatment effect on the index of financial literacy, measured as in Lusardi and Mitchell (2011).

We find that the *literacy* treatment significantly improves the inflation literacy index. Compared to the sample average, receiving the general, non-numerical text on inflation and monetary policy corresponds to a 20% increase in the average score in the test questions about inflation and monetary policy in the first wave survey. The *literacy* treatment also statistically significantly improves the average score in the financial literacy test questions, but the magnitude of the effect is relatively small, corresponding about 5% increase in the average grade of the financial literacy test.

In the second wave, we repeat the test questions measuring inflation literacy. We find that the *literacy* treatment still significantly affects inflation literacy after three months, though the magnitude of the effect is only about a third compared with the first wave.

In the Appendix, Tables A7 and A8 show the effect of the *literacy* treatment on the probability of answering correctly each question included in the inflation and financial literacy scores. We find that the *literacy* treatment significantly affects the probability of answering correctly all questions included in the inflation literacy measure in the first wave. However, the treatment has no effect on answering correctly the questions about interest rate compounding and risk diversification in the financial literacy test. These results suggest that the provided information only helps the receivers in understanding the basic intuition regarding inflation and monetary policy. The significant effects of

the treatment on inflation literacy also imply that respondents in the treated group pay attention to the information text they are provided with.

Table 1: Effect of the Literacy Treatment on Economic Literacy Scores

	Immediate		3 months later
	(1) Inflation literacy score	(2) Financial literacy score	(3) Inflation literacy score
Literacy	0.38***	0.087***	0.14***
	(0.04)	(0.03)	(0.05)
R^2	0.157	0.094	0.131
N observations	4000	4000	2851

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the OLS regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.2 The effect on inflation predictions

Table 2 shows the treatment effect on inflation point predictions, including inflation perceptions (π^p), inflation expectations in the next 12 months ($\pi^{e,1y}$) and in the next 3 years ($\pi^{e,1y}$), as well as respondents' guess about the inflation target of the ECB ($\pi^{ECB,target}$). The questions were asked *prior to* the second round of quantitative information treatments about inflation.

As about 30% and nearly 50% of respondents did not provide estimates of inflation perceptions, expectations and the ECB inflation target, respectively, we study both the extensive and intensive margins of the *literacy* treatment. The former measures the treatment effect on the probability of providing predictions, while the latter shows the treatment effect on the quantitative level of inflation predictions, provided that a prediction was made.

Table 2 shows that those who received the *literacy* treatment are about 5 percentage points more likely to answer these questions and the treatment effects are statistically significant at 1%. This suggests that the general information we provided made respondents more confident in providing numerical point predictions about current and future inflation, or in providing a guess about the ECB's inflation target, even though the information in the *literacy* treatment contained no numerical information about current/future inflation or the inflation target.

This is reflected also in our second finding on the intensive margin: Provided that a prediction was made, the *literacy* treatment has no significant effect on the size of respondents' prediction. Overall, these results suggest that providing some economic intuition on inflation and monetary policy potentially helps respondents to understand inflation questions, thereby raising their confidence in answering them (extensive margin),

Table 2: Effect of the Literacy Treatment on Inflation Predictions

	Extensive Margin				Intensive Margin			
	(1) π^{p}	(2) $\pi^{e,1y}$	(3) $\pi^{e,3y}$	(4) $\pi^{ECB,target}$	(5) π^{p}	(6) $\pi^{e,1y}$	(7) $\pi^{e,3y}$	(8) $\pi^{ECB,target}$
Literacy	0.06***	0.05***	0.05***	0.05***	-0.05	-0.1	-0.04	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.06)	(0.10)	(0.11)	(0.05)
Pseudo R^2	0.063	0.057	0.064	0.080				
R^2					0.010	0.044	0.017	0.025
N observations	4000	4000	4000	4000	1950	1950	1950	1578

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. The extensive margin measures the treatment effect on the probability of providing inflation forecasts. The intensive margin measures the treatment effect on the size of inflation forecasts, provided that a forecast is made by respondents. This table reports the marginal effect from probit regressions (columns 1-4) and estimated coefficients from Huber robust regressions (columns 5-8). Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

but does not affect the level of the point predictions relative to the control group (intensive margin).[2]

3.3 The effect on trust in the central bank

Finally, we evaluate the causal impact of the *literacy* treatment on trust in the ECB and the German Bundesbank. Both questions were measured qualitatively on a scale between 0 and 10. Note that the trust questions were included at the end of our survey to allow measuring both effect of the *literacy* treatment, and its interaction with further information treatments. In order to identify the "pure" effect of the *literacy* treatment, in this section we analyze only the control group from the second stage of our experiment, who did not receive any further information treatments. This explains the lower number of observations.

The results are presented in Table 3. Controlling for the same demographic characteristics as before, we find that the *literacy* treatment improves trust in the Bundesbank by 0.4 units, which corresponds to an increase of about 9% in trust relative to average trust in the group receiving neither the *literacy*, nor any further information treatments (see Table A6 in the appendix). However, trust in the ECB is not affected significantly, and there are no effects on trust three months after the treatment. Part of this may be due to measurement error in the relatively small sample. Table A10 in the appendix also suggests that the impact of the *literacy* treatment on trust may be driven by the subsample that provided prior point predictions on inflation. For this group, we find that the

[2]In Table A9 in the appendix, we show the effect of the *literacy* treatment on point inflation predictions after 3 months, but only for the control group from the second stage of our experiment, who did not receive any further information treatments in the second stage of our experiment. We do not find any significant effects of the *literacy* treatment on point predictions of inflation, both regarding the intensive and extensive margins. However, this could be due to the substantially smaller sample size of this group.

Table 3: Effect of the Literacy Treatment on Trust in the Central Banks

	Immediate		3 months later	
	(1) ECB	(2) Bundesbank	(3) ECB	(4) Bundesbank
Literacy	0.2	0.4**	0.2	0.3
	(0.19)	(0.20)	(0.25)	(0.24)
R^2	0.057	0.064	0.050	0.071
N observations	767	765	525	522

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. The sample consists of the control group in the second stage, who did not receive any further quantitative information treatments. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

literacy treatment significantly raises trust in both the ECB and the Bundesbank, where the effects are larger than in the overall sample, but still only significant in the first wave.

4 Interaction of general information with further numerical information about inflation

After evaluating the effect of the general information provided in the *literacy* treatment on prior expectations, we next turn to investigating how the literacy treatment interacts with further numerical information treatments on posterior expectations. The intention is to study whether respondents who received the general information are also better able to incorporate additional quantitative information into their forecasts.

We estimate the following equation:

$$Y_i = \alpha + \beta_0 Literacy_i + \sum_{j=1}^{4} \beta_j Treatment_{j,i} + \sum_{j=1}^{4} \eta_j Treatment_{j,i} \times Literacy_i + \gamma X_i + \epsilon_i, \quad (2)$$

where *Literacy* is a dummy variable indicating whether consumer i received a 1-minute reading text about inflation and monetary policy; $Treatment_j$ indicating whether consumer i received one of further numerical information treatments: (1) the inflation target of the ECB (*ECB target*), (2) the inflation target of the ECB and an additional text about the ECB's commitment to take into account the effect of climate change (*ECB targetplus*), (3) the current inflation rate (*current inf.*), (4) the current inflation rate and the Bundesbank's inflation projections over the next three years (*current plus forecast inf.*), in addition to a control group who did not receive any further information. Y is the outcome of interest, measured after providing further information treatments; X is a

vector of the same set of control variables used in equation 1. β and η are our coefficients of interest.

