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Influencing public trust in central banks: Identifying who is open to new information

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Influencing public trust in central banks: Identifying who is open to new information

(05 December 2022)

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Abstract: Using a randomized controlled trial in a 2018 survey of a representative sample of the German population, we study whether providing information about the European Central Bank's (ECB) inflation record in comparison to its inflation target affects people's trust in the central bank. In the treatment, administered to half of the roughly 2000 respondents, a graph of the annual inflation rate in the euro area from 1999 to 2017 and the ECB's 2% inflation target was shown to respondents. We find that the treatment has, on average, no significant effect on the level of trust respondents have in the ECB or on the distribution of survey answers. However, the treatment increases trust in the ECB among respondents who report no preference for any political party. Within this group, the effect is strongest among those who reported biased beliefs about the inflation rate but knew that price stability is the ECB's objective and those who reported a low level of subjective and objective knowledge about monetary policy.

Keywords: Central bank trust, European Central Bank, Central bank communication, Monetary policy, Germany, Household survey, RCT.

JEL classification: E52, E58, Z1.

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1. Introduction

Central banks have recently come under severe attack from politicians. For example, Donald Trump wanted "to audit the Federal Reserve" (Trump 2016). Jacob Rees-Mogg, an influential member of the Conservative Party in the UK, demanded that the Governor of the Bank of England "be fired for the way he has behaved in office" (Huffpost 2016). Lorenzo Fontana, Deputy Federal Secretary of Italy's Lega Nord party, heavily criticised the European Central Bank (ECB), declaring: "The euro is wrong!" (Express 2018). Turkish President Recep Tayyip Erdogan put his words into action and gave himself the power to appoint central bankers who set interest rates in line with his preferences (Bloomberg 2018). In New Zealand, the Minister

of Finance now determines the operational objectives of monetary policy (Hayo and Neumeier 2020).

Such attacks may undermine the support of central banks by the general public. Yet, central banks are delegated tasks that laypeople typically cannot monitor, which requires public trust in the institution. High public trust in the central bank may help the bank resist government attempts to influence monetary policy (Berger and de Haan, 1999).

How central banks can increase public support is unclear, though. Greater familiarity with the central bank (Kaltenthaler et al., 2010; Horvath and Katuscakova, 2016; Hayo and Neuenkirch, 2014) and greater transparency (van der Cruisjen and Eijffinger, 2010) appear to be correlated with greater trust, but it is difficult to infer causality from observational data. Therefore, it is not obvious whether a central bank can really increase trust by providing more information. Moreover, even the fundamental ability of central banks to communicate with laypeople is debated (Blinder 2018; Haldane and McMahon 2018).

To address those questions, we designed a randomized controlled trial (RCT) using a representative sample of the German population in 2018 to investigate whether the European Central Bank (ECB) can affect citizens' trust by providing information about its inflation performance. Specifically, a randomly chosen half of respondents, the treated group, were presented with a graph comparing the actual inflation rate and the official inflation target before being asked to report its level of trust in the ECB. The other half, the control group, was directly asked to report its level of trust in the ECB. Because the treated and control groups were randomly chosen, any difference in their levels of trust can be attributed to the treatment and measures the causal impact of providing respondents with information on the ECB's inflation performance on their reported trust in this institution.

However, it seems likely that only a subset of respondents will be sensitive to the information treatment, as behavioural mechanisms may mute its effect on respondents with strong priors. Cognitive dissonance prompts people to avoid internal inconsistencies in their views and, possibly unconsciously, to adjust their attitudes so that they match past decisions or actions (Festinger, 1957). Cognitive dissonance applies to politics, too. It has been found to induce voters to stick to their previous choices; hence, past voting behaviour may affect current behaviour. For instance, people who have voted in an election tend to hold more polarised views (Beasley and Joslyn, 2001; Mullainathan and Washington, 2009). In other words, once views have been established, they tend to become entrenched. The confirmation bias, defined as "seeking or interpreting of evidence in ways that are partial to existing beliefs" (Nickerson, 1998), is one of the mechanisms used to cope with inconsistencies. Empirical and experimental

evidence shows that this bias applies to partisan beliefs, too (Taber and Lodge, 2006; Jerit and Barabas, 2012; Coibion et al. 2020). Specifically, people easily agree with information that is in line with their political views but overlook or take issue with information that contradict them.

Applying such behavioural mechanisms to the case of citizens' trust in the ECB, we hypothesise that those favouring a political party should report a level of trust in the ECB that is consistent with this party's view of the ECB and European integration in general and be reluctant to change their opinion after being informed about the ECB's inflation performance. The hypothesis rests on evidence in the literature that trust in the ECB is associated with political ideology (Ehrmann et al., 2013; Bursian and Fürth, 2015; Farvaque et al., 2017; Brouwer and De Haan, 2021b). Accordingly, confirmation bias would lead respondents who endorse a party and its positive or negative views on the central bank to ignore the information conveyed by the treatment or to interpret it in a way that reinforces their priors. Only respondents who do not identify with a party may process the information and potentially adjust their level of trust in the central bank.

Therefore, the key hypothesis of this paper is that only respondents without entrenched views, which we operationalise by a lack of clearly defined political preferences, should react to the information treatment. To test this conjecture, we condition the treatment effect on the political party for which respondents declare that they would vote if there was an election. Some respondents report no party at all. We expect them to respond more to the treatment because they can be assumed to have less deeply rooted preferences and may be more open to adjusting their beliefs to new information.

The ECB is relevant to gaining an understanding of public trust in a central bank. It is one of the most independent central banks in the world, raising issues of democratic deficit and accountability (Kenen, 1995; Hayo and Hefeker, 2002). Moreover, the ECB oversees monetary policy in a monetary union. Failing to be trusted therefore not only jeopardises the ECB itself (Kaltenthaler et al. 2010) but also affects the rest of the European Union (Rohrschneider, 2002; Kaltenhalter et al., 2010). Already, there is evidence that trust in the ECB decreased after the 2008 financial crisis (Roth, 2009; Gros and Roth, 2009).

The determinants of trust in the ECB have been investigated, either at the country level (Fischer and Hahn, 2008; Roth et al., 2014; Wälti, 2012) or at the individual level (Farvaque et al., 2011; Bursian and Fürth, 2015; Kaltenthaler et al., 2010; Ehrmann et al., 2013; Hayo and Neuenkirch, 2014; Horvath and Katuscakova, 2016; van der Cruijsen and Samarina, 2021). However, these studies report correlations and do not provide concrete policy guidance as to

what the ECB could do to increase public trust. Our specific RCT setup allows us to derive causal conclusions about how providing information about the ECB's performance in relation to its inflation target will affect the general public's level of trust and how specific subgroups of the population may react.

In the context of household surveys and inflation, RCTs have primarily been used to assess the effect of information on inflation expectations (e.g., Binder and Rodrigue, 2018; Coibion et al., 2019; Coibion et al. forthcoming).

To the best of our knowledge, Bholat et al. (2019) and Brouwer and de Haan (2021a) are the only studies using survey experiments to analyse the impact of information on trust in a central bank. In a study of UK respondents, Bholat et al. (2019) find that providing individuals a relatable graphic communication with limited information content may increase trust in the central bank compared to more detailed but purely verbal communications. Examining trust in the ECB from a Dutch perspective, Brouwer and de Haan (2021a) observe no effect of providing information on the ECB's policy instruments. Our experiment, which is introduced in Hayo et al. (2018), differs from these two papers in three main respects. First, trust in the ECB is the focus of our investigation, whereas it is only a by-product of theirs. Second, the treatment that we consider is more straightforward. Bholat et al. (2019) use a mix of text and illustrations to offer an explicit explanation of the Bank of England's motivations behind its most recent decision. Brouwer and de Haan (2021a) randomly provide various short textbook summaries of the working of interest rate policy, negative interest rates, and the asset programme, explicitly emphasising that these mechanisms should cause the inflation rate to increase after having recalled to all respondents the ECB's inflation target and performance. Both papers therefore observe differences between ways to provide the same information or between different content. By contrast, our experiment compares a group that received information to a control group that received none, which allows testing the role of information *per se* and therefore addresses a foundational question that should precede the others. Furthermore, our treatment simply consists in providing information that is strictly factual and makes no comment on any theoretical expectations or the future path of the inflation rate. Finally, we use our experiment to test a specific theoretical framework based on behavioural mechanisms that emphasises a specific type of heterogeneity across population groups.

We find that our treatment has no effect on respondents' trust in the ECB *on average* or on respondents with strong political preferences. However, supporting our hypothesis, we observe that the effect of the treatment increases trust among respondents with shallow political preferences — those who report no preference for any political party — but not on others, which

echoes findings by Coibion et al. (2020) on partisan reaction to polling data in the US. When focusing on this specific group of respondents, we report evidence that it is the information on the ECB's inflation history contained in the treatment that triggers changes in the level of trust and find that the effect is the strongest for respondents with low levels of both subjective as well as objective knowledge of monetary policy.

The rest of the paper is structured as follows. The next section describes the survey and our empirical strategy. Section 3 reports our results, and Section 4 discusses possible mechanisms. Section 5 concludes.

