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Trust in the ECB: Drivers and consequences

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ABSTRACT

We use a survey among Dutch households to analyze trust in the European Central Bank (ECB). Our results confirm a positive association between respondents' right-wing ideology, knowledge of the ECB, and trust in other European institutions on the one hand and trust in the ECB on the other. A novel result is that we also find that individuals who were clients of a bank that received government support during the global financial crisis trust the ECB more. Furthermore, our results suggest that inflation expectations of respondents who trust the ECB are more in line with the ECB's inflation target.

> Public trust in the ECB has a direct impact on our monetary policy. Trust in the central bank stabilizes inflation expectations of private agents and increases the effectiveness of monetary policy measures.
>
> [Schnabel (2020) - Member of the Executive Board of the ECB.]

1. Introduction

European citizens' trust in the European Central Bank (ECB) has increased somewhat over the last couple of years but is still much lower than before the global financial crisis (Roth and Jonung, 2019). Low levels of trust may have important repercussions for the central bank. Using a theoretical model in which betrayal-averse agents condition their trust on past policy outcomes, Bursian and Faia (2018) find that low trust in the central bank amplifies macroeconomic fluctuations and steepens the sacrifice ratio. A low level of public trust is also problematic in view of recent empirical evidence suggesting that individuals who trust the ECB have inflation forecasts which are (i) more accurate (Rumler and Valderrama, 2020) and (ii) more in line with the inflation target of the ECB (Christelis et al., 2020).

It is therefore important to understand the drivers of trust in the ECB. Research suggests that the euro area's weak macroeconomic performance during the crisis is an important reason for the loss of confidence in the ECB. Ehrmann et al. (2013) and Roth and Jonung (2019) find that higher national unemployment rates reduced public trust in the ECB, while Wälti (2012) reports that trust in the ECB dropped significantly in countries experiencing higher sovereign bond yields and financial market turbulence.

Research also suggests that, apart from macroeconomic factors, the characteristics of individual survey respondents are also related to trust in the ECB. For instance, Hudson (2006) finds that several demographic variables (like gender, age, and education) are related to respondents' trust in the ECB, while Farvaque et al. (2017) and Bursian and Fürth (2015) report that respondents' political orientation, education level, and employment status are key in explaining trust in the ECB.

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There is also evidence suggesting that respondents' (actual and self-assessed) knowledge of the ECB is related to their trust in the ECB. For instance, Hayo and Neuenkirch (2014) find that individuals who (claim to) know more about the ECB have more trust in the ECB. Likewise, Mellina and Schmidt (2018) report that knowledge about the ECB's mandate is an important driver of trust. There is also evidence suggesting that trust in the ECB is strongly related to trust in other European institutions (Farvaque et al., 2017; Ehrmann et al., 2013).

Our first contribution to the literature is that we test several hypotheses about the drivers of trust in the ECB as suggested by previous studies. Trying to replicate previous studies' findings will help us to understand why trust in the ECB is still so low and which people are more likely to trust the ECB. Using a survey among Dutch households, we test how respondents' ideology, trust in other EU institutions, and knowledge of the ECB are related to their trust in the ECB.[1] We thus examine whether findings reported in previous studies are robust.[2]

Our second contribution is that we analyze whether individuals' experiences with their banks during the financial crisis are related to their trust in the ECB more than ten years later.[3] To do so, we exploit the fact that the survey we use follows many individuals over time. Therefore, we can test whether being client at a bank that went bankrupt or was bailed out by government during the global financial crisis is related to individuals' current trust in the ECB.

Not only academics are interested in the level of trust in the ECB but also policymakers, as illustrated by the quote from ECB Executive Board member Isabel Schnabel above. Trust is not only important for the democratic legitimacy of the ECB, but it might also be important to achieve price stability. As pointed out above, some recent studies suggest that individuals who trust the ECB have inflation expectations that are more aligned with the ECB inflation target than low-trust individuals. The final contribution of this paper is that we test the robustness of the finding of previous studies that individuals who trust the ECB have inflation expectations that are closer to the ECB's inflation target.

Our analysis is based on data collected using the Dutch Household Survey (DHS).[4] This dataset has several advantages over the use of Eurobarometer data, which has frequently been used for research on trust in the ECB (Ehrmann et al., 2013; Farvaque et al., 2017; Bursian and Fürth, 2015). First, the DHS provides detailed information on respondents' characteristics, such as their education level, gender, and employment situation for which we can control. Secondly, we can control for respondents' knowledge of the ECB's objectives and their financial sophistication. This is important as several studies suggest that financial literacy matters: more knowledgeable individuals have inflation expectations that are more accurate and more in line with the central bank's inflation target (Van der Cruijsen et al., 2015; Baerg et al., 2020). And finally, the DHS tracks many individuals over time. This means that we can test whether respondents' experiences with their banks during the global financial crisis are related to their trust in the ECB today.

Our results confirm some of the results found by previous studies: individuals who have a right-wing ideology, who (indicate to) know more of the ECB, or who trust other European institutions trust the ECB more. However, some results of previous studies could not be replicated: we do not find a significant impact of individuals' age, education level, income or employment status on trust in the ECB. Furthermore, we find that individuals who were clients of a bank that received government support during the crisis trust the ECB more. Finally, our results show that individuals with a high level of trust in the ECB have inflation expectations that are more in line with the ECB's inflation target than inflation expectations of low-trust individuals. This result thus confirms the finding of Christelis et al. (2020).

The rest of the paper is structured as follows. The next section discusses previous studies and presents the hypotheses tested. The third section describes the data used in this study. The fourth section shows the main results, while the fifth section discusses the limitations of our research and offers robustness checks. The final section concludes.

2. Hypotheses

We test four hypotheses about trust in the ECB. The first three hypotheses have been suggested by previous studies, while the fourth hypothesis has, to the best of our knowledge, never been tested before. Finally, we examine whether respondents' trust in the ECB is related to their inflation expectations.

Hypothesis 1 (*H*1)**.** Individuals with a right-wing ideology trust the ECB more than individuals with a different or no ideology.

There is some evidence that individuals' political ideology is related to their trust in the ECB. For instance, Ehrmann et al. (2013) report that respondents who have a centre-right political orientation are more likely to trust the ECB.[5] This is consistent with the

[1] Our survey was held during the COVID-19 pandemic. However, we find no indications that the pandemic had a substantial impact on respondents' answers. Several questions in our survey have been raised in previous rounds of the survey and the answers given to those questions in previous rounds are very similar to the answers in our survey.