We evaluate the interaction of the *literacy* treatment with numerical information treatments on the change inflation predictions after the numerical information treatments, the uncertainty of posterior predictions, the accuracy of posterior inflation perceptions and the posterior level of trust in the central bank.

4.1 Effects on updates of inflation predictions

First, we study the treatment effects on updates in inflation predictions after providing further numerical information treatments. Prediction updates are measured as the difference between prior and posterior inflation perceptions or expectations, that is $\Delta\pi = \pi^{posterior}_{probabilistic} - \pi^{prior}_{point}$.

Table 4 shows the results. We find that the *literacy* treatment, either with or without further information, has no significant effect on updates in inflation predictions. This means that respondents who received general information about inflation and monetary policy in the first part of the survey, on average did not update inflation predictions differently compared to those who did not receive this general information. The numerical information treatments did significantly influence updates in predictions: We find that those who received the ECB inflation target or the Bundesbank inflation projections significantly lowered their estimates of current inflation by 0.5-0.7 percentage points compared to the control group. By contrast, those who received information on the current inflation rate increased their predictions for inflation in 1 or 3 years by about 0.6-0.8 percentage points relative to the control group. In line with Dräger et al. (2022), we thus find that consumers adjust their inflation expectations towards the information about current inflation, which implies that they *increase* their forecasts in a high inflation environment. All treatment effects are only significant in the first wave, in line with the results in Coibion et al. (2022).

Surprisingly, we find that those who receive the information about the inflation target of the ECB and Bundesbank inflation projections show no significant differences regarding inflation expectations either in 1 or 3 years. This result is in contrast with the previous literature. For example, individuals' inflation expectations are influenced strongly when they are provided with the information on the central bank's inflation target Coibion et al. (2022) or professional forecasts Dräger et al. (2022). A possible explanation for our results is that our survey was conducted when inflation was soaring and highly volatile.

Note that in the Appendix in Table A13, we find that for a sub-sample of respondents with inflation predictions in a range of -1% to 14%, those who received news about current inflation and Bundesbank inflation projections, the *current plus forecast Inf.* treatment, have significantly lower inflation expectations over the next 1 and 3 years by 0.5-0.6 percentage points in the first wave, and 0.7-0.8 percentage point in the second wave.

However, the information treatments about the ECB inflation target still have no effects on the updates of inflation expectations for this subsample.

Table 4: Treatment Effects on Updates of Inflation Predictions

	Immediate			3 months later	
	(1) $\Delta\pi^{p}$	(2) $\Delta\pi^{e,1y}$	(3) $\Delta\pi^{e,3y}$	(4) $\Delta\pi^{e,1y}$	(5) $\Delta\pi^{e,3y}$
Literacy	-0.08	0.2	0.2	0.2	-0.002
	(0.31)	(0.29)	(0.27)	(0.50)	(0.46)
ECB target	-0.5*	-0.3	-0.03	0.2	-0.3
	(0.32)	(0.30)	(0.28)	(0.53)	(0.48)
ECB targetplus	-0.6*	-0.1	0.1	0.6	-0.01
	(0.32)	(0.30)	(0.28)	(0.50)	(0.46)
Current inf.	0.4	0.8***	0.6**	-0.05	-0.5
	(0.32)	(0.30)	(0.28)	(0.51)	(0.47)
Current plus forecast inf.	-0.7**	-0.4	-0.4	0.4	-0.5
	(0.31)	(0.30)	(0.27)	(0.51)	(0.47)
ECB target × Literacy	-0.01	-0.2	-0.4	-0.3	0.1
	(0.44)	(0.42)	(0.38)	(0.73)	(0.67)
ECB targetplus × Literacy	0.1	-0.2	-0.4	-1.2*	-0.4
	(0.44)	(0.42)	(0.38)	(0.72)	(0.66)
Current inf. × Literacy	-0.2	-0.2	-0.1	0.5	0.4
	(0.44)	(0.42)	(0.38)	(0.72)	(0.66)
Current plus forecast inf. × Literacy	0.3	0.1	0.09	-0.5	0.1
	(0.43)	(0.41)	(0.38)	(0.71)	(0.65)
R^2	0.039	0.035	0.033	0.031	0.023
N observations	1950	1950	1950	1444	1444

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 Effects on the uncertainty of posterior inflation predictions

This subsection studies the treatment effects on the uncertainty of inflation predictions, which we measured as the standard deviation of inflation predictions from probabilistic questions. Table 5 shows the results.

We find that the *literacy* treatment increases the uncertainty of inflation expectations in the next 1 and 3 years in the first wave. This result is in line with Rumler and Valderrama (2020) who find that individuals with higher inflation literacy are more uncertain about their inflation expectations. A possible explanation for this result is that inflation-literate individuals realize the difficulties involved in predicting inflation, and therefore

become less overconfident regarding their forecast accuracy. However, the effects become insignificant in the second wave.

The table also shows that all the numerical treatments, except for *ECB targetplus*, reduce the uncertainty of inflation perceptions in the first wave. Potentially, adding the central bank's commitment regarding climate change makes it harder for respondents to estimate the effect of this new policy on the development of future prices compared with the monetary policy objective focused solely on the inflation target.

We find that only those who received treatment *current and forecast inf.* are more confident in predicting future inflation rates, either in the next 1 or 3 years in the first survey wave. These results imply the importance of providing inflation projections to the public if the central bank aims to anchor the general public's inflation expectations.

Regarding the interactions of the *literacy* treatment with further information treatments, we find that more general knowledge combined with quantitative information generally reduces the uncertainty of future inflation predictions, where the interaction effect is significant for those who received either the *current inf.* or the *ECB target* and the *literacy* treatments.

4.3 Effects on the accuracy of posterior inflation predictions

Next, we study the treatment effects on the accuracy of both current inflation perceptions and short-run inflation expectations one year ahead. For both, we measure the absolute and the simple difference between perceived or expectated mean probabilistic forecasts and either the annual inflation rate in February 2022 (for perceptions) or the annual inflation rate in February 2023 (for short-run expectations). While the absolute deviation measures the magnitude of the prediction error, the simple difference reveals the sign of the error. Note that the first wave of our survey was conducted at the beginning of March 2022 (from 1-11 March) and we ask respondents to provide their perceived inflation in February 2022 compared with February 2021. Also, the information we provide on current inflation in treatments *current inf.* and *current plus forecast inf.* presents the annual inflation rate in January 2022, which was the most recent official inflation data published to the time we conducted the survey.