2. The randomized controlled trial

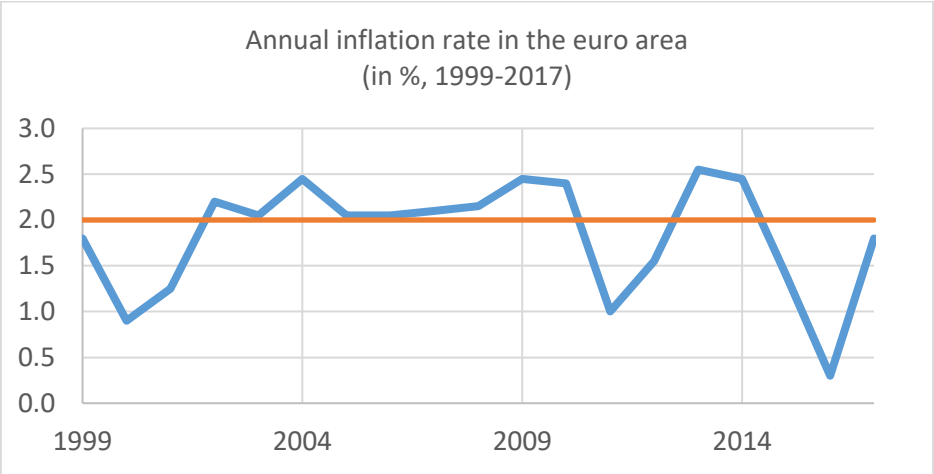
We implemented the information experiment in a representative omnibus survey on the German population conducted in 2018 by the Gesellschaft für Konsumforschung (GfK) to evaluate the effect of the treatment on the trust of German laypeople in the European Central Bank (ECB). Methodologically, the survey is based on quota sampling. The survey questions were asked in face-to-face interviews using pen-pads. GfK's survey quality control encompasses contact checks, address comparisons, sampling tests, and qualitative checks of the final interviews. Participation in the omnibus survey is incentivised in accordance with the ESOMAR Standard; in particular, participants collect points that can be used to buy a selection of products, make donations, and/or enter sweepstakes. More details on the survey can be found in the documentation paper (Hayo et al. 2018), and descriptive statistics of our sample are reported in Table A.3.

To introduce the treatment, which was administered randomly to half of the roughly 2000 survey participants, we provided the following paragraph showing the annual inflation rate in the euro area from 1999 to 2017 and the ECB's 2% inflation target (Figure 1) and some explanatory text.[1]

Please take a look at the following graph showing the development of the inflation rate in the euro area. The ECB's objective is to keep the inflation rate below, but close to, 2% over the medium term. In the graph, this objective is shown by a red horizontal line.

[1] Table A.4 of the Appendix reports t-tests showing that the characteristics of treated and non-treated respondents are not statistically different, confirming that the respondents' assignment to the two groups was random.

Figure 1: Inflation information treatment



The treated group then received another explanatory sentence:

Please take into account your impression of inflation development in the euro area when answering the next question.

The next question asked respondents to report their trust in the ECB:

To what extent do you trust the European Central Bank (ECB)? A value of 1 means that you have high trust. A value of 5 means that you have no trust at all. You may rate your trust with the values in between.

To ease interpretation, we recode the variable so that a value of 5 implies very high trust and vice versa.

Table 1 compares the average level of trust in the ECB of the treated and the non-treated groups of respondents. It shows that the treatment has no significant effect on the average level of ECB trust, its variance, or the full distribution of answers.

Table 1: Testing for effects of the inflation information treatment

	Number of observations	Arithmetic mean	Standard deviation
Untreated group	1010	2.61	0.999
Treated group	1005	2.64	0.995
t-test for differences in the mean	t = 0.8 (p-value 0.4)		
Mann-Whitney test for differences in the mean	z = -1.1 (p-value 0.3)		
Variance ratio test (H_0: =1)	F = 1 (p-value 0.9)		
Kolmogorov-Smirnov test for equality of distribution functions	D = 0.04 (p-value 0.5)		

Notes: Minimum and maximum of the ECB trust indicator are 1 and 5, respectively.

However, this non-result should not come as a surprise, considering our hypothesis that only respondents with weak political preferences may adjust their beliefs to information on the ECB. In the next section, we let the effect of the treatment be conditional on the political preferences of respondents.

3. Results

We estimate a series of ordered logit models, where the dependent variable is respondents' stated trust in the ECB and the explanatory variable a dummy variable set to one if the respondent was shown the graph plotting inflation in the euro area. Moreover, to test our hypothesis that only respondents with weaker political views should react to the treatment, we condition its effect on respondents' political preferences. To do so, we ask respondents about the party for which they would vote if a national election was held on the following Sunday. Respondents were invited to choose between the main six German political parties or, alternatively, they could state that they would vote for another party or reply "don't know".[2] Note that the question on political preferences was asked after the questions on monetary policy,

[2] The main parties are, from left to right on the political spectrum: left-wing party 'Die Linke', the social democratic party 'SPD', the green party 'Die Grünen', the liberal party 'FDP', the conservative Christian democrats 'CDU/CSU', and the 'AfD', a far-right party with a strong Eurosceptic stance. The distribution of respondents across parties can be found in Table A.3 in the appendix. Figure A.1 reports the average level of trust in the ECB by party type. The figure shows that parties significantly differ in terms of average trust in the ECB. The green party and the SPD display the highest level of trust. The AfD displays the lowest level of trust, in line with the party's Eurosceptic stance. Respondents who state no party affiliation display the second lowest level of trust.

and, hence, respondents were not reminded of their political preferences before the treatment and their degree of trust in the ECB. The outcomes of those regressions are reported in Table 2.

The first column of Table 2 reports the outcome of estimating the model on the entire sample regardless of political preferences. It confirms that the treatment had no effect on average, as the treatment dummy bears a coefficient that is statistically insignificant. The dummy is also insignificant when including the treatment in a full-fledged model of ECB trust based on Hayo and Neuenkirch (2014), which controls for a range of characteristics of respondents (Column 2).[3] In line with our hypothesis, Table 2 also shows that the effect of the treatment is statistically insignificant for all groups of respondents who knew which party they would vote for (Columns 3 to 9).

By contrast, the last column of the table (Column 10) shows that the effect of the treatment is positive and statistically significant for the group of respondents who did *not* select a party and could be assumed to have weaker views about the ECB's performance. Again, this finding is in line with the hypothesis that respondents with less entrenched political preferences display a weaker confirmation bias and, therefore, react to the treatment.[4] It echoes evidence obtained by Coibion et al. (2020) in a survey experiment that neither Democrats nor Republicans update the probability they assigned to their favourite candidate winning the 2020

[3] The full list of coefficients is reported in Table A.9 of the Appendix. Specifically, the model controls for (I) Economic Situation: (1) Household net income per capita (alternatively net personal income); (2) Lower-middle income quartile; (3) Upper-middle income quartile; (4) Upper income quartile; (5) Saver; (6) Borrower; (7) Satisfaction with his/her economic situation; (8) Own house; (9) Own flat; (II) Monetary Policy Knowledge: (10) Objective knowledge; (11) Subjective knowledge; (III) Political Preferences and Attitudes: Vote intention for (14) Alternative for Germany (AfD); (15) Conservatives (CDU/CSU); (16) Green; (17) Left Party; (18) Liberals (FDP); (19) Social-Democrats (SPD); (20) Public choice view of the political process; (IV) Socio-Demographic Indicators: (21) Female; (22) Age; Marriage status: (23) Single; (24) Partner; (25) Married; Formal education: (26) Certified apprenticeship; (27) Secondary school; (28) University-entrance diploma; (29) University degree; (30) Trade union member; Employment categories: (31) Blue collar; (32) White collar; (33) Public servant; (34) Self-employed; (35) Farmer; (36) Employed full time; (37) Employed part time; (38) Unemployed; (39) Nonworking; (40) Housewife; (41) Apprenticeship; (42) Community size; (43) East Germany; (44) No Internet access; (45) Number of children, (V) Psychological Indicators: (46) Risk propensity; Time preferences: (47) Future-oriented time preference; and (48) Short-run impatience.

[4] Table A.5 in the Appendix compares the characteristics of these respondents to those of respondents who named a party and performs a series of t-tests to determine which characteristics differ significantly across the two groups. The tests reveal that respondents who name no party, on average, report lower trust in the ECB, a lower subjective knowledge, and obtain a lower score of objective knowledge than those who declare a party affiliation. They are more likely female, younger, and single, and have fewer children. They are less likely to hold a high school or university degree. Moreover, their economic situation is less favourable across several dimensions. They report lower (i) income and (ii) level of economic satisfaction, and they are less likely to (iii) save, (iv) own a house or a flat, or (v) be a trade-union member or (vi) white-collar worker. They are (vii) more likely to identify themselves as blue collar workers, (viii) not working, (ix) part-time workers, or (x) in an apprenticeship.