[2] Our dataset does not allow to consider time series for macroeconomic variables, like inflation and unemployment, which some studies found to be relevant in explaining trust in the ECB. However, we include variables reflecting respondents' knowledge of inflation and their employment-status.

[3] There is evidence suggesting that financial crises may reduce trust in financial institutions and that this effect may last for a long time. For instance, Osili and Paulson (2014) find that immigrants who experienced a systemic banking crisis prior to living in the U.S. are less likely to have checking accounts than immigrants from the same country without such an experience.

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

[5] There are, however, also some papers which do not find evidence for this difference between the level of trust among left-leaning and right-leaning respondents; see, for instance, Kaltenthaler et al. (2010).

partisan theory, according to which right-wing parties care more about inflation than unemployment, as their constituencies are more hurt by higher inflation than by higher unemployment (Hibbs, 1977). This reasoning implies that individuals with a centre-right political orientation might trust the ECB more than others as the primary objective of the ECB is price stability.[6]

Hypothesis 2 (*H2*)**.** Trust in other EU institutions is positively related to trust in the ECB.

We test whether trust in the ECB is positively related to trust in other European institutions. The motivation for this hypothesis comes from the study of Ehrmann et al. (2013). Based on their analysis of Eurobarometer survey data, these authors conclude that "the fall in public trust in the ECB during the crisis can be explained well by a combination of three effects: (i) the sharp deterioration in the economic situation during the crisis; (ii) the overall fall in public trust in the European project during the crisis, possibly because citizens saw Europe as being unable to prevent or solve the global crisis; (iii) the fact that the ECB was associated, in the public opinion, to the troubles of the financial sector. All three factors are needed jointly for a satisfactory explanation." (p. 84). Farvaque et al. (2017) also report a strong association between trust in the ECB and trust in the European Commission.

Hypothesis 3 (*H3*)**.** Individuals with better (alleged) knowledge of the ECB have more trust in the ECB.

As explained by Ehrmann et al. (2013), knowledge of the ECB is an important variable that might affect the degree of trust in the ECB. Obviously, it is difficult to trust an institution whose main characteristics are not well known. Ehrmann et al. (2013) report that trust in the ECB is much higher among respondents who have previously heard about it; individuals who know the ECB are 30 percent more likely to trust it. Moreover, the loss of trust during the financial crisis is significantly lower among respondents who report to have heard of the ECB. Likewise, using data from the Bank of England's Inflation Attitude Survey, Jost (2017) shows that satisfaction with the Bank of England increases with a better understanding of monetary policy. Therefore, we hypothesize that respondents with better knowledge of the ECB trust the ECB more than respondents with limited knowledge of the ECB. An important open issue in the literature is whether self-assessed financial literacy or more objective measures of knowledge should be used. Hayo and Neuenkirch (2014) use both subjective and objective measures for individuals' knowledge of the ECB and find that both are related to trust in the ECB. Recently, Van der Cruijsen and Samarina (2021) also found that both subjective and objective measures for financial knowledge are positively related to trust in the ECB. We use a similar strategy and use measures based on respondents' self-assessed and actual knowledge of the ECB.

Hypothesis 4 (*H4*)**.** Respondents who were personally affected during the global financial crisis, because they were client of a bank which went bankrupt, was nationalized or was bailed out by the government, are less inclined to trust the ECB.

We expect that individuals who were personally affected during the global financial crisis, because they were a client of a bank which went bankrupt, was nationalized, or was bailed out by the government, are less inclined to trust the ECB. Ehrmann et al. (2013), provide various reasons why trust in the ECB declined during the crisis. Two of these might explain why respondents' experiences with their banks during the crisis might affect their trust in the ECB: (1) Individuals whose bank got into trouble have less trust in commercial banks in general and assume (incorrectly) that the ECB is also a commercial bank. Van der Cruijsen et al. (2021) show that individuals who were client of a bank that got into serious difficulties during the financial crisis have significantly less trust in the banking sector at large compared to respondents without such experience. (2) Individuals hold the ECB (partly) accountable for the financial distress at their bank because they (wrongly, at least during the crisis) assume that the ECB has direct supervisory and regulatory responsibilities for the banking sector. Different experiences with their banks (bankruptcy, nationalization or bail-out) might affect individuals differently. For example, individuals whose bank went bankrupt might trust the ECB less than individuals whose bank was bailed out. Clients of a bank that was nationalized during the crisis may in fact have hardly realized this, in contrast to clients of a bank that went bust.

To examine whether different experiences (like nationalization or bankruptcy of the bank) make a difference, we construct several variables (see Section 4.2 for details).

Hypothesis 5 (*H5*)**.** Individuals who trust the ECB more have inflation expectations which are closer to the inflation target of the ECB.

There is evidence that trust in the ECB is related to inflation expectations. Based on a survey among Austrian households, Rumler and Valderrama (2020) conclude that respondents who report high levels of trust in the ECB have significantly lower short-run and long-run inflation expectations. Christelis et al. (2020) present similar results. Using a survey among Dutch households, these authors report that individuals with a high level of trust in the ECB have inflation expectations that are close to the ECB's inflation target. We examine whether our data confirm this result.

[6] Our survey suggests, as is explained in more detail in Section 3.1, that a majority of participants is aware that the primary goal of the ECB is price stability and not low unemployment.

Table 1
Demographic characteristics.

	Survey mean	Population mean
Male	50%	49%
Age	55.5	48.4
Partner *(1 = living together with partner)*	69%	62%
Unemployed	1.8%	3.6%
Retired	33%	18.3%
Monthly gross income *(in €1000)*	3.18	3.06
Education *(1 = higher educated)*	38%	30%

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

3. Data

We collected data using an (internet) questionnaire, which was distributed among DHS participants.[7] A total of 3449 members received the questionnaire on May 18, 2020 and were given fourteen days to respond. Compared with surveys conducted by telephone or mail, the response rate to continuous internet-based surveys is usually very high. In our case, the response rate was eighty percent, which corresponds to 2749 individuals.

Table 1 provides information on the demographic characteristics of the respondents. The average respondent is in his mid-fifties, lives with a partner, and is not higher-educated. For this study's external validity, respondents' demographic characteristics should be representative of the Dutch population at large. Table 1 also shows the averages for the Dutch population (provided by Statistics Netherlands (CBS)). The table suggests that our sample differs significantly from the Dutch population on several dimensions. The average age of the participants in the survey is seven years higher, unemployment is substantially lower, gross household income is higher, the education-level of respondents is eight points higher and a larger share of the sample is retired compared to the population at large. We checked, similar to Van der Cruijsen et al. (2015) who also found differences between the DHS and the Dutch population at large, whether re-weighting observations based on average age, income, education level, and unemployment of the Dutch population changes our main conclusions. This turned out not to be the case (see online Appendix A for more details).