Table 6 shows the results. We find that the *literacy* treatment has no effect on the accuracy of either current perceived or future predicted inflation, and also does not interact significantly with the quantitative information treatments. Of these, only the treatment informing respondents about the most recent inflation rate (in January 2022) significantly reduces the absolute forecast error for both perceived and expected inflation one year ahead. It should be noted that the first wave of our survey was conducted shortly after the Russian invasion of Ukraine in a period with already high German inflation rates and very large uncertainty regarding future inflation caused by the war. As discussed in

Table 5: Treatment Effects on the Uncertainty of Posterior Predictions

	Immediate			3 months later	
	(1) $\sigma\pi^{p}$	(2) $\sigma\pi^{e,1y}$	(3) $\sigma\pi^{e,3y}$	(4) $\sigma\pi^{e,1y}$	(5) $\sigma\pi^{e,3y}$
Literacy	-0.02	0.4**	0.3**	-0.02	-0.02
	(0.19)	(0.18)	(0.17)	(0.22)	(0.22)
ECB target	-0.4*	0.01	0.1	-0.2	-0.2
	(0.20)	(0.18)	(0.18)	(0.23)	(0.23)
ECB targetplus	0.008	0.1	0.2	-0.1	-0.1
	(0.20)	(0.18)	(0.17)	(0.22)	(0.22)
Current inf.	-0.4*	-0.02	0.2	0.2	0.05
	(0.20)	(0.18)	(0.17)	(0.23)	(0.22)
Current plus forecast inf.	-0.5***	-0.3*	-0.3*	-0.2	-0.2
	(0.19)	(0.18)	(0.17)	(0.22)	(0.22)
ECB target × Literacy	0.3	-0.3	-0.4*	0.1	-0.07
	(0.28)	(0.25)	(0.24)	(0.32)	(0.32)
ECB targetplus × Literacy	0.2	-0.05	-0.1	-0.1	-0.07
	(0.28)	(0.25)	(0.24)	(0.32)	(0.31)
Current inf. × Literacy	0.1	-0.5*	-0.4*	-0.6*	-0.3
	(0.27)	(0.25)	(0.24)	(0.32)	(0.31)
Current plus forecast inf. × Literacy	0.2	-0.2	-0.3	0.10	-0.05
	(0.27)	(0.25)	(0.24)	(0.31)	(0.31)
R^2	0.083	0.060	0.056	0.078	0.067
N observations	1950	1950	1950	1444	1444

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Dräger et al. (2022), the invasion of Ukraine led to an immediate increase in inflation expectations by both German economic experts and German households.

Moreover, we find that the treatment informing respondents about the ECB target causes significantly lower perceptions of current inflation in February 2022 as well as lower expectations for inflation one year ahead by about 0.6-0.7 percentage points relative to the control group. However, due to inflation being above target, this leads to a downward bias and, hence, does not improve prediction accuracy. We observe similar effects on current inflation perceptions from the *ECB targetplus* and the *current plus forecast inf.* treatments.

Table 6: Treatment Effects on the Accuracy of Posterior Inflation Predictions

	Inflation Perceptions		Inflation Expectations 1yr	
	(1)	(2)	(3)	(4)
	$\lvert\pi^{p} - \pi^{02.22}_{actual}\rvert$	$\pi^{p} - \pi^{02.22}_{actual}$	$\lvert\pi^{e,1y}_{actual} - \pi^{02.23}_{actual}\rvert$	$\pi^{e,1y} - \pi^{02.23}_{actual}$
Literacy	-0.2	-0.07	-0.2	0.2
	(0.18)	(0.31)	(0.26)	(0.32)
ECB target	-0.1	-0.7**	0.4	-0.6*
	(0.19)	(0.32)	(0.27)	(0.34)
ECB targetplus	0.04	-0.6*	-0.06	0.01
	(0.19)	(0.32)	(0.27)	(0.33)
Current inf.	-0.5**	0.3	-0.8***	0.8**
	(0.19)	(0.32)	(0.27)	(0.33)
Current plus forecast inf.	-0.3	-0.8***	0.4	-0.4
	(0.19)	(0.31)	(0.27)	(0.33)
ECB target × Literacy	0.3	0.3	0.08	0.10
	(0.26)	(0.45)	(0.38)	(0.46)
ECB targetplus × Literacy	0.3	-0.1	0.5	-0.5
	(0.26)	(0.45)	(0.38)	(0.46)
Current inf. × Literacy	0.2	-0.2	0.5	-0.5
	(0.26)	(0.44)	(0.37)	(0.46)
Current plus forecast inf. × Literacy	0.2	0.2	0.04	-0.06
	(0.26)	(0.44)	(0.37)	(0.45)
R^2	0.056	0.048	0.058	0.054
N observations	1950	1950	1950	1950

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.4 Effects on trust in the central bank

Finally, this subsection studies the treatment effects on trust in the central bank, including the ECB and the Bundesbank in our case. Trust in the central bank is measured with a rating scale from 0 to 10, and on average, trust in the ECB and Bundesbank stands respectively at 4.1 and 4.4 in the first wave for those who do not receive any information treatments.

Table 7 shows the results. We find that inflation expectations are significantly negatively correlated with trust in the central bank in both waves, in line with the results in Christelis et al. (2020) and Rumler and Valderrama (2020).

Regarding the quantitative information treatments about inflation and their interaction with the *literacy* treatment, we find that informing respondents about the ECB's inflation target, either with or without the news about the ECB's commitment to take the effect of climate change into account, does not affect trust in the ECB and the Bundesbank. This may be due to the fact that actual inflation was strongly above target at the time of our survey. However, we discover that providing the current inflation information improves trust in the central banks in both survey waves, particularly if that information is coupled with inflation projections that predict a fall in inflation. These information treatment effects tend to be still significant after three months.

However, those who received the *literacy* treatment on average report *lower* trust in the central banks after additionally being informed that inflation is currently very high. The effect is still significant regarding trust in the Bundesbank after three months. These results make sense, as the information on the current inflation rate shows that the ECB was not able to maintain price stability at that moment. This implies that those who understand more about inflation and monetary policy in general, may also hold the central bank accountable more in situations where the mandate is not fulfilled. The result thus also discovers a potential pitfall of communicating with the general public, which links nicely to the theoretical model by Haldane et al. (2020).

We also estimate the treatment effects on trust in the central bank for those who do not provide inflation predictions, shown in Table A11 in the appendix. In this sub-sample, there are fewer treatment effects from quantitative information. Only those who received the *ECB targetplus* treatment show higher trust in the ECB and the Bundesbank, but the effect is significant only in the second wave. Since this effect is not significant in the full sample, this could imply that the reputation of the central bank gains from this simple information particularly for those with relatively low levels of forecasting abilities.

Table 7: Treatment Effect on Trust in the Central Banks: Control for Posterior Inflation Expectations

	Immediate		3 months later	
	(1) ECB	(2) Bundesbank	(3) ECB	(4) Bundesbank
$\pi^{posterior,3y}$	-0.1***	-0.1***	-0.08***	-0.07***
	(0.02)	(0.01)	(0.01)	(0.02)
Literacy	0.5**	0.7**	0.03	0.06
	(0.26)	(0.26)	(0.31)	(0.32)
ECB target	0.3	0.10	0.4	0.3
	(0.28)	(0.27)	(0.33)	(0.33)
ECB targetplus	0.3	0.4	-0.09	0.4
	(0.27)	(0.27)	(0.31)	(0.32)
Current inf.	0.5*	0.6**	0.6*	1.0***
	(0.27)	(0.27)	(0.32)	(0.32)
Current plus forecast inf.	0.9***	0.8***	0.5	0.6*
	(0.27)	(0.26)	(0.32)	(0.32)
ECB target × Literacy	-0.4	-0.4	0.001	0.02
	(0.38)	(0.38)	(0.45)	(0.46)
ECB targetplus × Literacy	0.009	-0.4	0.6	-0.006
	(0.38)	(0.38)	(0.45)	(0.45)
Current inf. × Literacy	-0.6*	-0.9**	-0.6	-0.9**
	(0.38)	(0.37)	(0.45)	(0.46)
Current plus forecast inf. × Literacy	-0.7*	-0.6	0.01	-0.006
	(0.37)	(0.37)	(0.44)	(0.45)
R^2	0.086	0.089	0.085	0.077
N observations	1950	1950	1444	1444

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 Conclusion

This paper studies how general and qualitative information about inflation and monetary policy can improve consumers' inflation literacy and whether an increase in literacy enables consumers to form better inflation predictions and to better incorporate quantitative information into their predictions. We test this research question using a two-step RCT design on a sample of 4.000 German consumers surveyed in March 2022.