Table 2: Effect of the treatment on trust in the ECB conditional on party preferences

	(1) All parties	(2) All parties	(3) Die Linke	(4) SPD	(5) Die Grünen	(6) CDU/ CSU	(7) FDP	(8) AfD	(9) Other party	(10) No party
Graph shown	0.087	0.099	0.278	0.016	-0.238	-0.03	0.372	-0.242	0.479	0.484
	(1.056)	(1.090)	(0.968)	(0.074)	(-0.895)	(-0.176)	(1.106)	(-0.960)	(1.304)	(2.490)**
Controls		✓								
Observations	2,015	1,821	161	339	207	480	132	213	118	365

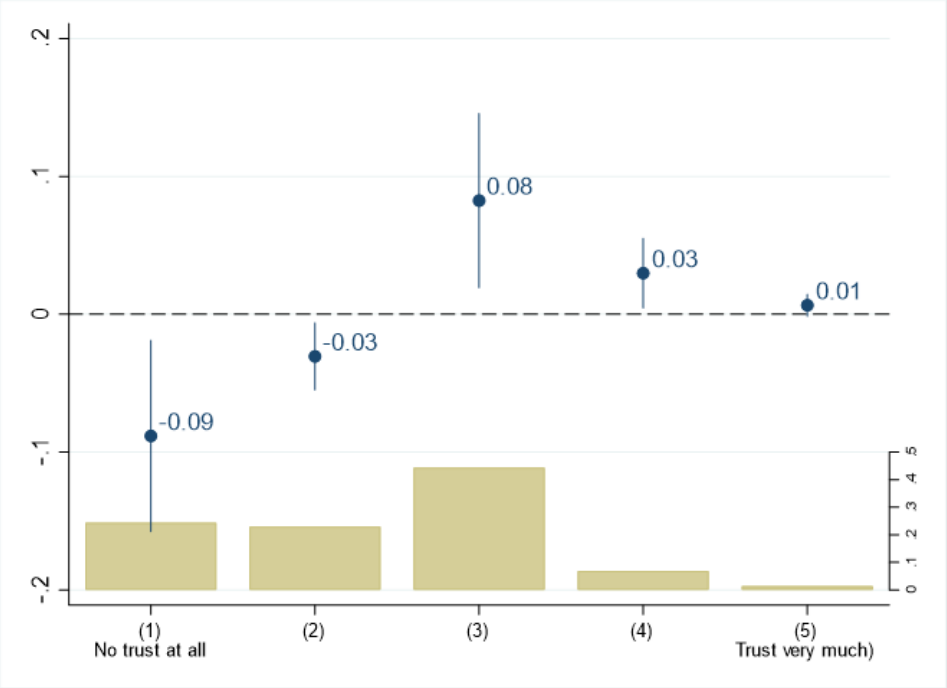
Notes: Ordered logit estimates. Robust z-statistics in parentheses. The result in Column 2 is taken from Table A.9 of the Appendix, which reports the coefficients of all control variables. *** p<0.01, ** p<0.05, * p<0.1.

US presidential election after seeing polling data changed. By contrast, independents did update their assumed probability.

Table A.5 sets out that the characteristics of respondents who do not state a party are balanced across 35 of the 38 dimensions describing treatment and control groups.[5] Accordingly, we can give a causal interpretation to the differences between the two groups even for the sample restricted to respondents who state no party preference.

Figure 2 shows the marginal effect of the treatment on the probability of respondents who would not name a party on the chosen level of trust. Having seen the graph reduces the probability that respondents report not trusting the ECB at all, as 24% of them do, by almost 9 percentage points (pp). It increases the probability of respondents choosing the middle category, selected by 44% of respondents, by more than 8 pp.

Figure 2: Marginal effect of the treatment on trust in the ECB of respondents who report no party preference



Notes: Marginal effects based on the ordered logit model reported in Column 9 of Table 2. The bar chart reports the distribution of respondents' trust in the ECB.

[5] The three exceptions are a significantly lower share of treated with secondary schooling, subjective monetary policy knowledge, and patient time preference. However, the quantitative differences are not worrisome. Moreover, Table A.10 of the Appendix shows that controlling for these variables does not affect the estimated treatment effect in a noteworthy way. Table A.12 reports matching estimates that confirm that the differences in those variables do not drive our results. Table A.8 also shows that the characteristics of respondents who state a party are balanced across all but two characteristics, being single and having access to the internet.

To see how well the bivariate description of non-voters holds up in a multivariate setting, Table A.6 reports the outcome of estimating a logit model, where the dependent variable is a dummy set to one if a respondent states no party preference and zero otherwise. To reduce our 48 descriptive variables, we employ a general-to-specific modelling approach (see Hendry 1993) and obtain a more parsimonious model with only 11 descriptive variables. Stating no party preference is significantly associated with being (i) younger, (ii) female, and (iii) neither a saver nor a borrower, as well as having (iv) lower objective and subjective monetary policy knowledge, (v) a lower level of education, and (vi) fewer children.

To test the sensitivity of our finding to the specification of the model, we interacted the treatment dummy with all party dummies, using the group of 'no votes' as the reference category. Table A.14 of the Appendix reports the corresponding raw coefficients and the implied marginal effects. These results confirm that showing the graph to respondents who stated 'no party' increases their trust in the ECB. By contrast the marginal effect of the treatment is statistically insignificant for all respondents who stated a party preference.

To summarise, the results of this section are in line with the hypothesis that respondents with stronger political views do not easily adjust their level of trust in the ECB. Only those with weaker *a priori* views do. In the next section, we investigate what prompts these respondents to change their minds.

4. Mechanisms

We now focus on respondents who declare no party preference, as they constitute the only group sensitive to the treatment.[6] We investigate the influence of the content of the treatment and the role of objective and subjective knowledge about the ECB.

4.1. The content of the treatment

The treatment provides information both on the actual inflation rate and on the ECB's policy objective. To determine which pieces of information respondents react to, we condition the effect on the respondents' prior knowledge of both.

We start with knowledge of the inflation rate. We should expect respondents who already knew the inflation rate to react less to the treatment than other respondents. To test this conjecture, we utilise two variants of a question appearing earlier in the questionnaire, namely

[6] We focus on characteristics for which we observe meaningful results and allow for interpretation of the treatment. Table A.15 in the Appendix shows that the effect is not conditional on education, and Table A.17 shows that it is not conditional on household per capita income. In Table A.24 and Table A.25, we also report evidence that among respondents who do not state a party men are more responsive to the treatment than women.

"Do you remember, roughly, what Germany's rate of inflation was in 2017?" In one variant, respondents could state a number; in the other, they were invited to choose between several intervals. In both variants, respondents could choose to reply that they did not know the answer.[7]

The official German CPI was 1.8% in 2017, and we consider an inflation rate ranging from 1% to 2% to be a correct answer. We find that about 17% of respondents who did not state a party preference answered the question correctly, 63% did not know the answer, and almost 20% were wrong. Of the latter group, the vast majority (16% of total respondents) overestimated inflation, and only 4% of total respondents underestimated it.

We estimated the effect of the treatment separately on respondents who answered correctly, answered incorrectly, or responded that they did not know the answer. The top panel of Table 3 reports the outcome of these regressions.

Table 3: Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on knowing the inflation rate and the objective of the European Central Bank

	(1)	(2)	(3)
	Reported past inflation rate		
	Correct	Wrong	Doesn't know
Graph shown	-0.338	1.313	0.376
	(-0.691)	(3.233)***	(1.482)
Observations	58	87	220
	Objective of the ECB		
	Correct	Wrong	Doesn't know
Graph shown	0.885	0.415	0.038
	(2.678)***	(1.043)	(0.123)
Observations	133	92	140

Notes: Ordered logit estimates. Respondents are considered to know the past inflation rate if they reported a value between 1% to 2%. They are considered to know the objective of the ECB if they choose price stability in the list of five possible objectives. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The striking feature of the top panel of Table 3 is that the treatment is positive and statistically significant at the 1%-level in the group of respondents who were wrong about the inflation rate and insignificant for the other two groups. Arguably, the treatment corrected the beliefs of those who were wrong. For most of them, it meant revising their perception of inflation downwards, which prompted them to increase their trust in the ECB. By contrast,

[7] The exact wording of the two questions is reported in Appendix A.1.

respondents who already knew the answer had no reason to change their trust in the ECB. In line with this conjecture, they did not adjust their trust in the ECB.

Respondents who stated that they did not know the answer likely had no priors about the inflation rate. Predicting the effect of showing them the actual inflation record of the ECB is not straightforward, and our estimate suggests that the average effect is statistically insignificant, possibly due to heterogeneous reactions.

We assessed the prior knowledge of the objective of the ECB based on a question that directly asked respondents to choose the correct objective from five possible objectives.[8] About 36% of the respondents correctly answered that the ECB's objective is to maintain price stability in the euro area, 25% chose a wrong objective, and 38% reported that they did not know.

The bottom panel of Table 3 reports the outcome of estimating the baseline model separately for each group. We observe that the treatment had a statistically significant effect only on respondents who already knew that price stability was the ECB's objective, whereas it is statistically insignificant for those who either were wrong about it or admitted that they did not know. An appealing interpretation of that finding is that the information content of the treatment was essentially the level of the inflation rate. Respondents who already knew that price stability was the ECB's objective could compare the ECB's inflation record with its objective. Our estimates suggest that these respondents increased their trust in the ECB. By contrast, the others did not react to the information, possibly because they did not process the information of the ECB's objective contained in the treatment, and they therefore lacked a yardstick by which to assess the ECB's inflation performance.