3.1. Knowledge of the ECB

Three questions in our survey intend to assess the (self-reported) knowledge of the ECB. First, we measure respondents' knowledge of the mandate of the ECB using the same approach as Van der Cruijsen et al. (2015). We presented eleven statements about the ECB's mandate of which some are incorrect. For each statement, participants were asked to indicate whether the statement is correct, incorrect or that they do not know. Next, we presented six statements about the ECB's instruments and asked respondents to indicate for each instrument whether the ECB can use it. In our empirical analysis, we use the percentage of correct answers given by an individual to our statements about the mandate of the ECB and the ECB instruments. Before we asked the questions about the mandate and the instruments of the ECB, we had asked participants to rate their knowledge of the ECB on a five-point scale ranging from very low to very high. Besides these answer options, participants could also answer "I don't know".

The answers to the questions about the mandate are shown in Fig. 1. The statement that the main objective of the ECB is price stability received by far the highest percentage of correct answers (65%). Details about the inflation target are less well known. Notably, few respondents know that the ECB does not define its objective in terms of inflation in each euro area country. The (false) statement that the ECB's objective applies to all euro area countries separately (statement ten) received the lowest score of correct answers. As said, the statements to test individuals' knowledge of the mandate of the ECB are identical to those used by Van der Cruijsen et al. (2015). It is quite remarkable that the percentages of individuals who correctly identify whether a statement is (in)correct are very similar in both studies for all statements. Similar to the findings of Haldane and McMahon (2018) for the Bank of England, our results thus suggest that knowledge of the ECB has remained stable despite the ECB's increased focus on communication to the general public.

Fig. 2 shows respondents' answers to the statements about the instruments of the ECB. Three instruments were often correctly identified, namely the ECB sets the interest rate at which banks deposit money at the ECB, the ECB lends money to banks, and the ECB determines the interest rate of these loans. However, 65% of the respondents incorrectly believe that the ECB lends money to countries.[8]

[7] Panel members are Dutch individuals aged sixteen years and older who have been selected to give a representative view of the Netherlands.

[8] Under article 123 of the Treaty on the Functioning of the European Union, the ECB is not allowed to lend to governments. We therefore considered the answer to the statement that the ECB lends money to countries incorrect. However, as asset purchase programmes may be interpreted as indirect monetary financing, we have redone our analysis, considering the answer as correct in constructing our knowledge variable. This had no substantial impact on our main finding (results available on request).

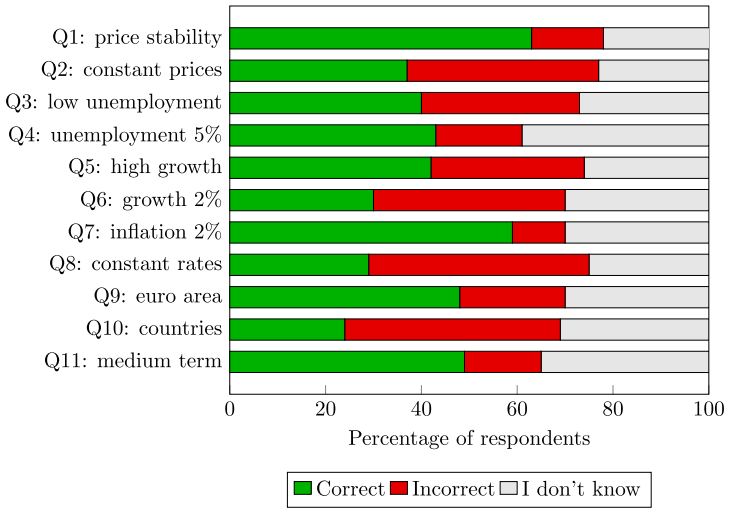

Fig. 1. Understanding of ECB's goals: Distribution of answers per question.
Note: The horizontal bars denote the percentage of correct (green) and incorrect (red) assessments of the eleven statements on the ECB's main objective (see online Appendix B for the full statements). The light grey bars denote the percentage of respondents who answered "I don't know". (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

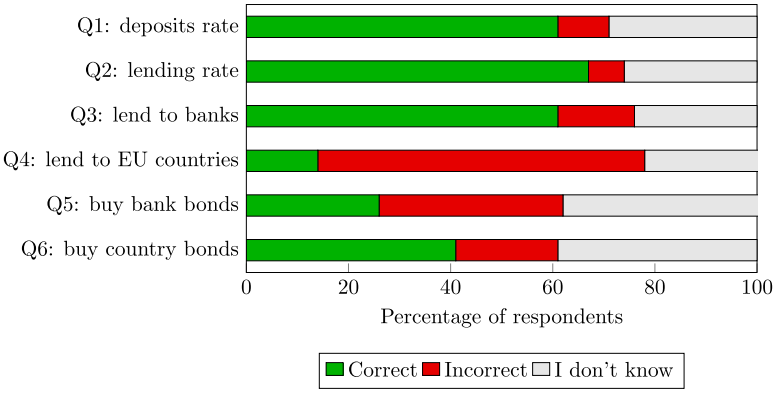

Fig. 2. Understanding of ECB's instruments: Distribution of answers per question.
Note: The horizontal bars denote the percentage of correct (green) and incorrect (red) assessments of the six statements on the ECB's instruments (see online Appendix B for the full statements). The light grey bars denote the percentage of respondents who answered "I don't know". (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

A majority of respondents indicate that they have (very) poor to neutral knowledge of the ECB. Fig. 3 shows the average number of correct responses grouped by participants' self-reported knowledge level. It seems that our participants are able to correctly assess their knowledge: the higher their self-assessed knowledge, the higher is their actual knowledge of the ECB. This result is in line with the work of Van der Cruijsen et al. (2015) who find a similar relationship between individuals' actual knowledge of the ECB's mandate and their self-assessed knowledge.

3.2. Trust in european institutions

Individuals were asked to indicate their level of trust in the ECB, the European Parliament (EP), and the European Commission (EC) on a scale from 1 (very low) to 10 (very high). This question has also been used by Christelis et al. (2020), who asked DHS panelists about their trust in the ECB in 2015.