Our results are somewhat two-sided: On the one hand, the general information provided in the *literacy* treatment in the first step of our RCT significantly improves inflation literacy, and this effect persists after three months. While the improvement in literacy leads to a higher likelihood of providing inflation predictions, it does not affect the level of predictions in comparison to the control group. This suggests that the general and qualitative information made consumers more confident in their ability to provide quantitative inflation predictions, but did not affect the quality of their predictions. However, the *literacy* treatment also has an effect on trust in both the ECB and the Bundesbank, which may interact with its effect on the confidence in providing inflation predictions: For those who provided point forecasts, we observe that the *literacy* treatment significantly improved trust in both central banks, while the effect is smaller and only significant for trust in the Bundesbank in the overall sample.

On the other hand, we find that the *literacy* treatment does not interact with quantitative information treatments provided in the second step of our RCT design regarding the update of inflation predictions and the posterior prediction accuracy. We do find that quantitative information treatments caused changes in inflation predictions and affected predicted accuracy independently of the *literacy* treatment. This implies that consumers incorporated the quantitative information into their posterior predictions in the second step, but did so regardless of whether they received the *literacy* treatment in the first step. However, the *literacy* treatment affects posterior prediction uncertainty as well as trust in monetary policy institutions, and this effect also interacts with some information treatments. While respondents in the *literacy* treatment seem to be more aware of the difficult inflation forecast environment at the time of our survey, their forecast uncertainty is reduced more when they are shown the information about the ECB inflation target or current inflation. Similarly, the *literacy* treatment on average improves trust in the central bank, but when in addition information is shown that current inflation is high, this reduces trust for the more literate relative to those who did not receive the general information.

Overall, our results tell a cautious tale about efforts to improve knowledge about inflation and monetary policy in the general public. While it may be possible to generate literacy with simple and general information, this does not automatically imply an effect on consumers' predictions about current and future inflation. Rather, the effect seems to be more subtle, affecting the confidence to provide forecasts or trust in the central bank

(which in turn correlates with inflation expectations). What's more, higher literacy also seems to make consumers more aware of the difficulties in projecting inflation. On the one hand, this may increase their forecast uncertainty – which could be a good thing if they were overconfident in their forecasts before. But on the other hand, it may hurt their trust in the central bank in an inflationary environment, once they are presented with additional evidence that inflation is currently too high.

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A Appendix

Table A1: The Distribution of Respondents across Treatments

	Control	ECB target	ECB targetplus	current Inf.	current plus forecast Inf.	Total
Control	419	392	386	387	412	1,996
Literacy	420	392	395	387	410	2,004
Total	839	784	781	774	822	4,000

Table A2: Demographic characteristics: Literacy treatment vs. Control group (Step 1)

	Literacy treatment			Control group		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
age	2,004	46.55	15.35	1,996	46.41	15.22
income (euro)	1,883	3,032	1,753	1,859	2,993	1,750
college	2,004	0.42	0.49	1,996	0.43	0.49
full time job	2,004	0.48	0.50	1,996	0.47	0.50
part-time job	2,004	0.14	0.34	1,996	0.15	0.36
retired	2,004	0.18	0.39	1,996	0.18	0.38
male	2,004	0.50	0.50	1,996	0.50	0.50
renter	2,004	0.53	0.50	1,996	0.54	0.50
household size	2,004	2.26	1.15	1,996	2.23	1.10
East Germany	2,004	0.14	0.35	1,996	0.15	0.36

Table A3: Summary statistics on inflation and financial literacy: Control group (Step 1)

Variable	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**N**
Inflation literacy score	2.34	1.38	0	5	1996
(1) Question on inflation definition	0.77	0.42	0	1	1996
(2) Question on inflation and real consumption	0.6	0.49	0	1	1996
(3) Question on objective of monetary policy	0.34	0.47	0	1	1996
(4) Question on monetary policy instruments	0.49	0.5	0	1	1996
(5) Question on monetary policy and inflation	0.27	0.44	0	1	1996
Financial literacy score	1.91	0.95	0	3	1996
(1) Question on inflation and real consumption	0.6	0.49	0	1	1996
(2) Question on interest rate compounding	0.62	0.49	0	1	1996
(3) Question on risk diversification	0.69	0.46	0	1	1996

Note: The exact wording of inflation and financial literacy questions are shown in the Appendix A3.

Table A4: Proportion of Providing Inflation Predictions: Control group (Step 1)

Variable	Mean	Std. Dev.	Min.	Max.
Perceived inflation (π^p)	0.74	0.44	0	1
Expected inflation in the next year ($\pi^{e,1y}$)	0.73	0.44	0	1
Expected inflation in the next 3 years ($\pi^{e,3y}$)	0.67	0.47	0	1
Inflation target of the ECB ($\pi^{ECB,target}$)	0.52	0.5	0	1
N		1996		

Table A5: Summary statistics on inflation predictions (prior point estimates - raw data): Control group (Step 1)

Variable	Mean	Median	Std. Dev.	Min.	Max.	N
π^p	6.15	5	7.99	-50	100	1479
$\pi^{e,1y}$	8.26	6	8.84	-25	100	1461
$\pi^{e,3y}$	7.97	5	11.29	-15	100	1325
$\pi^{ECB,target}$	4.25	2	8.4	-10	100	1034

Table A6: Summary statistics on trust in the central bank: Control group (Step 1 & 2)

Variable	Mean	Std. Dev.	Min.	Max.	N
Trust in the ECB	4.11	2.51	0	10	376
Trust in the Bundesbank	4.39	2.56	0	10	377

Note: This table shows summary statistics on trust in the central bank for those who do not receive any information treatments.