Overall, the results reported in Table 3 sketch a consistent picture. They show that respondents who did not state a party preference and who knew the ECB's main objective processed the information about inflation featured in the graph. As a result, they appeared to have interpreted the ECB's performance favourably and, consequently, their level of trust in the ECB increased. This interpretation is backed by Table A.21, which reports the outcome of separately estimating the baseline model for the nine subsamples of respondents resulting from combining knowledge about past inflation and the ECB's objective.[9] In this table, the only subsample where the treatment has a positive and statistically significant effect is the group of

[8] The exact wording of the question is reported in Appendix A.1.3.

[9] As the size of each subsample is small, these results are only indicative, which is why we only report them in the Appendix. Table A.20 reports the same sets of estimates for all respondents and respondents who state a party. For these two groups, the marginal effect of the treatment is statistically insignificant for all combinations of respondents' knowledge of past inflation and of the ECB's objective.

respondents who know the ECB's objective but were wrong about the prior inflation rate. Accordingly, respondents who knew that price stability is the ECB's main objective, did not state a party, and were wrong about the inflation rate — typically, by overestimating it — updated their beliefs and reported a higher level of trust in the ECB.

We also conditioned the treatment effect on knowing the inflation rate and the objective of the ECB in the whole sample and in a sample consisting only of respondents who state a party preference and know the inflation rate, as in the baseline estimations. Reported in Table A.19 of the Appendix, none of these regression estimates have a significant effect. The contrast between these results and those obtained for respondents stating no party preference can be interpreted as implying that only the latter group processed the information contained in the treatment and revise their trust in the ECB. In line with the presence of a confirmation bias, the others either interpreted the information as consistent with their beliefs or discarded it.

4.2. Familiarity with the ECB

Hayo and Neuenkirch (2014) discuss the trust Germans have in the ECB and emphasise that general objective and subjective knowledge is associated with higher trust. To distinguish respondents' general knowledge of the ECB from the specific information content of the treatment, we therefore distinguish subgroups among respondents who report no party preference based on their familiarity with the ECB and knowledge about monetary policy. In the survey, respondents were asked to state their level of monetary policy knowledge on a scale from very bad to very good, in steps from one to five. This reflects what respondents *think* they know about this topic. The top panel of Table 4 reports the outcome of specific regressions for each level of subjective knowledge.[10]

The striking feature of these results is that the effect of the treatment is statistically insignificant for respondents who consider their knowledge of monetary policy to be above three on a one-to-five scale. Conversely, the effect is positive and statistically significant at the five percent level for those who consider their knowledge of monetary policy to be very bad or bad. One interpretation of these results is that respondents who acknowledge their lack of understanding of monetary policy remain open-minded about the ECB and, accordingly, are willing to update their trust in the ECB when given information on its inflation record. This can be interpreted as further evidence of a confirmation bias, as only respondents who

[10] The exact wording of the question is reported in Appendix A.1.2. We also condition the treatment effect on subjective knowledge in the whole sample and in a sample consisting only of respondents who state a party preference. As in the baseline estimations, we find no significant effect. The outcomes of these estimations are reported in Table A.22 of the Appendix.

acknowledged their lack of knowledge reacted to the information contained in the graph by updating their beliefs. Those who thought that they knew either considered that information to be in line with their priors or discarded it.

Table 4: Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on subjective and objective knowledge about monetary policy

	(1)	(2)	(3)	(4)	(5)
	Very bad				Very good
	Subjective knowledge				
Graph shown	0.739	0.838	0.209	0.670	-
	(2.387)**	(2.150)**	(0.515)	(0.763)	
Observations	148	94	102	20	1
	Objective knowledge				
Graph shown	0.305	0.730	0.329	0.061	2.303
	(1.030)	(1.929)*	(0.744)	(0.082)	(1.321)
Observations	159	107	69	21	9

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

We then constructed an index of objective knowledge based on four questions in the survey pertaining to monetary policy and the ECB.[11] We added one point to the index for each correct answer, resulting in an index ranging from zero to four. The bottom panel of Table 4 sets out the results of running specific regressions for each level of knowledge.

The results reported in the bottom panel of Table 4 slightly differ from those obtained for subjective knowledge. In line with the results obtained for subjective knowledge, we find no significant effect of showing the ECB's inflation record for respondents with the best knowledge of monetary policy (Columns 3 to 5). Similar to subjective knowledge, we observe a positive and statistically significant effect of showing the graph to respondents in the second category — that is, those who could correctly answer one of four questions about monetary policy. However, the effect is only statistically significant at the 10% level. Finally, we observe

[11] The questions used to compute that score are reported in Appendix A.1.3. Although the correlation between subjective and objective knowledge is positive and significant at the 1% level, it is far from a perfect correlation, with a coefficient of correlation of 0.34 in the whole sample and 0.33 among respondents who state no party preference. Table A.1 reports the joint distribution of subjective and objective knowledge in the whole sample and Table A.2 for respondents who state no party preference. We also condition the treatment effect on objective knowledge in the whole sample and in a sample consisting only of respondents who state a party preference. As in the baseline estimations, we find no significant effect. The outcomes of these estimations are reported in Table A.23 of the Appendix.

no statistically significant effect for respondents with no monetary policy knowledge. Those results signal a larger heterogeneity of reactions to the treatment within objective knowledge categories than within subjective knowledge categories. It can be interpreted as implying that the perception of being knowledgeable may result in a stronger confirmation bias than an objective knowledge of monetary policy. Arguably, this is fully in line with behavioural mechanisms, such as cognitive dissonance, which are based on perception rather than in fact.

5. Conclusion

Employing an RCT placed in a survey, we study how laypersons' trust in the ECB is affected by verbal and graphical information about its inflation record and target. Our hypothesis is that cognitive dissonance and confirmation bias make it unlikely that people with entrenched views will change their level of trust in the bank in light of factual information. In contrast, people with malleable views may react and update their views based on information provided to them. We operationalise entrenched and non-entrenched views by distinguishing between respondents with clear political party preferences and those without.

We find that, on average, the treatment does not affect people's trust in the ECB. However, when differentiating between respondents with entrenched or non-entrenched views, we discover that the treatment had no effect on the former group, but a statistically significant, positive, and economically relevant effect on the latter. These results are in line with our hypothesis.

We report evidence suggesting that it is the information on past inflation rates that prompted these respondents to change their level of trust in the ECB, as those who held correct beliefs about previous year's inflation rate did not change their level of trust in reaction to the information provided. In addition, the effect is only statistically significant for respondents who correctly perceive the ECB's objective to be price stability. Moreover, the effect is particularly large for those who have a low level of subjective knowledge about monetary policy, and therefore arguably weaker priors. The effect is weakly conditional on objective knowledge, suggesting that it is the perception of one's knowledge rather than the knowledge itself that drives the confirmation bias. This finding further supports the relevance of a behavioural mechanism, such as cognitive dissonance, for the impact of factual information on people's trust in the ECB. In a nutshell, information about the ECB's inflation record could affect the level of trust of respondents who knew its inflation target, were wrong about its inflation performance, and whose political preferences were sufficiently weak to be willing or able to

revise their beliefs. These respondents are comfortable revising their level of trust in the ECB because the information they received was not inconsistent with their prior beliefs.

Several policy recommendations can be derived from our analysis. First, providing the same type of information to the whole population may not generate notable movements in people's trust in the ECB. Second, a more promising avenue for the ECB to increase trust is by targeting a specific group in society, namely people with weaker political views.

How realistic is it for the ECB to communicate with this group of people? On the one hand, there are reasons to be sceptical about a central bank's ability to communicate with the public (Blinder, 2018). On the other hand, there is evidence that well-designed messages may reach a wider audience (Haldane and McMahon, 2018; Ehrmann and Wabitsch, 2021; Blinder et al., 2022). Finding the best way to reach a target audience in practice nonetheless remains fodder for research. Finally, as our results were obtained in a low inflation environment, how respondents would react now that inflation has increased also needs to be investigated.

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Appendix

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Appendix 1: Survey questions

A.1.1. Questions on past inflation

Question C1a: Do you remember, roughly, what Germany's rate of inflation was in 2017? Please write the percentage here: …
Respondents could either state a number or declare that they did not know the answer.

Question C1b: Do you remember, roughly, what Germany's rate of inflation was in 2017? Which of the following options describes best how prices have changed? (a) Decreased; (b) Unchanged; (c) Increased by 1% or less; (d) Increased by more than 1% but less than 2%; (e) Increased by more than 2% but less than 3%; (f) Increased by more than 3% but less than 4%; (g) Increased by 4% or more; (h) Don't know.

A.1.2. Question on subjective knowledge about the European Central Bank

Question C6: The monetary policy of all countries in the euro area is managed by the European Central Bank (ECB). How do you rate your own knowledge about the ECB? A value of 1 means that your knowledge is very good. A value of 5 means that your knowledge is very bad. You may grade your knowledge using the values in between.
a) (1) Very good; b) (2); c) (3); d) (4); e) (5) Very bad.

A.1.3. Questions on objective knowledge about the European Central Bank and monetary policy

Question C7: Which of the following do you think is the main objective of the ECB? The main objective of the ECB is to …
a) Promote growth in the euro area.
b) Fight unemployment in the euro area.
c) Maintain price stability in the euro area.
d) Provide credit to European Union member states.
e) Control the euro/US dollar exchange rate.
f) Don't know

Question C8: In the euro area, commercial banks (e.g., Deutsche Bank, Commerzbank, Sparkassen, Volksbanken, etc.) borrow money from the European Central Bank (ECB) at a given interest rate (Main Refinancing Rate). The commercial banks then lend this money at a higher interest rate to households and firms. Do you know, roughly, the interest rate that the ECB charges the commercial banks? Please write the percentage here:
a) % _____.
b) Don't know.