Our questionnaire did not provide a definition of trust to the participants. Kril et al. (2016) differentiate between two types of trust in central banks: reason-based, which is the result of a rational argumentative decision, and implicit trust, i.e. an automatic, unintentional reaction which originates from associative and conditioned learning processes and memory. These authors measured reason-based trust in the central bank by asking individuals about their confidence in the central bank's forecasts for inflation and economic growth. In line with the work of Christelis et al. (2020), who used a similar approach to measure trust as we do, we

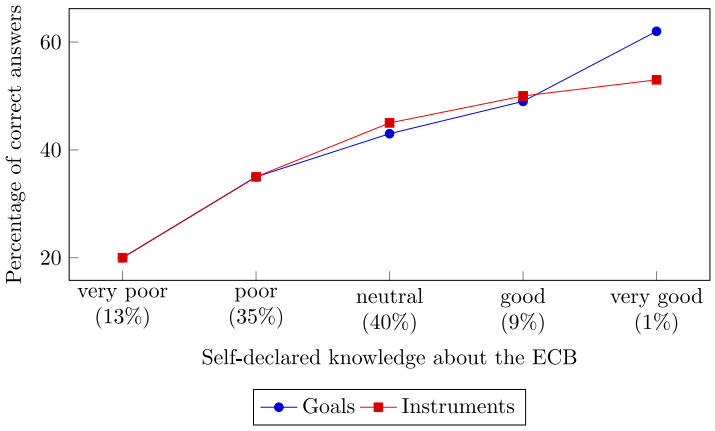

Fig. 3. Actual vs. self-declared knowledge.
Note: Response shares are shown in parentheses (2.7% of respondents indicated that they do not know their knowledge level of the ECB). The dots represent the average number of correct answers to the question.

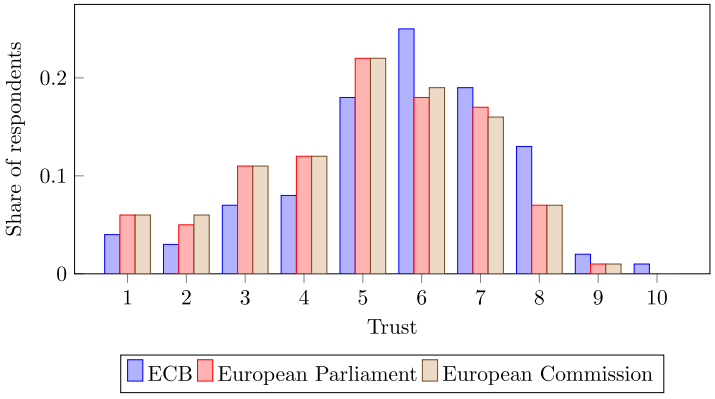

Fig. 4. Respondents' trust in EU institutions.
Note: This histogram shows the distribution of respondents' trust in the ECB, the European Parliament and the European Commission.

interpret our trust measure as a proxy for the implicit level of trust in the ECB. We assume that individuals will predominantly rely on an automatic unintentional feeling when answering questions about trust in institutions.

Fig. 4 shows the distribution of trust in the ECB, the EP, and the EC. The distribution of trust in various EU institutions is reasonably comparable: a majority of individuals rate their trust in these institutions between 5 and 7. However, on closer inspection, the responses are not that similar: individuals trust the ECB more than the EP or the EC. Almost sixty percent of individuals rate their level of trust in the ECB above 5 (medium), whereas this is just above forty percent for the EP and the EC. This is contrary to what is observed in the Eurobarometer Survey of November 2019 among Dutch individuals according to which more individuals indicated to trust the European Commission (62%) or the European Parliament (66%) than the European Central Bank (57%).

Average trust in the ECB in our sample is higher than found by Christelis et al. (2020) in the DHS five years ago. These authors report a mean of 4.7 for trust in the ECB, whereas in our survey average trust amounts to 5.7. Furthermore, the standard deviation in our survey is lower (1.8 versus 2.1). This suggests that trust in the ECB has increased between 2015 and 2020. This result is in line with the study of Roth and Jonung (2019) who come to this conclusion based on Eurobarometer survey data.

3.3. Inflation expectations

According to Coibion et al. (2018a), in the past few decades, models with full-information rational expectations have been the workhorse approach for modelling inflation expectations[9] However, this approach seems to be inconsistent with evidence on how firms, households and professionals form their forecasts. Therefore, some researchers relax the assumption of model consistency of expectations in favour of matching the behaviour of expectations in the survey data (cf. Coibion et al., 2018b).

[9] There are, however, some notable exceptions. See, for example, Carroll (2003).

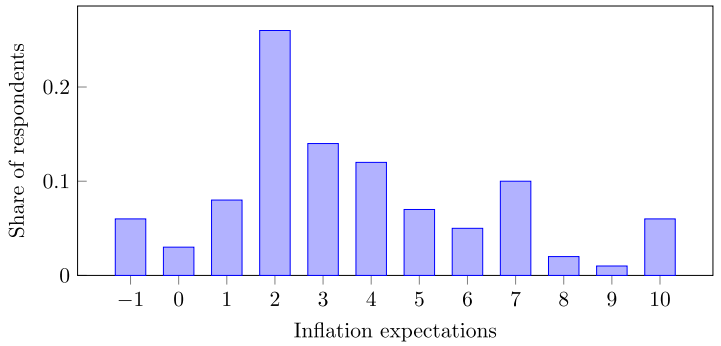

Fig. 5. Inflation expectations of survey participants. **Note:** This histogram shows the distribution of respondents' inflation expectations.

Broadly speaking, two alternatives exist for constructing inflation expectations, namely expectations derived from prices of financial instruments or expectations based on surveys among economic and financial professionals, households, or firms (Kryvtsov and MacGee, 2020). Market-based measures of inflation expectations can be derived from financial instruments that are directly linked to inflation, such as inflation-linked bonds and derivatives like inflation swaps or inflation options. Market-based expectations provide almost immediate information about the response of expectations to macroeconomic developments and policy announcements. An important limitation of market-based expectations is that they may not represent the inflation expectations of firm managers (Kryvtsov and MacGee, 2020). Because prices of goods and services are set by non-financial firms, the expectations of managers of these firms are probably most relevant to inflation dynamics. Therefore, surveys of firm managers may provide a more accurate view of the dynamics of inflation expectations. The findings of Coibion and Gorodnichenko (2015) suggest that the forecasts of firm managers are very similar to those of households.

Probably the best-known survey in Europe among professionals is the ECB Survey of Professional Forecasters (SPF) which started in 1999. It is a quarterly survey of expectations for the rate of inflation, real GDP growth and unemployment in the euro area for several horizons. The participants are experts from financial or non-financial institutions based within the European Union. Similar to market-based inflation expectations, professional inflation expectations do not necessarily reflect expectations of firms and households. For example, Coibion and Gorodnichenko (2015) find that during the early 2010s, when headline inflation was low in most advanced economies, professional and market-based inflation forecasts improved but expectations of households declined.