Figure A1: Distribution of inflation and financial literacy: Control group (Step 1)

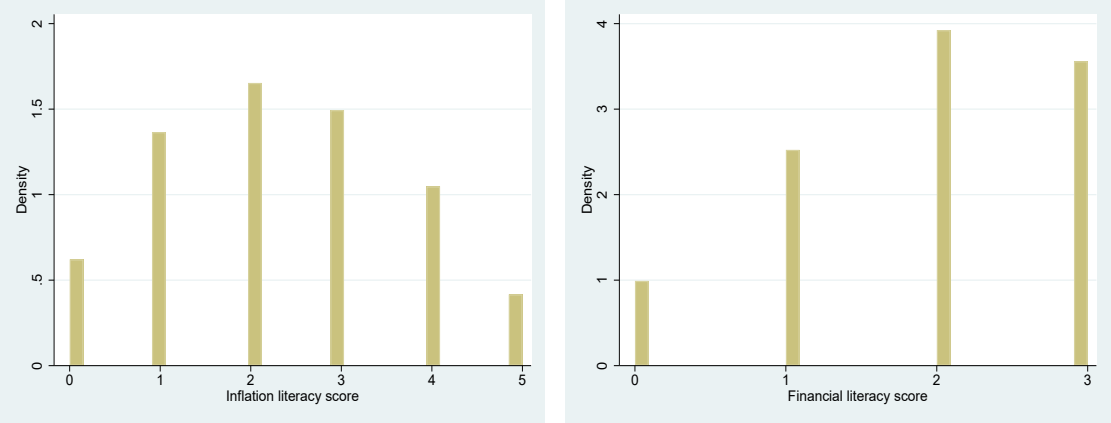
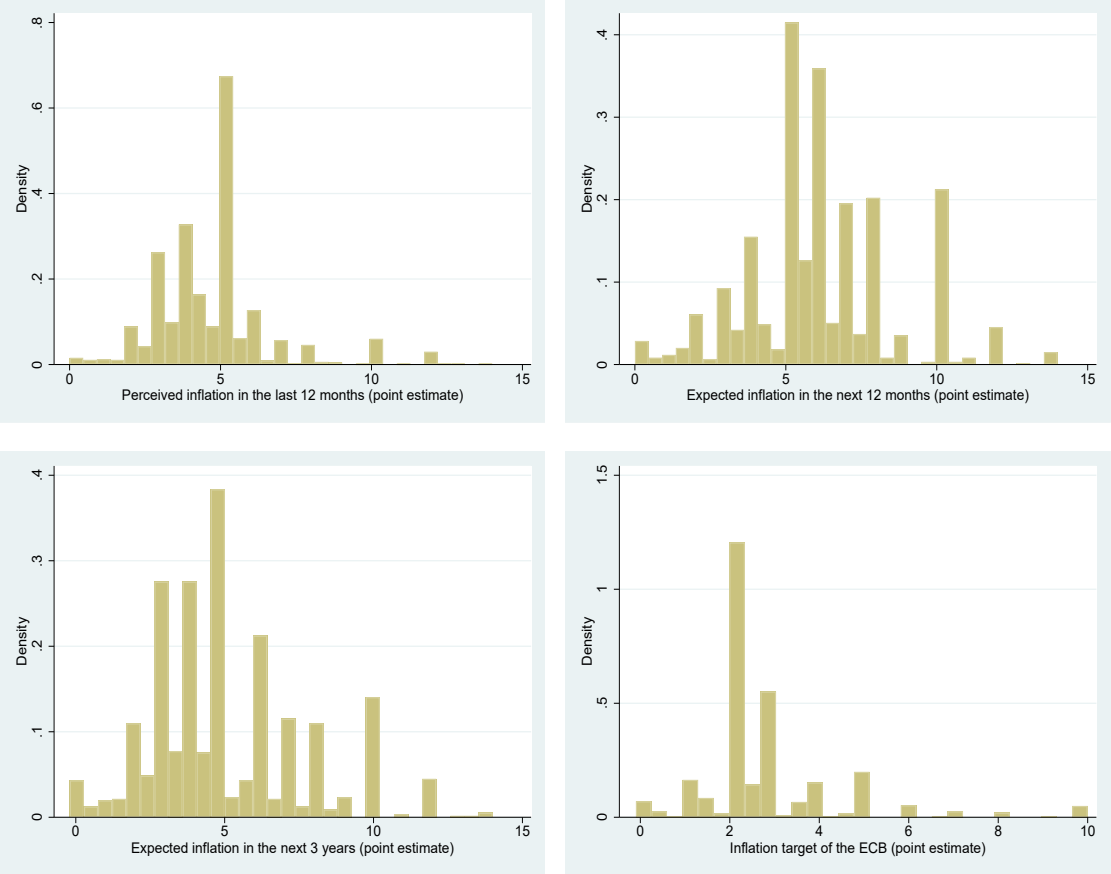
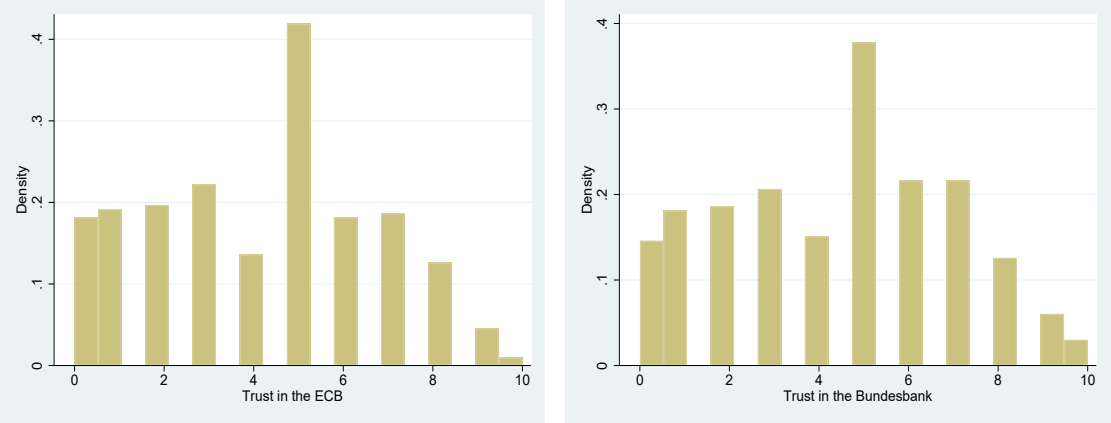


Figure A2: Distribution of inflation predictions: Control group (Step 1)



Note: This figure shows the distribution of point inflation predictions in a range from -1% to 14%

Figure A3: Distribution of trust in the central bank: Control group (Step 1 & 2)



Note: This figure shows the distribution of trust in the central bank for those who do not receive any information treatments.

A.1 Additional Results

Table A7: Effect of Economic Literacy on Inflation Literacy

	Immediate					3 months later				
	(1) Q1	(2) Q2	(3) Q3	(4) Q4	(5) Q5	(6) Q1	(7) Q2	(8) Q3	(9) Q4	(10) Q5
Literacy	0.081***	0.053***	0.16***	0.14***	0.042***	0.025*	0.053***	0.037**	0.0079	0.021
	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Pseudo R^2	0.052	0.018	0.056	0.071	0.065	0.049	0.021	0.036	0.063	0.083
N observations	4000	4000	4000	4000	4000	2851	2851	2851	2851	2851

Note: Q1-5 refer to five inflation literacy questions: (1) Inflation definition, (2) Inflation and real consumption, (3) Objectives of monetary policy, (4) Monetary policy instrument, (5) Macroeconomic policy and inflation, respectively. Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports marginal effects of probit estimations. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Effect of Literacy Treatment on Financial Literacy

	(1) Inflation	(2) Interest rate	(3) Risk Diversification
Literacy	0.053***	0.012	0.022
	(0.02)	(0.01)	(0.01)
Pseudo R^2	0.018	0.063	0.062
N observations	4000	4000	4000

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports marginal effects of probit estimations. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9: Effect of the Literacy Treatment on Point Inflation Predictions for Control group (Step 2): 3 months later