Question C9: Private banks borrow liquidity from the European Central Bank (ECB) at a given interest rate. Assume that prices in the euro area are expected to increase strongly. How do you think the interest rate should be set?

a) Decrease interest rate.
b) Keep interest rate constant.
c) Increase interest rate.
d) Don’t know.

Question C10) Who is responsible for setting this interest rate?

a) The ECB, independently of euro area governments.
b) The ECB; euro area governments have to agree afterward.
c) The ECB together with euro area governments.
d) The euro area governments, with the ECB executing the decisions.
e) Don’t know.

A.1.4. Subjective vs. objective knowledge

Table A.1 Distribution of subjective and objective knowledge in the whole sample

		Subjective monetary policy knowledge				
		Very bad (1)	(2)	(3)	(4)	Very good (5)
Objective monetary policy knowledge						
Knows nothing	(0)	649	407	372	35	2
	(1)	369	381	441	104	3
	(2)	211	277	357	83	6
	(3)	53	138	178	91	21
Knows a lot	(4)	8	107	183	75	4

Table A.2 Distribution of subjective and objective knowledge among respondents who state no party preference

		Subjective monetary policy knowledge				
		Very bad (1)	(2)	(3)	(4)	Very good (5)
Objective monetary policy knowledge						
Knows nothing	(0)	215	126	102	1	
	(1)	93	68	91	30	
	(2)	46	56	70	17	
	(3)	4	11	28	7	6
Knows a lot	(4)		13	16		

Appendix 2: Description of respondents

A.2.1. Descriptive statistics

Table A.3 Descriptive statistics: Whole sample

	Obs	Mean	Std. dev.	Min	Max
Trust in the ECB	2015	2.62	1.00	1	5
Linkspartei	2015	0.0799	0.271	0	1
SPD	2015	0.168	0.374	0	1
Grüne	2015	0.103	0.304	0	1
FDP	2015	0.066	0.247	0	1
CDU/CSU	2015	0.238	0.426	0	1
AfD	2015	0.106	0.308	0	1
No party	2015	0.181	0.385	0	1
Other Party	2015	0.059	0.235	0	1
Female	2015	0.53	0.50	0	1
Age	2015	50.57	18.26	14	94
No certified apprenticeship	2015	0.05	0.22	0	1
Certified apprenticeship	2015	0.30	0.46	0	1
Secondary school	2015	0.41	0.49	0	1
University-entrance diploma	2015	0.13	0.33	0	1
University degree	2015	0.10	0.30	0	1
Single	2015	0.23	0.42	0	1
Has a partner	2015	0.11	0.31	0	1
Married	2015	0.48	0.50	0	1
Number of children	2015	1.14	1.16	0	6
Community size	2015	5.98	2.60	1	10
Lives in former GDR	2015	0.24	0.43	0	1
No internet access	2015	0.15	0.36	0	1
Household per capita income	1507	1326.75	606.43	62.38	4500
Trade union member	2015	0.08	0.26	0	1
Blue collar worker	2015	0.12	0.33	0	1
White collar worker	2015	0.35	0.48	0	1
Civil servant	2015	0.02	0.13	0	1
Self employed	2015	0.06	0.24	0	1
Farmer	2015	0	0.05	0	1
Works full-time	2015	0.44	0.50	0	1
Works part-time	2015	0.13	0.33	0	1
Unemployed	2015	0.03	0.16	0	1
Not working	2015	0.29	0.45	0	1
Housewife	2015	0.04	0.19	0	1
Apprenticeship	2015	0.02	0.15	0	1
Owns a house	2015	0.44	0.50	0	1
Owns a flat	2015	0.07	0.25	0	1
Saver	2015	0.64	0.48	0	1

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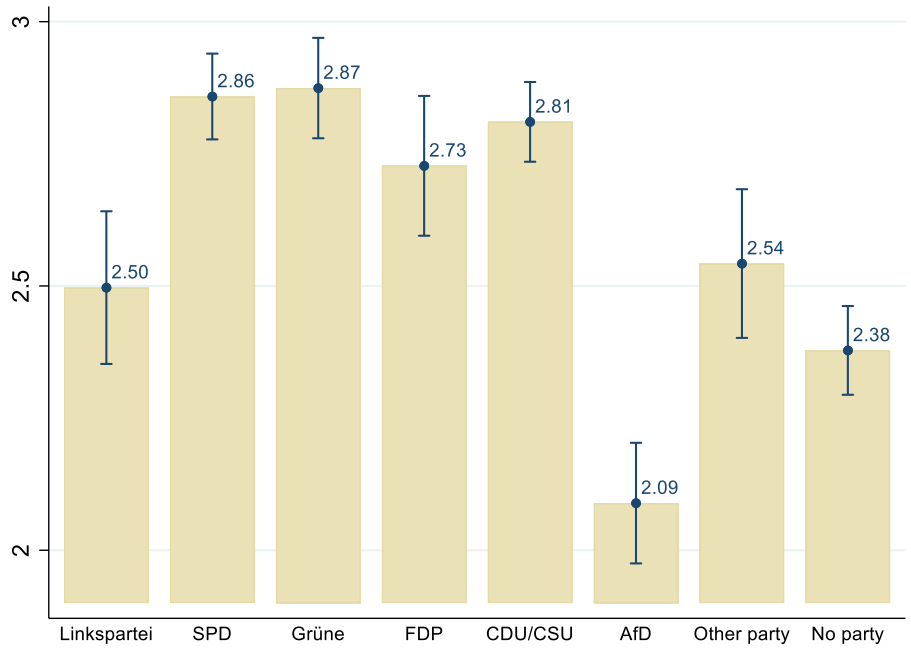
Borrower	2015	0.20	0.40	0	1
Objective monetary policy knowledge	2015	1.33	1.21	0	4
Subjective monetary policy knowledge	2015	2.25	0.99	1	5
Economic satisfaction	2015	3.33	0.92	1	5
Opinion of the	2015	3.12	1.17	1	5
Risk preference	1887	0.12	0.70	-1	1
Rho	1880	102.97	86.54	0	200
Tau	1850	10.77	38.41	-66.67	200

A.2.2. Distribution of trust in the ECB by political party

Figure A.1: Trust in the ECB by political party



Notes: Average level of trust by political party. Confidence intervals are computed at a five percent level of confidence.

A.2.3. Comparison of the treated and control groups

Table A.4: Balance test: Whole sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Control group	Treated group	Mean (control)	Mean (treated)	(3)-(4)	s.e.	t-stat.	p value
Trust in the ECB	1010	1005	2.61	2.64	-0.04	0.04	-0.80	0.43
CDU/CSU	1010	1005	0.26	.21	.05	.02	2.45	.01
SPD	1010	1005	0.17	.17	-.01	.02	-.35	.73
AfD	1010	1005	0.10	.11	-.02	.01	-1.25	.2
FDP	1010	1005	0.06	.07	-.01	.01	-.55	.57
Linkspartei	1010	1005	0.08	.08	-.01	.01	-.45	.66
Grüne	1010	1005	0.10	.11	-.01	.01	-.85	.4
No party	1010	1005	0.18	.18	0	.02	.25	.81
Female	1010	1005	0.54	0.52	0.02	0.02	1.00	0.32
Age	1010	1005	50.99	50.14	0.85	0.81	1.05	0.29
No certified apprenticeship	1010	1005	0.06	0.05	0.01	0.01	1.25	0.21
Certified apprenticeship	1010	1005	0.29	0.31	-0.02	0.02	-1.00	0.32
Secondary school	1010	1005	0.41	0.41	0.00	0.02	0.05	0.97
University-entrance diploma	1010	1005	0.13	0.12	0.01	0.01	0.70	0.49
University degree	1010	1005	0.10	0.1	0.00	0.01	0.35	0.74
Single	1010	1005	0.22	0.24	-0.03	0.02	-1.40	0.17
Has a partner	1010	1005	0.11	0.11	0.00	0.01	-0.30	0.75
Married	1010	1005	0.48	0.47	0.01	0.02	0.60	0.54
Number of children	1010	1005	1.16	1.11	0.05	0.05	0.95	0.34
Community size	1010	1005	6.03	5.93	0.10	0.12	0.90	0.37
Lives in former GDR	1010	1005	0.25	0.23	0.01	0.02	0.65	0.50
No internet access	1010	1005	0.16	0.13	0.03	0.02	1.90	0.06
Household per capita income	771	736	1339.11	1313.81	25.31	31.23	0.80	0.42
Trade union member	1010	1005	0.07	0.08	0.00	0.01	-0.30	0.78
Blue collar worker	1010	1005	0.12	0.13	-0.01	0.01	-0.65	0.52
White collar worker	1010	1005	0.35	0.35	0.00	0.02	0.05	0.95
Civil servant	1010	1005	0.01	0.02	-0.01	0.01	-1.20	0.23
Self employed	1010	1005	0.06	0.07	-0.01	0.01	-0.65	0.50
Farmer	1010	1005	0.00	0.00	0.00	0.00	1.35	0.18
Works full-time	1010	1005	0.42	0.45	-0.03	0.02	-1.15	0.26
Works part-time	1010	1005	0.13	0.13	0.00	0.01	0.15	0.87
Unemployed	1010	1005	0.03	0.03	0.00	0.01	-0.30	0.77
Not working	1010	1005	0.29	0.28	0.01	0.02	0.70	0.47
Housewife	1010	1005	0.03	0.04	-0.01	0.01	-0.70	0.47
Apprenticeship	1010	1005	0.03	0.02	0.01	0.01	1.15	0.25
Owns a house	1010	1005	0.45	0.43	0.02	0.02	0.75	0.45
Owns a flat	1010	1005	0.07	0.07	0.00	0.01	-0.30	0.77
Saver	1010	1005	0.67	0.62	0.05	0.02	2.20	0.03
Borrower	1010	1005	0.19	0.22	-0.03	0.02	-1.70	0.09