A key issue in surveys, is how the question about inflation is raised. Participants can, for instance, be asked about "prices in general", or "inflation". Bruine de Bruin et al. (2012) find that participants consider the "inflation" wording as more difficult, and that compared to questions that use the simple "prices in general" wording, questions about "inflation" produce less dispersion in reported expectations. One explanation is that participants tend to focus on large price changes, such as those for gas, that are most salient.

We therefore used the approach of Baerg et al. (2020) to construct inflation expectations. In this approach, respondents are not asked directly about their expected inflation rate but receive a hypothetical situation to make the question easier to understand. Respondents had to indicate what the monthly expenditures on typical purchases for food, goods, and services such as groceries, clothes and a hair-cut will be next year if a person currently spends 1500 euros per month on these items. Response options range from "less than 1500 euros" to "1650 euros or more". Each response option reflected a one-percentage-point higher rate of annual inflation.

Fig. 5 shows the distribution of inflation expectations in our sample. 29% of the respondents expect inflation to be in line with the inflation target of the ECB (2%). Only 17% percent of the survey participants have expectations that are below this target even though inflation was less than 2% in seven out of the last ten years in the Netherlands. Moreover, many individuals expect inflation to be substantially higher than actual inflation. For example, 27% of the participants expect inflation to be 5% or higher in the next twelve months. In addition, the distribution shows a small spike at 7%, which corresponds to the answer that an individual has to pay 1600 euros in the next year. As this is the first of the answers provided that rounds up to the next hundred (from 1500 to 1600), this response option may have attracted more attention. Baerg et al. (2020) find a similar spike.

4. Results

4.1. Drivers of trust

This section presents our estimates of models for trust in the ECB ($trust_i^{ECB}$). This (ordinal) variable ranges from 1 (very little trust) to 10 (very much trust). First we include several control variables suggested by previous studies, after which we add variables to test hypotheses H1–H3. Next, we test H4 for a subset of our sample. Finally, we examine whether trust is related to respondents' inflation expectations (H5).

We include a wide range of demographic characteristics which prior studies found to be related to trust in the ECB. The included demographic characteristics are depicted in Eq. (1) as vector DC_i. We briefly elaborate on the variables included in this vector.

Male is a dummy which is 1 if individual i is male and 0 otherwise. There is some evidence that women trust the ECB less. For instance, Ehrmann et al. (2013) and Farvaque et al. (2017) find that women trust the ECB less than men. Both studies are based on Eurobarometer survey data. However, using a survey of German households, Hayo and Neuenkirch (2014) report that women trust the ECB more than men.

Age is a discrete variable for the age of individual i in years. Some previous studies report that age is positively related to trust in the ECB (Ehrmann et al., 2013; Farvaque et al., 2017). However, Hayo and Neuenkirch (2014) and Christelis et al. (2020) observe that trust first declines and then increases with age.

Educated is a binary variable which is 1 for respondents who completed vocational or university education and 0 otherwise. The effect of education is not clear a priori. On the one hand, more educated people may be better informed and therefore have more trust in the ECB. Indeed, Ehrmann et al. (2013) report that while only 56 percent of respondents without a high school degree report to trust the ECB, this percentage rises to 70 percent for respondents with a university degree. Mellina and Schmidt (2018) also report a positive relationship between the level of education of respondents and their trust in the ECB. However, one could also argue that more educated individuals would be more critical of public institutions including the ECB, and therefore, depending on how they think the ECB is performing, might have a lower degree of trust in the ECB. Hayo and Neuenkirch (2014) report results that provide some support for this view. Although they find a positive relationship between education and trust in the ECB, this effect reaches its maximum for respondents who finished secondary school. Trust in the group with a university degree is lower than that in the secondary school group. These authors argue that this may reflect that university students are more likely to scrutinize and criticize specific actions rather than simply trust that a public institution is always doing the right thing. Hayo and Neumeier (2021) find no relationship between education and trust in the central bank of New Zealand.

Income is a continuous variable for gross monthly income of individual i. Based on a survey among German citizens, Hayo and Neuenkirch (2014) find that trust in the ECB increases in income.

Finally, DC_i includes two variables related to respondents' employment-status:*Unemployed* and *Retired*, where 1 indicates that an individual is, respectively, unemployed or retired and which is 0 otherwise. Some previous studies suggest that unemployed individuals trust the ECB less (Hudson, 2006; Farvaque et al., 2017).

To test H1, we include a binary variable *Right-wing* to check whether individuals who consider themselves to be right-wing trust the ECB more. This variable is 1 if an individual indicated to have a conservative or liberal ideology and 0 otherwise.

To test H2, we include individuals' trust in European institutions other than the ECB ($trust_i^{EU}$). This (ordinal) variable is the average of respondents' trust in the European Commission and in the European Parliament and ranges from 1 (very little confidence) to 10 (very much confidence).

We consider two variables related to an individual's knowledge (K_i) of the ECB, to test whether individuals who know more about the ECB trust the ECB more (H3). *Knowledge: subjective* is an ordinal variable which reflects respondents' subjective knowledge of the ECB. This variable ranges from 1 (I have very little knowledge of the ECB) to 5 (I have very much knowledge of the ECB). *Knowledge: objective* measures respondents' objective knowledge of the ECB. This variable is constructed using two steps. First, we calculate the average percentage of correct answers given by an individual to our statements about the ECB's mandate and the instruments used by the ECB. And second, we divide this percentage by twenty to make this variable range from 1 to 5 in order to make it easier to compare to our subjective knowledge measure.[10]

Eq. (1) is estimated using an ordered logistic regression with robust standard errors.[11] The results are shown in Table 2. The reported coefficients show the impact of the explanatory variables when they are at their mean.[12] Column (1) only includes the demographic characteristics (DC_i) and respondents' ideology. Column (2) includes the measure for trust in other European institutions ($trust_i^{EU}$), while in columns (3) and (4) measures for respondents' subjective and objective knowledge of the ECB are added, respectively.

$$trust_i^{ECB} = \beta_1 + \beta_2 \times DC_i + \beta_3 \times trust_i^{EU} + \beta_4 \times K_i + \varepsilon_i \tag{1}$$

The results show that we cannot reject hypotheses H1–H3. Our results suggest that individuals who have a right-wing ideology trust the ECB more (H1). In line with hypothesis H2, trust in other EU institutions ($trust_i^{EU}$) is significantly correlated with trust in the ECB. Trust in other EU institutions also has major explanatory power. The adjusted pseudo R^2 of our estimates increases by more than 0.2 points when we include this variable. The size of this coefficient is comparable to that reported in prior studies such as Ehrmann et al. (2013). Finally, we find that individuals with a higher level of subjective or objective knowledge of the ECB have higher trust in the ECB (H3). This result is in line with the work of Hayo and Neuenkirch (2014) who also find that both subjective and objective knowledge matters.