	Extensive Margin				Intensive Margin			
	(1) π^{p}	(2) $\pi^{e,1y}$	(3) $\pi^{e,3y}$	(4) $\pi^{ECB,target}$	(5) π^{p}	(6) $\pi^{e,1y}$	(7) $\pi^{e,3y}$	(8) $\pi^{ECB,target}$
Literacy	0.010	0.01	-0.01	-0.02	-0.2	0.05	0.06	-0.07
	(0.03)	(0.03)	(0.03)	(0.04)	(0.22)	(0.34)	(0.34)	(0.15)
Pseudo R^2	0.080	0.096	0.092	0.124				
R^2					0.072	0.069	0.091	0.046
N observations	593	593	593	593	289	292	292	243

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. The extensive margin measures the treatment effect on the probability of providing inflation forecasts. The intensive margin measures the treatment effect on the size of inflation forecasts, provided that a forecast is made by respondents. This table reports the marginal effect from probit regressions (columns 1-4) and estimated coefficients from Huber robust regressions (columns 5-8). Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A10: Effect of the Literacy Treatment on Trust in the Central Banks: Control Group (Step 2)

	Consumers with prior inflation predictions				Consumers without prior inflation predictions			
	Immediate		3 months later		Immediate		3 months later	
	(1) ECB	(2) Bundesbank	(3) ECB	(4) Bundesbank	(5) ECB	(6) Bundesbank	(7) ECB	(8) Bundesbank
Literacy	0.5*	0.7***	-0.02	0.04	-0.09	0.06	0.5	0.6*
	(0.28)	(0.27)	(0.34)	(0.34)	(0.28)	(0.29)	(0.37)	(0.36)
R^2	0.067	0.090	0.085	0.094	0.065	0.055	0.063	0.109
N obs.	394	394	297	297	373	371	228	225

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. The sample consists of the control group in the second stage, who did not receive any further quantitative information treatments. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A11: Treatment Effect on Trust in the Central Banks: For Those Who Do Not Provide Inflation Expectations

	Immediate		3 months later	
	(1) ECB	(2) Bundesbank	(3) ECB	(4) Bundesbank
Literacy	-0.08	0.07	0.5	0.5
	(0.27)	(0.27)	(0.36)	(0.36)
ECB target	-0.1	0.1	0.3	0.1
	(0.27)	(0.27)	(0.36)	(0.36)
ECB targetplus	0.3	0.4	0.7**	0.7*
	(0.27)	(0.27)	(0.37)	(0.37)
Current inf.	-0.03	0.08	0.5	0.2
	(0.27)	(0.27)	(0.36)	(0.36)
Current plus forecast inf.	0.03	0.2	0.07	0.3
	(0.27)	(0.27)	(0.36)	(0.35)
ECB target × Literacy	0.4	0.1	-0.3	-0.2
	(0.38)	(0.39)	(0.52)	(0.51)
ECB targetplus × Literacy	-0.3	-0.3	-0.8	-1.1**
	(0.38)	(0.39)	(0.51)	(0.51)
Current inf. × Literacy	-0.2	-0.06	-0.5	-0.3
	(0.39)	(0.39)	(0.52)	(0.52)
Current plus forecast inf. × Literacy	-0.4	-0.5	-0.2	-0.3
	(0.38)	(0.39)	(0.50)	(0.50)
R^2	0.037	0.041	0.039	0.055
N observations	1772	1760	1144	1131

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.2 Robustness Checks

These robustness checks show the results when we truncate inflation predictions, both point and probabilistic forecast, in a range from -1% to 14% to further control for the effect of outliers. The reason for choosing this range is due to our designed survey, 14% is the maximum value of probabilistic inflation predictions, so to be consistent we also select those who have point inflation predictions less than or equal to 14%. On the other hand, as our surveys were conducted during a period with high and rising inflation (CPI inflation in Germany was 7.3% in March 2022, and 7.6% in June 2022), we drop those who predict inflation lower than -1%. Our conclusions in the main analysis qualitatively remain unchanged.

Table A12: Effect of the Literacy Treatment on Inflation Predictions

	Extensive Margin				Intensive Margin			
	(1) π^{p}	(2) $\pi^{e,1y}$	(3) $\pi^{e,3y}$	(4) $\pi^{ECB,target}$	(5) π^{p}	(6) $\pi^{e,1y}$	(7) $\pi^{e,3y}$	(8) $\pi^{ECB,target}$
Literacy	0.06***	0.05***	0.05***	0.05***	-0.01	-0.04	-0.10	0.04
	(0.01)	(0.01)	(0.01)	(0.01)	(0.06)	(0.10)	(0.11)	(0.05)
Pseudo R^2	0.063	0.057	0.064	0.080				
R^2					0.011	0.041	0.030	0.036
N observations	4000	4000	4000	4000	1480	1480	1480	1208

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. The extensive margin measures the treatment effect on the probability of providing inflation forecasts. The intensive margin measures the treatment effect on the size of inflation forecasts, provided that a forecast is made by respondents. This table reports the marginal effect from probit regressions (columns 1-4) and estimated coefficients from Huber robust regressions (columns 5-8). Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A13: Treatment Effects on Updates of Inflation Predictions

	Immediate			3 months later	
	(1) $\Delta\pi^{p}$	(2) $\Delta\pi^{e,1y}$	(3) $\Delta\pi^{e,3y}$	(4) $\Delta\pi^{e,1y}$	(5) $\Delta\pi^{e,3y}$
Literacy	-0.2	-0.1	0.1	-0.6	-0.1
	(0.26)	(0.24)	(0.23)	(0.43)	(0.43)
ECB target	-0.5*	-0.4	-0.04	-0.8*	-0.6
	(0.27)	(0.26)	(0.24)	(0.45)	(0.45)
ECB targetplus	-0.6**	-0.4	0.02	-0.2	-0.1
	(0.27)	(0.26)	(0.24)	(0.44)	(0.44)
Current inf.	0.4	0.5*	0.4*	-0.9**	-1.1***
	(0.27)	(0.25)	(0.24)	(0.44)	(0.44)
Current plus forecast inf.	-0.6**	-0.6**	-0.5**	-0.8*	-0.7
	(0.26)	(0.25)	(0.23)	(0.44)	(0.43)
ECB target × Literacy	0.2	-0.05	-0.4	0.5	0.05
	(0.37)	(0.34)	(0.32)	(0.60)	(0.60)
ECB targetplus × Literacy	0.2	0.03	-0.4	-0.7	-0.1
	(0.37)	(0.34)	(0.32)	(0.61)	(0.60)
Current inf. × Literacy	-0.2	0.07	0.002	1.1*	1.0
	(0.36)	(0.34)	(0.32)	(0.60)	(0.60)
Current plus forecast inf. × Literacy	0.3	0.3	0.2	0.9	0.4
	(0.36)	(0.34)	(0.32)	(0.59)	(0.59)
R^2	0.055	0.048	0.041	0.050	0.043
N observations	1480	1480	1480	830	830

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A14: Treatment Effects on the Uncertainty of Predictions