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Objective monetary policy knowledge	1010	1005	1.32	1.35	-0.04	0.05	-0.65	0.51
Subjective monetary policy knowledge	1010	1005	2.29	2.22	0.07	0.04	1.70	0.09
Economic satisfaction	1010	1005	3.36	3.30	0.07	0.04	1.60	0.12
Opinion of the municipal budget	1010	1005	3.17	3.08	0.09	0.05	1.65	0.10
Risk preference	947	940	0.13	0.10	0.03	0.03	0.90	0.38
Rho	943	937	104.83	101.1	3.72	3.99	0.95	0.35
Tau	932	918	10.15	11.4	-1.25	1.79	-0.70	0.48

A.2.4. Respondents who do not state a party preference

Table A.5: Descriptive statistics of respondents who state a party preference vs. respondents who do not

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	States a party	Does not state a party	Mean (1)	Mean (2)	(3)-(4)	s.e.	t-stat.	p value
Trust in the ECB	1650	365	2.68	2.38	0.30	0.06	5.35	0
Female	1650	365	0.51	0.61	-0.10	0.03	-3.40	0
Age	1650	365	51.74	45.27	6.46	1.09	5.95	0
No certified apprenticeship	1650	365	0.04	0.10	-0.06	0.02	-3.55	0
Certified apprenticeship	1650	365	0.30	0.29	0.01	0.03	0.25	0.79
Secondary school	1650	365	0.41	0.39	0.02	0.03	0.85	0.40
University-entrance diploma	1650	365	0.14	0.09	0.05	0.02	3.00	0
University degree	1650	365	0.11	0.06	0.05	0.01	3.20	0
Single	1650	365	0.21	0.32	-0.11	0.03	-4.10	0
Has a partner	1650	365	0.11	0.10	.010	0.02	0.50	0.63
Married	1650	365	0.50	0.40	0.10	0.03	3.35	0
Number of children	1650	365	1.17	0.96	0.21	0.06	3.30	0
Community size	1650	365	5.98	5.96	0.02	0.15	0.10	0.91
Lives in former GDR	1650	365	0.24	0.23	0.01	0.02	0.60	0.55
No internet access	1650	365	0.15	0.16	-0.01	0.02	-0.55	0.58
Household p.c. income	1269	238	1357.66	1161.96	195.71	38.83	5.05	0
Trade union member	1650	365	0.08	0.04	0.04	0.01	3.10	0
Blue collar worker	1650	365	0.11	0.18	-0.06	0.02	-2.90	0
White collar worker	1650	365	0.36	0.30	0.06	0.03	2.45	0.02
Civil servant	1650	365	0.02	0.01	0	0.01	0.65	0.52
Self employed	1650	365	0.07	0.05	0.02	0.01	1.20	0.23
Farmer	1650	365	0.00	0	0	0	2.25	0.03
Works full-time	1650	365	0.45	0.39	0.06	0.03	2.05	0.04
Works part-time	1650	365	0.12	0.15	-0.03	0.02	-1.45	0.15
Unemployed	1650	365	0.02	0.04	-0.02	0.01	-1.45	0.15
Not working	1650	365	0.30	0.24	0.06	0.03	2.55	0.01
Housewife	1650	365	0.04	0.04	0	0.01	0.25	0.81
Apprenticeship	1650	365	0.02	0.04	-0.01	0.01	-1.40	0.16
Owns a house	1650	365	0.45	0.39	0.06	0.03	2.20	0.03
Owns a flat	1650	365	0.07	0.05	0.02	0.01	1.40	0.17
Saver	1650	365	0.67	0.52	0.15	0.03	5.40	0
Borrower	1650	365	0.20	0.21	-0.01	0.02	-0.40	0.70
Objective monetary policy knowledge	1650	365	1.42	0.94	0.48	0.06	7.70	0
Subjective monetary policy knowledge	1650	365	2.31	1.99	0.32	0.06	5.70	0
Economic satisfaction	1650	365	3.38	3.08	0.30	0.05	5.65	0
Opinion of the municipal budget	1650	365	3.11	3.18	-0.07	0.07	-1.05	0.29
Risk preference	1550	337	0.12	0.08	0.05	0.04	1.15	0.26
Rho	1550	330	104.31	96.67	7.65	5.29	1.45	0.15
Tau	1526	324	10.67	11.27	-0.60	2.41	-0.25	0.80

Table A.6: Correlates of not stating a party preference

	(1)
Saver	-0.661
	(-4.357)***
Borrower	-0.597
	(-3.251)***
Objective monetary policy knowledge	-0.227
	(-3.940)***
Subjective monetary policy knowledge	-0.178
	(-2.628)***
Female	0.313
	(2.459)**
Age	-0.017
	(-4.477)***
Certified apprenticeship	-1.096
	(-5.270)***
Secondary school	-1.254
	(-6.291)***
University-entrance diploma	-1.878
	(-6.764)***
University degree	-1.488
	(-5.090)***
Number of children	-0.123
	(-2.150)**
Observations	2,015

Notes: Logit estimate. The dependent variable is a dummy variable set to one if the respondent does not state a party. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7: Balance test: Respondents who do not state a party preference

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Control group	Treated group	Mean (control)	Mean (treated)	(3)-(4)	s.e.	t-stat.	p value
Trust in the ECB	185	180	2.25	2.51	-0.26	0.10	-2.60	0.01
Female	185	180	0.62	0.61	0.01	0.05	0.20	0.83
Age	185	180	44.44	46.13	-1.68	1.99	-0.85	0.40
No certified apprenticeship	185	180	0.11	0.09	0.01	0.03	0.45	0.67
Certified apprenticeship	185	180	0.25	0.33	-0.07	0.05	-1.55	0.12
Secondary school	185	180	0.44	0.34	0.10	0.05	1.95	0.05
University-entrance diploma	185	180	0.10	0.07	0.03	0.03	0.85	0.39
University degree	185	180	0.04	0.08	-0.03	0.03	-1.40	0.17
Single	185	180	0.35	0.28	0.07	0.05	1.40	0.16
Has a partner	185	180	0.08	0.13	-0.05	0.03	-1.45	0.15
Married	185	180	0.39	0.41	-0.01	0.05	-0.20	0.83
Number of children	185	180	0.95	0.98	-0.03	0.12	-0.30	0.78
Community size	185	180	6.04	5.89	0.15	0.27	0.55	0.59
Lives in former GDR	185	180	0.23	0.22	0.01	0.04	0.25	0.82
No internet access	185	180	0.15	0.17	-0.03	0.04	-0.70	0.49
Household per capita income	122	116	1133.35	1192.04	-58.7	69.46	-0.85	0.40
Trade union member	185	180	0.04	0.04	0.00	0.02	-0.05	0.96
Blue collar worker	185	180	0.16	0.19	-0.03	0.04	-0.65	0.50
White collar worker	185	180	0.31	0.28	0.04	0.05	0.75	0.46
Civil servant	185	180	0.01	0.02	-0.02	0.01	-1.35	0.17
Self employed	185	180	0.04	0.06	-0.01	0.02	-0.55	0.59
Farmer	185	180	0.00	0.00	0.00	0.00	.	.
Works full-time	185	180	0.37	0.41	-0.04	0.05	-0.85	0.40
Works part-time	185	180	0.16	0.14	0.01	0.04	0.35	0.74
Unemployed	185	180	0.04	0.03	0.01	0.02	0.50	0.62
Not working	185	180	0.23	0.24	-0.02	0.04	-0.4	0.70
Housewife	185	180	0.04	0.03	0.00	0.02	0.25	0.82
Apprenticeship	185	180	0.05	0.02	0.03	0.02	1.35	0.17
Owns a house	185	180	0.39	0.39	0.01	0.05	0.10	0.91
Owns a flat	185	180	0.03	0.07	-0.04	0.02	-1.70	0.09
Saver	185	180	0.54	0.49	0.05	0.05	1.00	0.33
Borrower	185	180	0.18	0.24	-0.07	0.04	-1.55	0.12
Objective monetary policy knowledge	185	180	0.92	0.96	-0.04	0.11	-0.35	0.73
Subjective monetary policy knowledge	185	180	2.09	1.89	0.20	0.10	2.00	0.04
Economic satisfaction	185	180	3.10	3.07	0.03	0.10	0.25	0.79
Opinion of the municipal budget	185	180	3.21	3.15	0.06	0.12	0.50	0.60
Risk preference	172	165	0.07	0.08	-0.01	0.08	-0.10	0.92
Rho	168	162	92.65	100.83	-8.18	9.63	-0.85	0.40
Tau	165	159	12.18	10.33	1.86	4.40	0.40	0.67