[10] As suggested by one of the reviewers, we have added some proxy for knowledge of inflation in the model for trust in the ECB. Better knowledge of inflation might lead to both higher knowledge of the ECB and more trust in the ECB. If true, adding knowledge of inflation would affect the estimated coefficient of knowledge about the ECB in the model for trust in the ECB. It turned out, that adding different proxies for knowledge of inflation had no material impact on the reported findings (results available on request).

[11] We have checked whether explanatory variables that are included in our analysis are correlated. The results are reported in online Appendix C. We find that among the explanatory variables only *Age* and *Retired* show a moderate correlation (0.67), which is not surprising; among the other explanatory variables we only find no or weak relationships. This result is confirmed by running a VIF analysis after estimating Eq. (1), which shows that the VIF value is below 2 for all explanatory variables.

[12] We have also estimated the model using a dummy which is 1 if an individual indicated to trust the ECB (trust level in the ECB of 7 or higher on a scale from 10) and 0 otherwise. This gave very similar results as in Table 2. Results, including the marginal effects of the coefficients, are available on request.

Table 2
Drivers of trust in the ECB.

	(1)	(2)	(3)	(4)
Male	0.15*	0.43***	0.24***	0.33***
	(1.85)	(5.18)	(2.79)	(3.91)
Age	−0.01***	−0.00	−0.00	−0.00
	(−2.80)	(−0.64)	(−1.41)	(−0.90)
Partner	−0.03	0.06	0.04	0.06
	(−0.35)	(0.63)	(0.49)	(0.71)
Education	0.69***	0.19**	0.15*	0.13
	(7.79)	(2.12)	(1.74)	(1.45)
Unemployed	−0.83***	0.09	0.05	0.10
	(−3.01)	(0.33)	(0.19)	(0.36)
Retired	0.21*	0.16	0.18*	0.18
	(1.88)	(1.47)	(1.65)	(1.62)
Income	0.00	0.00	−0.00	−0.00
	(1.24)	(0.07)	(−0.96)	(−0.22)
Right-wing	0.08	0.28***	0.20**	0.21**
	(0.85)	(3.00)	(2.08)	(2.23)
$Trust^{EU}$		1.24***	1.23***	1.23***
		(29.06)	(28.22)	(28.34)
Knowledge: subjective			0.35***	
			(6.78)	
Knowledge: objective				0.14***
				(3.83)
N	2020	2020	1955	1955
Pseudo R^2	0.012	0.238	0.241	0.237

Note: This table shows the estimation results of Eq. (1) and is used to test which characteristics of respondents affect their trust in the ECB. t statistics (using robust standard errors) in parentheses.
*means significant at the 10 percent level.
**means significant at the 5 percent level.
***means significant at the 1 percent level.

Furthermore, our results suggest that males have more trust in the ECB. We do not find a significant effect of age on trust in the ECB.[13] This result is not in line with prior studies, which may reflect that our model specification differs slightly from the one used by these studies. For example, Christelis et al. (2020), who find that older individuals trust the ECB more than younger individuals, do not account for an individual's retirement status and allow age to have a non-linear effect. However, dropping the *Retirement* dummy or allowing for non-linear effects does not change our conclusion as the coefficient of age remains insignificant (see Appendix D.1 for detailed estimation results).

An individual's income also does not significantly affect trust in the ECB. The coefficients of *Education* and *Unemployment* become insignificant when we control for trust in other European institutions. This result is not in line with the work of Ehrmann et al. (2013) or Farvaque et al. (2017), who find a significant effect for education and employment-status using Eurobarometer survey data while controlling for trust in the European Commission.[14]

Finally, we have rerun the model for trust in the ECB excluding respondents who had inflation expectations equal to 7 or higher. Excluding the more extreme parts of the distribution does not have a substantial impact on the drivers of trust in the ECB (see online Appendix D.3).

4.2. Impact of experience with banks during the financial crisis on trust

Next, we examine whether respondents' experiences with their banks during the global financial crisis matter for their current level of trust in the ECB (H4). The DHS follows many individuals over time (while adding new persons to maintain a stable population size). This allows us to test whether individuals' experiences during the financial crisis affect their trust in the ECB. To do so, we only look at respondents who were already enrolled in the DHS prior to 2010 (650 participants) as, similar to Van der Cruijsen et al. (2016), we use the information on personal experiences during the crisis from the 2010 and 2013 surveys.[15]

We construct three binary dummies: $Bank_i^{bankrupt}$ which is 1 if an individual had savings at a bank in 2010 which went bankrupt and zero otherwise; $Bank_i^{support}$ which is 1 if an individual had savings at a bank in 2010 which was bailed out and zero otherwise and, finally, $Bank_i^{nationalized}$ which is 1 if an individual was a client of a bank in 2013 which was nationalized in the previous years as a result of the financial crises. These variables are included in Eq. (2) as vector C_i.[16]

[13] Retirement is significant when we include our subjective knowledge measure (at a 90% confidence level). However, when we re-weight the sample to match the characteristics of the Dutch population at large it becomes insignificant. See Appendix A for more details.

[14] Using trust in the European Commission instead of our measure $trust_i^{EU}$ (which also includes trust in the European Parliament) does not affect our results. See Appendix D.2 for the detailed estimation results.

[15] Descriptive statistics of the respondents who were already enrolled in the DHS prior to 2010 are available in online Appendix E.

[16] The correlation between these three variables is very low (0.29 at most). Full details are available in the online Appendix E.

Table 3
Impact of personal financial experiences during the global financial crisis on trust in the ECB.