	Immediate			3 months later	
	(1) $\sigma\pi^{p}$	(2) $\sigma\pi^{e,1y}$	(3) $\sigma\pi^{e,3y}$	(4) $\sigma\pi^{e,1y}$	(5) $\sigma\pi^{e,3y}$
Literacy	0.05	0.3*	0.3*	-0.2	-0.2
	(0.16)	(0.15)	(0.15)	(0.22)	(0.22)
ECB target	-0.3*	-0.1	-0.03	-0.4*	-0.4**
	(0.17)	(0.16)	(0.16)	(0.23)	(0.22)
ECB targetplus	0.02	0.007	0.06	-0.02	-0.1
	(0.17)	(0.16)	(0.16)	(0.23)	(0.22)
Current inf.	-0.3*	-0.005	0.1	-0.1	-0.3
	(0.17)	(0.16)	(0.15)	(0.23)	(0.22)
Current plus forecast inf.	-0.4***	-0.3**	-0.3**	-0.3	-0.4*
	(0.16)	(0.15)	(0.15)	(0.22)	(0.22)
ECB target × Literacy	0.3	-0.1	-0.3	0.6*	0.4
	(0.23)	(0.21)	(0.21)	(0.31)	(0.30)
ECB targetplus × Literacy	0.2	-0.02	-0.07	-0.1	0.07
	(0.23)	(0.21)	(0.21)	(0.31)	(0.30)
Current inf. × Literacy	0.09	-0.4*	-0.4*	-0.02	0.04
	(0.22)	(0.21)	(0.21)	(0.31)	(0.30)
Current plus forecast inf. × Literacy	0.05	-0.2	-0.2	0.2	0.2
	(0.22)	(0.21)	(0.20)	(0.31)	(0.30)
R^2	0.082	0.075	0.073	0.101	0.113
N observations	1480	1480	1480	830	830

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A15: Treatment Effects on the Accuracy of Posterior Inflation Predictions

	Inflation Perceptions		Inflation Expectations 1yr	
	(1) $\lvert\pi^{p} - \pi^{02.22}_{actual}\rvert$	(2) $\pi^{p} - \pi^{02.22}_{actual}$	(3) $\lvert\pi^{e,1y}_{actual} - \pi^{02.23}_{actual}\rvert$	(4) $\pi^{e,1y} - \pi^{02.23}_{actual}$
Literacy	0.02	-0.3	0.01	-0.02
	(0.15)	(0.26)	(0.24)	(0.26)
ECB target	0.2	-0.8***	0.6**	-0.7**
	(0.15)	(0.27)	(0.25)	(0.28)
ECB targetplus	0.3*	-0.7**	0.04	-0.04
	(0.15)	(0.27)	(0.25)	(0.28)
Current inf.	-0.1	0.1	-0.5**	0.6**
	(0.15)	(0.26)	(0.25)	(0.27)
Current plus forecast inf.	0.05	-0.7***	0.7***	-0.8***
	(0.15)	(0.26)	(0.24)	(0.27)
ECB target × Literacy	-0.05	0.6	-0.4	0.5
	(0.21)	(0.36)	(0.34)	(0.37)
ECB targetplus × Literacy	0.2	0.004	0.4	-0.5
	(0.21)	(0.36)	(0.34)	(0.37)
Current inf. × Literacy	-0.04	0.10	0.3	-0.3
	(0.20)	(0.36)	(0.33)	(0.37)
Current plus forecast inf. × Literacy	0.006	0.2	-0.2	0.2
	(0.20)	(0.35)	(0.33)	(0.36)
R^2	0.066	0.062	0.072	0.070
N observations	1480	1480	1480	1480

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A16: Treatment Effect on Trust in the Central Banks

	Immediate		3 months later	
	(1) ECB	(2) Bundesbank	(3) ECB	(4) Bundesbank
$\pi^{posterior,3y}$	-0.2***	-0.2***	-0.2***	-0.2***
	(0.03)	(0.03)	(0.04)	(0.04)
Literacy	0.6*	0.7**	0.04	-0.2
	(0.31)	(0.30)	(0.44)	(0.43)
ECB target	0.5	0.2	0.3	-0.1
	(0.33)	(0.32)	(0.45)	(0.45)
ECB targetplus	0.4	0.4	-0.3	0.2
	(0.33)	(0.32)	(0.45)	(0.44)
Current inf.	0.7**	0.6**	0.6	0.7*
	(0.32)	(0.31)	(0.45)	(0.44)
Current plus forecast inf.	0.9***	0.8***	0.4	0.2
	(0.31)	(0.31)	(0.44)	(0.43)
ECB target × Literacy	-0.7*	-0.6	-0.05	0.4
	(0.44)	(0.43)	(0.61)	(0.60)
ECB targetplus × Literacy	-0.2	-0.5	0.7	0.1
	(0.44)	(0.43)	(0.61)	(0.60)
Current inf. × Literacy	-0.8*	-0.9**	-0.9	-1.0*
	(0.43)	(0.42)	(0.61)	(0.60)
Current plus forecast inf. × Literacy	-0.7	-0.4	0.3	0.7
	(0.43)	(0.42)	(0.60)	(0.59)
R^2	0.074	0.089	0.100	0.111
N observations	1480	1480	830	830

Note: Demographic controls include age, education, gender, income, employment status, house owner, household size, and region. This table reports estimated coefficients from the Huber robust regressions. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.3 Survey questions

After some questions about demographics, we randomly assign each respondent to either the "Control group 1" or Treatment group. The treatment group receives the following information:

Please look at the following information carefully before continuing with the survey.

"Inflation is the percentage increase in the general price level. This means that 1 Euro buys less than it did 12 months ago. By contrast, a fall in general prices is called "deflation". Inflation is usually measured using the index of consumer prices and comparing prices today with prices 12 months ago. The index of consumer prices measures prices of a basket of selected goods and services, such as rent, energy, food and drink, transport, health, education and durable goods like furniture, computers or household appliances.

High inflation has economic costs, for instance reducing the purchasing power of those with fixed incomes or savings. However, people with debt, for instance households with a mortgage, also benefit from inflation, since inflation reduces the value of their debt. Low and stable inflation is regarded as optimal for the economic development, since low inflation encourages investment, while keeping down the economic costs of inflation. Deflation is detrimental for economic development because with prices falling, there is an incentive to not consume or invest today, but rather wait to see if prices will fall further. This can cause a recession with rising unemployment.

Since Germany is part of the Euro area, its monetary policy is decided by the Eurosystem, consisting of the European Central Bank and the national central banks like the Bundesbank. The Eurosystem is responsible for keeping prices stable throughout the Euro area over the medium term. This means that average inflation over a period of 1-3 years should be low and stable. The Eurosystem can achieve this by setting interest rates and/or by buying securities from banks."

_ I have read the text in full. [Allow to proceed to the next screen only if the box is checked].

Now we would like to ask you a few general questions about inflation and monetary policy. Please answer all questions according to your current knowledge.

Inflation, monetary, and financial literacy

- *Inflation definition:* The rate of inflation in an economy is best described as the percentage increase in

  1 the overall price level of goods and services.

  2 the overall level of money wages.

3 the long-term interest rate.

4 prices of stocks

999 Don't know

- *Inflation and real consumption:* Suppose that in the year 2023, your net income (after taxes) has doubled and the prices of all goods have doubled as well. In 2023, how much will you be able to buy with your income?

  1 More than you can buy today.

  2 The same as you can buy today.

  3 Less than you can buy today.

  4 It cannot be determined from the information given.

  999 Don't know

- *Objective of monetary policy:* The primary purpose of the monetary policy of the European Central Banks (ECB) today is to

  1 Stabilize the price level of goods and services.

  2 Stabilize the price of corporate stocks.

  3 Keep interest rates low and steady.

  4 Reduce national debt.

  999 Don't know

- *Monetary policy instruments:* Which of the following is a tool of monetary policy?