Table A.8: Balance test: Respondents who state a party preference

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Control group	Treated group	Mean (control)	Mean (treated)	(3)-(4)	s.e.	t-stat.	p value
Trust in the ECB	825	825	2.69	2.67	0.02	0.05	0.35	0.73
Female	825	825	0.53	0.50	0.02	0.02	1.00	0.33
Age	825	825	52.46	51.01	1.45	0.88	1.65	0.10
No certified apprenticeship	825	825	0.05	0.04	0.01	0.01	1.20	0.22
Certified apprenticeship	825	825	0.29	0.30	-0.01	0.02	-0.40	0.71
Secondary school	825	825	0.40	0.42	-0.02	0.02	-0.85	0.40
University-entrance diploma	825	825	0.14	0.13	0.01	0.02	0.45	0.67
University degree	825	825	0.11	0.10	0.01	0.01	0.85	0.38
Single	825	825	0.19	0.23	-0.05	0.02	-2.35	0.02
Has a partner	825	825	0.12	0.11	0.01	0.02	0.30	0.76
Married	825	825	0.51	0.49	0.02	0.02	0.80	0.43
Number of children	825	825	1.21	1.14	0.07	0.06	1.20	0.24
Community size	825	825	6.03	5.93	0.09	0.13	0.75	0.46
Lives in former GDR	825	825	0.25	0.24	0.01	0.02	0.65	0.53
No internet access	825	825	0.17	0.13	0.04	0.02	2.45	0.01
Household per capita income	649	620	1377.79	1336.59	41.2	34.46	1.20	0.23
Trade union member	825	825	0.08	0.09	0	0.01	-0.25	0.79
Blue collar worker	825	825	0.11	0.12	-0.01	0.02	-0.40	0.70
White collar worker	825	825	0.36	0.36	-0.01	0.02	-0.25	0.80
Civil servant	825	825	0.02	0.02	-0.01	0.01	-0.75	0.46
Self employed	825	825	0.06	0.07	-0.01	0.01	-0.50	0.62
Farmer	825	825	0.01	0	0	0	1.35	0.18
Works full-time	825	825	0.44	0.46	-0.02	0.02	-0.85	0.40
Works part-time	825	825	0.12	0.12	0	0.02	0	1.00
Unemployed	825	825	0.02	0.03	-0.01	0.01	-0.65	0.51
Not working	825	825	0.31	0.29	0.02	0.02	0.95	0.33
Housewife	825	825	0.03	0.04	-0.01	0.01	-0.90	0.37
Apprenticeship	825	825	0.02	0.02	0	0.01	0.50	0.61
Owns a house	825	825	0.46	0.45	0.02	0.02	0.80	0.43
Owns a flat	825	825	0.07	0.07	0.01	0.01	0.40	0.70
Saver	825	825	0.69	0.65	0.05	0.02	2.00	0.05
Borrower	825	825	0.19	0.21	-0.02	0.02	-1.15	0.24
Objective monetary policy knowledge	825	825	1.40	1.44	-0.03	0.06	-0.55	0.59
Subjective monetary policy knowledge	825	825	2.33	2.29	0.05	0.05	0.95	0.33
Economic satisfaction	825	825	3.42	3.34	0.07	0.05	1.65	0.10
Opinion of the municipal budget	825	825	3.16	3.07	0.09	0.06	1.55	0.12
Risk preference	775	775	0.14	0.11	0.04	0.04	1.05	0.30
Rho	775	775	107.47	101.16	6.31	4.38	1.45	0.15
Tau	767	759	9.72	11.63	-1.91	1.95	-1.00	0.33

Appendix 3: Robustness checks and validation tests

Table A.9: Effect of the treatment on trust in the ECB controlling for respondents' characteristics: Whole sample

Graph shown	0.099 (1.090)	Vote for Linkspartei/PDS	0.172 (0.797)	Self employed	0.181 (0.382)
Net household income per capita in euro	-0.000 (-0.599)	Vote for Die Grünen	0.542 (3.390)***	Farmer	-2.447 (-1.941)*
2nd lowest HH income quartile	0.146 (1.033)	Municipality budget spent on actual needs vs used for re-election	-0.235 (-5.504)***	Full time occupation	-0.186 (-0.366)
2nd highest HH income quartile	0.075 (0.513)	Sex: Female	0.156 (1.509)	Part time occupation	-0.353 (-0.714)
Highest HH income quartile	0.147 (0.662)	Age respondent	-0.010 (-2.038)**	Currently unemployed	0.133 (0.290)
Saver	0.249 (1.905)*	Single	-0.004 (-0.023)	Non-working (e.g. pensioners)	-0.089 (-0.301)
Borrower	0.372 (2.265)**	Living with partner	0.021 (0.105)	Housewife/househusband	0.184 (0.559)
How satisfied are you with your overall economic situation?	0.357 (5.826)***	Married	-0.252 (-1.728)*	In apprenticeship/compulsory military service	0.071 (0.208)
Owner-occupied house	-0.007 (-0.063)	Apprenticeship	0.029 (0.148)	Community size: no of inhabitants	0.069 (3.610)***
Owner-occupied flat	-0.011 (-0.055)	Secondary school	0.010 (0.051)	East Germany	-0.450 (-3.592)***
Objective monetary policy knowledge	-0.078 (-1.906)*	Abitur	0.069 (0.302)	Internet access: no internet access	0.258 (1.528)
Subjective monetary policy knowledge	0.627 (10.763)***	University	0.107 (0.423)	Number of children	0.044 (0.849)
Vote for CDU/CSU	0.559 (4.049)***	Are you a trade union member?	0.107 (0.675)	DK coded as 0; -1=risk averse and 1=risk loving	0.052 (0.683)
Vote for SPD	0.781 (5.408)***	Blue-collar worker	0.470 (1.034)	Time preference	0.000 (0.289)
Vote for AfD	-0.596 (-3.410)***	White-collar worker	0.152 (0.344)	Hyperbolic discounting	0.001 (0.567)
Vote for FDP	0.286 (1.451)	Public servant	-0.048 (-0.089)	*Observations*	*1,821*

Notes: Ordered logit estimate. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.10: Effect of the treatment on trust in the ECB of respondents who state no party preference controlling for variables that differ between the treated and the control groups

	(1)	(2)	(3)	(4)
Graph shown	0.478	0.509	0.603	0.629
	(2.468)**	(2.597)***	(3.031)***	(3.123)***
Secondary school	-0.072			-0.063
	(-0.363)			(-0.310)
Owns a flat		-0.531		-0.625
		(-1.210)		(-1.287)
Subjective monetary policy knowledge			0.432	0.437
			(3.692)***	(3.776)***
Observations	365	365	365	365

Notes: Ordered logit estimates. The dependent variable is trust in the ECB. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.11: Effect of the treatment on trust in the ECB: All respondents and respondents who state a party preference controlling for variables that differ between the treated and the control groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All respondents					Respondents who state a party preference			
Graph shown	0.107	0.081	0.101	0.084	0.110	-0.017	-0.011	0.019	-0.010
	(1.289)	(0.982)	(1.221)	(1.016)	(1.315)	(-0.188)	(-0.118)	(0.209)	(-0.104)
Vote for CDU/CSU	0.439				0.423				
	(4.420)***				(4.224)***				
No internet access		-0.255			-0.314		-0.361		-0.360
		(-2.228)**			(-2.696)***		(-2.768)***		(-2.717)***
Saver			0.310		0.279			0.371	0.444
			(3.636)***		(3.218)***			(3.836)***	(4.549)***
Objective monetary policy knowledge				0.074	0.047				
				(2.065)**	(1.304)				
Single						0.373			0.397
						(3.375)***			(3.579)***
Observations	2,015	2,015	2,015	2,015	2,015	1,650	1,650	1,650	1,650

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.12: Effect of the treatment on trust in the ECB of respondents who state no party preference: Matching estimates

	(1)	(2)	(3)
	Propensity score matching		Inverse probability weighting
	Nearest neighbour	Five nearest neighbours	
Graph shown	0.309 (3.070)***	0.299 (2.971)***	0.320 (3.220)***
Observations	365	365	365

Notes: Average treatment effects. Observations are matched using secondary schooling, subjective monetary policy knowledge, and time preference. Propensity scores and probabilities are computed using the logit function. z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A. 13: Effect of the treatment on trust in the ECB: All respondents ad respondents who state a party preference: Matching estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	All respondents			Respondents who state a party preference		
	Propensity score matching		Inverse prob. matching	Propensity score matching		Inverse prob. matching
	Nearest neighbour	Five nearest neighbours		Nearest neighbour	Five nearest neighbours	
Graph shown	0.042	0.044	0.045	-0.027	-0.030	-0.025
	(0.937)	(0.992)	(1.031)	(-0.548)	(-0.615)	(-0.512)
Observations	2,015	2,015	2,015	1,650	1,650	1,650

Notes: Average treatment effects. Observations in the whole sample are matched on choosing CDU/CSU, not having internet access, being a saver, and having objective monetary policy knowledge. Observations in the sample of respondents who state a party are matched on being single, not having internet access, and being a saver. Propensity scores and probabilities are computed using the logit function. z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.14: Effect of the treatment on trust in the ECB conditional on respondents' party preference