	(1)	(2)	(3)	(4)
$Bank^{Bankrupt}$	−0.13			−0.12
	(−0.50)			(−0.48)
$Bank^{Supported}$		0.24**		0.32***
		(2.24)		(2.79)
$Bank^{Nationalized}$			−0.10	−0.12
			(−0.70)	(−0.83)
Male	0.26*	0.28*	0.26	0.35**
	(1.66)	(1.77)	(1.63)	(2.23)
Age	0.00	0.00	0.00	−0.00
	(0.12)	(0.25)	(0.09)	(−0.00)
Partner	−0.16	−0.17	−0.16	−0.15
	(−0.93)	(−1.02)	(−0.98)	(−0.90)
Education	−0.10	−0.07	−0.12	−0.11
	(−0.69)	(−0.50)	(−0.82)	(−0.71)
Unemployed	−0.03	−0.02	−0.01	0.03
	(−0.06)	(−0.04)	(−0.02)	(0.06)
Retired	−0.09	−0.06	−0.10	0.02
	(−0.48)	(−0.29)	(−0.50)	(0.09)
Income	−0.00	0.00	−0.00	0.00
	(−0.06)	(0.18)	(−0.04)	(0.02)
Right-wing	0.24	0.28*	0.24	0.28
	(1.39)	(1.66)	(1.42)	(1.62)
$Trust^{EU}$	1.23***	1.24***	1.23***	1.24***
	(16.68)	(16.71)	(16.70)	(16.88)
Knowledge: subjective	0.30***	0.29***	0.29***	0.29***
	(3.31)	(3.28)	(3.28)	(3.23)
N	650	650	650	650
Pseudo R^2	0.237	0.239	0.237	0.239

Note: This table shows the estimation results of Eq. (2) and is used to test if individuals' experiences during the global financial crisis impact their trust in the ECB. t statistics (using robust standard errors) in parentheses.
*means significant at the 10 percent level.
**means significant at the 5 percent level.
***means significant at the 1 percent level.

Table 3 shows the estimates for Eq. (2) using ordered logistic regression with robust standard errors. Columns (1)–(3) show the results when each dummy is taken up separately, while column (4) presents the findings when all three crisis experiences dummies are included simultaneously.

$$trust_i^{ECB} = \beta_1 + \beta_2 \times DC_i + \beta_3 \times trust_i^{EU} + \beta_4 \times K_i + \beta_5 \times C_i + \varepsilon_i \quad (2)$$

We find that individuals whose bank received government support during the global financial crisis trust the ECB more. This result is in contrast to Hypothesis 4. A possible explanation might be that individuals (wrongly) assume that the ECB provided the support. However, more research is needed to substantiate this possible explanation. The coefficients of the other dummies are not significant.

4.3. Trust in the ECB and inflation expectations

Finally, we turn to the consequences of trust in the ECB and test whether individuals who trust the ECB have inflation expectations that are more in line with the ECB's inflation target (H5).

We use the variable π_i^D as the dependent variable, which is the absolute distance between an individual's inflation expectations and the ECB target ($|\pi_i - 2|$). This variable only takes discrete values as both inflation expectations (π_i) and the target rate are discrete.[17]

However, as noted by Christelis et al. (2020), inflation expectations and trust in the ECB might have a two-way relationship. Do individuals trust the ECB because they believe that the ECB is achieving its goal of price stability (reflected by inflation expectations being in line with the ECB target)? Or, do individuals have inflation expectations that are in line with the ECB target because they believe that the ECB can be trusted to reach this target? Similar to Christelis et al. (2020), we use an individual's trust in other people as an instrument for trust in the ECB. Recently, Angino et al. (2021) showed that generalized trust is strongly related to trust

[17] As suggested by a reviewer, we have also performed our analysis while using the absolute distance between an individual's inflation expectations and the mean inflation forecast of the ECB's survey of Professional Forecasters (SPF). This does not change our main findings; these results are available in the online Appendix F.

Table 4
The drivers of the distance between inflation expectations and the target rate of the ECB.

	OLS		2SLS	
	(1)	(2)	(3)	(4)
$Trust^{ECB}$	−0.23***	−0.10**	−0.98***	−4.61*
	(−7.75)	(−2.20)	(−6.97)	(−1.89)
Male	−0.47***	−0.33***	−0.42***	0.48
	(−4.60)	(−3.09)	(−3.53)	(0.91)
Age	0.00	0.00	−0.01	−0.01
	(0.13)	(0.35)	(−1.24)	(−1.05)
Partner	−0.19*	−0.23**	−0.24*	−0.13
	(−1.79)	(−2.07)	(−1.90)	(−0.46)
Education	−0.62***	−0.45***	−0.14	−0.26
	(−6.19)	(−4.41)	(−0.93)	(−0.86)
Unemployed	0.44	0.32	−0.22	0.42
	(1.14)	(0.87)	(−0.49)	(0.45)
Retired	0.11	0.13	0.26	0.72
	(0.79)	(0.94)	(1.56)	(1.53)
Income	−0.00*	−0.00*	−0.00	−0.00
	(−1.86)	(−1.86)	(−1.45)	(−1.12)
Right-wing	−0.37***	−0.29***	−0.32**	0.35
	(−3.50)	(−2.71)	(−2.56)	(0.78)
$Trust^{EU}$		−0.16***		3.14*
		(−3.99)		(1.76)
Knowledge: Objective		−0.29***		0.09
		(−6.09)		(0.40)
N	2016	1951	2016	1951
R^2	0.087	0.114	−0.271	−5.453

Note: This estimation is used to test which characteristics of an individual influences the absolute distance between an individuals' inflation expectations and the target rate of the ECB. t statistics (using robust standard errors) in parentheses.

*means significant at the 10 percent level.

**means significant at the 5 percent level.

***means significant at the 1 percent level.

in the ECB. Christelis et al. (2020) argue that using this instrument exploits the variation in the component of trust in the ECB that relates to generalized trust. In 2019, DHS members were asked whether they believed, in general, that other individuals could be trusted or not.[18] We use this binary variable, *Trust in other individuals*, which is 1 if an individual believes that other individuals can be trusted and 0 otherwise, as instrument for trust in the ECB.[19]

The estimation results are shown in Table 4. Columns (1) and (2) show the OLS estimation results. Column (1) only includes respondents' demographic characteristics and ideology, while column (2) also includes trust in other European institutions ($trust_i^{EU}$) and subjective knowledge of the ECB (K_i). Columns (3) and (4) follow a similar structure but are estimated by 2SLS using *Trust in other individuals* as an instrument for Trust in the ECB ($Trust_i^{ECB}$).[20]

$$\pi_i^D = \beta_1 + \beta_2 \times DC_i + \beta_3 \times trust_i^{EU} + \beta_4 \times K_i + \beta_5 \times TrustECB_i + \varepsilon_i \tag{3}$$

The coefficient of trust in the ECB is negative and significant in the models estimated by OLS and 2SLS. This implies that individuals who trust the ECB have inflation expectations that are more in line with the ECB target. This finding confirms the conclusion of Christelis et al. (2020) which is based on DHS data from 2015 and provides support for H5.