  1 Raising and lowering income taxes

  2 Increasing and decreasing unemployment benefits

  3 Raising and lowering interest rates

  4 Increasing and decreasing government spending

  999 Don't know

- *Monetary policy and inflation:* Which of the following measures is most likely to lead to lower inflation?

  1 Raising the short-term interest rate.

  2 Lowering the short-term interest rate.

  3 Lowering income taxes.

  4 Raising the level of government spending.

  999 Don't know

- *Interest rate compounding:* Imagine you have 100 € in a bank account. Your money earns 10% interest per year. How many dollars are in your account after two years?

  1 Exactly 110 €

  2 Exactly 120 €

  3 Exactly 200 €

  4 Slightly more than 120 €

  999 Don't know

- *Risk diversification:* Do you agree with the following statement: "The investment in the stock of a single company is less risky than investing in a fund with stocks in similar companies"?

  1 I agree

  2 I do not agree

  999 Don't know

Point inflation predictions

- We would like to ask you about the rate of inflation/deflation in the last 12 months (Note: inflation is the percentage rise in overall prices in the economy, most commonly measured by the Consumer Price Index and deflation corresponds to when prices are falling). Please enter a number in the box below. If you prices did not change in the last 12 months, please enter a "0". If you think there was deflation, enter a negative value. If you think there was inflation, enter a positive value.

  Over the last 12 months, the rate of inflation/deflation was ... percent (one decimal allowed).

  999 Don't know

- What do you think the rate of inflation or deflation will be over the next 12 months? Please enter a number in the box below. If you think prices will not change in the next 12 months, please enter a "0". If you think there will be deflation, enter a negative value. If you think there will be inflation, enter a positive value.

  Over the next 12 months, I expect the rate of inflation/deflation to be ... percent (one decimal allowed).

  999 Don't know

- What do you think the rate of inflation or deflation will be on average over the next 3 years? Please enter a number in the box below. If you think prices will not change over the next 3 years, please enter a "0". If you think there will be deflation, enter a negative value. If you think there will be inflation, enter a positive value.

Over the next 3 years, I expect the average rate of inflation/deflation to be ... percent (one decimal allowed).

999 Don't know

- What is your best guess about the annual inflation rate that the ECB tries to achieve on average over the medium run (about 1-3 years)? (Please use a percentage between -100 and 100) ... % per year

  999 Don't know

Randomly assign each respondent to either the "Control group 2" or Treatment groups 1-4. For treatment groups 1-4:

Please look at the following information carefully before continuing with the survey.

- Treatment group 1: Since its strategy review enacted in July 2021, the European Central Bank (ECB) is committed to setting its monetary policy to ensure that inflation stabilizes at its 2% target in the medium term. This target is symmetric, meaning that the ECB considers negative and positive deviations from this target as equally undesirable.

  _ I have read the text in full. [Allow to proceed to the next screen only if the box is checked].

- Treatment group 2: Since its strategy review enacted in July 2021, the European Central Bank (ECB) is committed to setting its monetary policy to ensure that inflation stabilizes at its 2% target in the medium term. This target is symmetric, meaning that the ECB considers negative and positive deviations from this target as equally undesirable.

  In addition, the ECB is now committed to accounting for the effect of climate change on the stability of the financial system.

  _ I have read the text in full. [Allow to proceed to the next screen only if the box is checked].

- Treatment group 3: The inflation rate in Germany, measured as the year-on-year change in the consumer price index, was measured at +4.9% in January 2022. Since 1994, inflation rates across German federal states have been very close to each other.

  _ I have read the text in full. [Allow to proceed to the next screen only if the box is checked].

- Treatment group 4: The inflation rate in Germany, measured as the year-on-year change in the consumer price index, was measured at +4.9% in January 2022. The

Bundesbank inflation projections, published in December 2021, forecast average inflation in Germany at 3.6% in 2022, 2.2% in 2023 and 2.2% in 2024.

_ I have read the text in full. [Allow to proceed to the next screen only if the box is checked].

Probabilistic inflation predictions

- Now we would like to ask you about the rate of inflation/deflation you expect in February 2022 compared with February 2021.

  In this question, you will be asked about the percent chance of something happening. The percent chance must be a number between 0 and 100 and the sum of your answers must add up to 100.

  What do you think is the percent chance that, in February 2022... (Respondi: sum percentages automatically and only allow to go to the next question if they sum to 100%)

  1 the rate of deflation (opposite of inflation) will be -12% or less —

  2 the rate of deflation (opposite of inflation) will be between -8% and -12% —

  3 the rate of deflation (opposite of inflation) will be between -4% and -8% —

  4 the rate of deflation (opposite of inflation) will be between -2% and -4% —

  5 the rate of deflation (opposite of inflation) will be between 0% and -2% —

  6 the rate of inflation will be between 0% and 2% —

  7 the rate of inflation will be between 2% and 4% —

  8 the rate of inflation will be between 4% and 8% —

  9 the rate of inflation will be between 8% and 12% —

  10 the rate of inflation will be 12% or more —

  % Total —

  999 Don't know

- Now we would like to ask you about the rate of inflation/deflation you expect in the next 12 months.

  In this question, you will be asked about the percent chance of something happening. The percent chance must be a number between 0 and 100 and the sum of your answers must add up to 100.

  What do you think is the percent chance that, over the next 12 months... (Respondi: sum percentages automatically and only allow to go to the next question if they sum to 100%)

1 the rate of deflation (opposite of inflation) will be -12% or less —

2 the rate of deflation (opposite of inflation) will be between -8% and -12% —

3 the rate of deflation (opposite of inflation) will be between -4% and -8% —

4 the rate of deflation (opposite of inflation) will be between -2% and -4% —

5 the rate of deflation (opposite of inflation) will be between 0% and -2% —

6 the rate of inflation will be between 0% and 2% —

7 the rate of inflation will be between 2% and 4% —

8 the rate of inflation will be between 4% and 8% —

9 the rate of inflation will be between 8% and 12% —

10 the rate of inflation will be 12% or more —

% Total —

999 Don't know

- Now we would like to ask you about the rate of inflation/deflation you expect in the next 3 years.

  In this question, you will be asked about the percent chance of something happening. The percent chance must be a number between 0 and 100 and the sum of your answers must add up to 100.

  What do you think is the percent chance that, over the next 3 years... (Respondi: sum percentages automatically and only allow to go to the next question if they sum to 100%)

  1 the rate of deflation (opposite of inflation) will be -12% or less —

  2 the rate of deflation (opposite of inflation) will be between -8% and -12% —

  3 the rate of deflation (opposite of inflation) will be between -4% and -8% —

  4 the rate of deflation (opposite of inflation) will be between -2% and -4% —

  5 the rate of deflation (opposite of inflation) will be between 0% and -2% —

  6 the rate of inflation will be between 0% and 2% —

  7 the rate of inflation will be between 2% and 4% —

  8 the rate of inflation will be between 4% and 8% —

  9 the rate of inflation will be between 8% and 12% —

  10 the rate of inflation will be 12% or more —

  % Total —

  999 Don't know

Trust in the central banks

- How much do you trust the European Central Bank (ECB)? Please indicate your level of trust on a scale from 0 to 10, where 0 means you cannot trust at all and 10 means that you fully trust.

  999 Don't know

- How much do you trust the Bundesbank? Please indicate your level of trust on a scale from 0 to 10, where 0 means you cannot trust at all and 10 means that you fully trust.

  999 Don't know