	(1) Raw coefficients	(2) Marginal effect
Graph shown	0.262	
	(2.596)***	
Linkspartei × Graph shown	-0.070	0.193
	(-0.347)	[1.11]
SPD × Graph shown	-0.258	.0042
	(-1.827)*	[0.04]
Grünen × Graph shown	-0.404	-.142
	(-2.650)***	[-1.24]
FDP × Graph shown	-0.147	.116
	(-0.773)	[0.72]
CDU/CSU × Graph shown	-0.280	-.0173
	(-2.044)**	[-0.19]
AfD × Graph shown	-0.400	-.137
	(-2.328)**	[-0.99]
Other Party × Graph shown	-0.096	.167
	(-0.489)	[1.00]
Linkspartei	0.149	
	(1.107)	
SPD	0.608	
	(5.879)***	
die Grünen	0.700	
	(6.621)***	
FDP	0.418	
	(2.974)***	
CDU/CSU	0.570	
	(6.051)***	
AfD	-0.085	
	(-0.682)	
Other Party	0.207	
	(1.628)	
No vote	Reference category	
Observations	2,015	

Notes: OLS estimates. Column 1 reports the raw regression coefficients. Column 2 reports the marginal effect of showing the graph to respondents who report voting for the party appearing in the relevant interaction term. Robust t-statistics in parentheses. z-statistics in square brackets. *** p<0.01, ** p<0.05, * p<0.1.

Appendix 4: Additional results

A.4.1. The role of education

Table A.15: Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on education

	(1) Low education	(2)	(3)	(4)	(5) High education
Graph shown	0.524	0.356	0.425	0.655	0.264
	(0.785)	(0.976)	(1.376)	(0.922)	(0.330)
Observations	37	106	142	31	22

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.16 Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All respondents					Respondents who state a party preference				
	Low education	2	3	4	High education	Low education	2	3	4	High education
Graph shown	0.717 (1.752)*	0.063 (0.413)	0.136 (1.055)	-0.225 (-0.953)	-0.052 (-0.201)	0.893 (1.697)*	0.022 (0.129)	0.052 (0.366)	-0.385 (-1.513)	-0.063 (-0.228)
Observations	107	597	823	255	199	70	491	681	224	177

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

A.4.2. The role of household income per capita

Table A.17: Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on household income per capita

	(1) 1st quartile	(2) 2nd quartile	(3) 3rd quartile	(4) 4th quartile
Graph shown	0.630 (1.436)	0.616 (1.308)	0.270 (0.574)	-0.210 (-0.348)
Observations	76	61	63	38

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A.18: Effect of the treatment on trust in the ECB of all respondents and on respondents who state a party preference conditional on household income per capita

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All respondents				Respondents who state a party preference			
	1st quartile	2nd quartile	3rd quartile	4th quartile	1st quartile	2nd quartile	3rd quartile	4th quartile
Graph shown	0.154	0.163	0.058	-0.105	-0.064	0.090	0.048	-0.098
	(0.743)	(0.848)	(0.324)	(-0.542)	(-0.268)	(0.423)	(0.248)	(-0.476)
Observations	328	363	443	373	252	302	380	335

Notes: Ordered logit estimates. z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

A.4.3. The role of knowledge about previous year's inflation rate and the objective of the ECB

Table A.19: Effect of the treatment on trust in the ECB of all respondents and on respondents who state a party preference conditional on knowing previous year's inflation rate and the objective of the ECB

	(1)	(2)	(3)	(4)	(5)	(6)
	Reported past inflation rate					
	All respondents			Respondents who state a party preference		
	Correct	Wrong	Doesn't know	Correct	Wrong	Doesn't know
Graph shown	0.095	0.115	0.079	0.119	-0.064	-0.020
	(0.599)	(0.833)	(0.578)	(0.706)	(-0.435)	(-0.124)
Observations	546	704	765	488	617	545
	Objective of the ECB					
	All respondents			Respondents who state a party preference		
	Correct	Wrong	Doesn't know	Correct	Wrong	Doesn't know
Graph shown	0.072	0.083	-0.019	-0.049	0.030	-0.042
	(0.607)	(0.541)	(-0.105)	(-0.381)	(0.180)	(-0.192)
	983	599	433	850	507	293

Notes: Ordered logit estimates. Robust z-statistics in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table A.20: Effect of the treatment on trust in the ECB of all respondents and on respondents who state a party preference conditional on knowing previous year's inflation rate

		(1)	(2)	(3)	(4)	(5)	(6)
		All respondents			Respondents who state a party preference		
		Correct	Wrong	Doesn't know	Correct	Wrong	Doesn't know
ECB objective	Correct	0.102	0.160	-0.022	0.046	-0.017	-0.174
		(0.502)	(0.842)	(-0.098)	(0.217)	(-0.085)	(-0.666)
		327	377	279	298	334	218
	Wrong	0.222	0.113	0.429	0.346	-0.023	-0.292
		(0.759)	(0.477)	(0.713)	(1.117)	(-0.093)	(-0.839)
		170	242	47	153	214	140
	Doesn't know	-0.484	-0.293	0.131	-0.455	-0.540	0.209
		(-0.855)	(-0.724)	(0.607)	(-0.686)	(-1.174)	(0.760)
		49	85	299	37	69	187

Notes: Ordered logit estimates. Robust z-statistics in parentheses. Number of observations in italics.
*** p<0.01, ** p<0.05, * p<0.1

Table A.21: Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on knowing both previous year's inflation rate and the objective of the ECB

		(1)	(2)	(3)
		Reported past inflation rate		
		Correct	Wrong	Doesn't know
ECB objective	Correct	0.058	1.687	0.570
		(0.080)	(2.819)***	(1.087)
		29	*43*	*61*
	Wrong	-0.874	0.900	0.429
		(-0.893)	(1.119)	(0.713)
		17	*28*	*47*
	Doesn't know	-0.626	0.464	0.004
		(-0.469)	(0.454)	(0.013)
		12	*16*	*112*

Notes: Ordered logit estimates. Robust z-statistics in parentheses. Number of observations in italics.
*** p<0.01, ** p<0.05, * p<0.1

A.4.5. The role of objective and subjective knowledge about the ECB

Table A.22 Effect of the treatment on trust in the ECB of all respondents and on respondents who state a party preference conditional on subjective knowledge about monetary policy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All respondents					Respondents who state a party preference				
	Very bad	2	3	4	Very good	Very bad	2	3	4	Very good
Graph shown	0.251	0.155	0.042	0.067	-0.527	0.098	0.043	-0.020	-0.010	-0.682
	(1.613)	(0.999)	(0.278)	(0.241)	(-0.620)	(0.540)	(0.252)	(-0.124)	(-0.032)	(-0.789)
Observations	565	585	676	168	21	417	491	574	148	20

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.23 Effect of the treatment on trust in the ECB of all respondents and on respondents who state a party preference conditional on objective knowledge about monetary policy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All respondents					Respondents who state a party preference				
	Very bad	1	2	3	Very good	Very bad	1	2	3	Very good
Graph shown	0.025	0.080	0.153	-0.269	0.476	-0.082	-0.029	0.096	-0.305	0.379
	(0.164)	(0.515)	(0.875)	(-1.039)	(1.577)	(-0.459)	(-0.171)	(0.505)	(-1.106)	(1.215)
Observations	615	608	444	201	147	456	501	375	180	138

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A.4.6. The role of gender

Men have been found to be more interested in monetary policy than women (Hayo and Neuenkirch, 2018). One may accordingly expect male respondents to pay more attention to the graph and react more to it than female respondents. However, there is some evidence that confirmation bias may be stronger for men than women (Traut-Mattausch et al., 2011), which should prompt male respondents to react less than female ones. To determine which effect dominates, we estimated the effect of the treatment separately for male and female respondents who state no political party preference.

Table A.24 reports the results of those two regressions. It shows that seeing the graph has a significantly positive effect for men and an insignificant one for women. This finding suggests that the greater interest of men in monetary policy overtakes their possibly stronger confirmation bias.

Table A.24: Effect of the treatment on trust in the ECB of respondents who state no party preference conditional on gender

	(1)	(2)
Gender	Women	Men
Graph shown	0.201	0.934
	(0.809)	(2.920)***
Observations	223	142

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1

When we condition the treatment effect on gender in the whole sample, we find an effect significant at the 10% level. However, the effect vanishes in the sample consisting only of respondents who state a party preference, as in the baseline estimations, which shows that the effect in the whole was driven by the subsample of respondents who state no party preference. The outcomes of these estimations are reported in Table A.25.

Table A.25: Effect of the treatment on trust in the ECB of all respondents and on respondents who state a party preference conditional on gender

	(1)	(2)	(3)	(4)
	All respondents		Respondents who state a party	
	Women	Men	Women	Men
Graph shown	-0.051	0.233	-0.110	0.110
	(-0.446)	(1.939)*	(-0.853)	(0.845)
Observations	1,071	944	848	802

Notes: Ordered logit estimates. Robust z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

References cited in the appendix

Traut-Mattausch, E., Jonas, E., Frey, D., and Zanna, M.P., 2011. Are there 'his' and 'her' types of decisions? Exploring gender differences in the confirmation bias. *Sex Roles*, 65(3), 223–233.