5. Discussion and robustness analysis

We identify some potential drawbacks of our study. First, like most previous studies on the drivers of trust in the ECB, our study cannot draw causal inferences on the basis of the analysis. That is why in a follow-up study, we use a random controlled trial (RCT) to isolate the effect of receiving information about the ECB's instruments on inflation expectations and trust in the central bank (Brouwer and de Haan, 2021). The major advantage of RCTs is that the results can be interpreted as causal effects. In such an experiment, two groups are randomly selected from a homogeneous population: the first receives a treatment (in our

[18] See Van der Cruijsen and Samarina (2021) for the full set of questions which were asked during this round of the DHS.

[19] We also re-ran the model while including dummies for the respondents' experiences with their banks during the crisis. These results are available upon request.

[20] There might be some concerns that the exclusion restriction, requiring that trust in individuals must not affect inflation expectations by any other channel than by trust in the ECB, is violated. For example, more optimistic individuals might trust other individuals more and have more trust in the ECB. Therefore, as an additional check we added the same optimism proxy as used by Christelis et al. (2020) which is based on the difference between subjective life expectancy and objective life expectancy. We find that this does not affect our results (results available on request).

case: information on the ECB's instruments), while the second gets a 'placebo', either a different treatment or no treatment at all (in our case: no information on the ECB's instruments). In this follow-up study, we conclude that ECB communication on certain instruments affects inflation expectations but has no impact on trust in the ECB. More recently, Hayo and Pierre-Guillaume (2022) employed an RCT in a representative survey among Germans. They find that providing information about the ECB's inflation record in comparison to its inflation target has, on average, no effect on people's trust in the central bank. However, the treatment increases trust in the ECB among respondents who report no preference for any political party. Within this group, the effect is the strongest for those who report a low level of (subjective and objective) knowledge of monetary policy.

While the method used in the present paper is in itself not sufficient to draw definitive conclusions on the causality between various characteristics of individuals and their trust in the ECB, it still can help to gain more insight into the drivers of trust in the ECB. Hill (1965) describes various criteria to determine whether a statistical relation is mere association or actual causation. One of the criteria, consistency, stresses the importance that results should been repeatedly observed in different times and places. Therefore, our paper tests several hypotheses about the drivers of trust in the ECB as suggested by previous studies. By confirming (or rejecting) the results of prior studies we can thus improve our knowledge of the drivers of trust in the ECB. While our results do not provide a conclusive answer to how policy makers can affect trust in the ECB, it does provide, in combination with existing (experimental) literature, evidence which may be useful for policy makers to affect trust in the ECB. For instance, the ECB may tailor its communication policies to groups that have low trust in the ECB. One of the results of previous studies that we confirm is the relationship between knowledge of the ECB and trust in the ECB. Whether this implies that the attempts by the ECB to enhance the general public's knowledge may be useful, is however, not clear. Several central banks are making active efforts to educate the broader public. However, their efforts focus mostly on personal financial management, not on monetary policy (ECB, 2021). Furthermore, views differ on even whether these educational efforts work. For instance, three recent meta-analyses summarizing this literature reached rather different conclusions. Kaiser and Menkhoff (2017), in a meta-analysis of 126 impact evaluation studies, find that financial education significantly improved financial literacy. However, not all interventions are equally effective; for example, financial education is less effective with low-income individuals. Based on 76 randomized experiments, Kaiser et al. (2021), reported that financial education programmes have, on average, positive causal treatment effects on financial knowledge and behaviours. But note that our comment on RTCs applies to this literature as well: In experiments, all subjects receive the information. In reality, they do not. Furthermore, Fernandes et al. (2014) meta-analysis of 168 articles reporting on 201 studies conclude that interventions to improve individuals' financial skills explained just 0.1% of the variance in financial behaviour.

Another potential shortcoming of this line of research is that an omitted variable may be correlated with the explanatory variables included. In the present study, we consider as many control variables as possible which have been suggested in previous studies, like household characteristics, to ensure that our findings do not suffer from an omitted variable bias. Unfortunately, for some potential control variables, which, to the best of our knowledge, have not been considered in previous studies on drivers of trust in the ECB, we do not have the required data.[21]

We have performed several additional robustness checks. First, in view of the distribution of respondents' inflation expectations, we have added three dummies. The *inflation quartile 50%* variable is 1 if an individual belongs to the second quartile, *inflation quartile 75%* is 1 if an individual belongs to the third quartile, etcetera. The effects of including these dummies are presented in online Appendix G. We find that the coefficients of all inflation quartile variables are insignificant and that adding these variables does not change our results.

Furthermore, some respondents have been part of the survey panel for quite some time. This may matter as some related questions have been asked on more than one occasion; it may also testify for respondents' interest in (socio-)economic issues. To check whether long-time panel membership affects our results, we have included a dummy to the regressions reported in Sections 4.1 and 4.3 which is 1 if an individual joined the DHS prior to 2015 (57% of the respondents have been member prior to 2015). The results, which are similar to our previous findings, are shown in online Appendix H.

6. Concluding remarks

There is an increasing body of literature (both theoretical and empirical) which shows that the current low levels of trust in the ECB may have important repercussions for the central bank. Low trust might amplify macroeconomic fluctuations (Bursian and Faia, 2018) and lead to inflation expectations which are less accurate (Rumler and Valderrama, 2020) and less in line with the inflation target of the ECB (Christelis et al., 2020).

We use data for a large panel of Dutch households collected using the DHS panel to gain more insights into why trust in the ECB is still so low and which people are more likely to trust the ECB. We confirm some of the results found by previous research: trust in the ECB is higher if the respondent has a right-wing ideology, knows more of the ECB, and trusts other European institutions. However, some other results of previous studies could not be replicated: we do not find a significant impact of individuals' age, education level, income, and employment status on their trust in the ECB.

We also analyze whether respondents' experiences with their banks during the global financial crisis are related to their trust in the ECB more than ten years later. We find that individuals who were clients of a bank that received government support during the crisis trust the ECB more.

[21] This holds, for instance, for inflation preferences, which may be correlated with other characteristics of respondents and their trust in the ECB. Our database does not contain information that would allow us to construct a proper proxy for this variable. We consider it very unlikely that this omission leads to biased results concerning heterogeneity across households, but we cannot fully rule it out.

Finally, we tested whether individuals who trust the ECB have inflation expectations that are closer to the ECB's inflation target. Our results suggest that individuals who trust the ECB have inflation expectations that are more in line with the ECB target. This illustrates the importance of public trust. Consistent with the view of Isabel Schnabel cited at the beginning of this paper, high trust in the ECB will increase the effectiveness of its monetary policies. Our results, suggest that in its communications the ECB could target groups that have a low trust in the ECB. For instance, Brouwer and de Haan (2021) and Hayo and Pierre-Guillaume (2022) find, using RCT experiments, that providing information about the central bank only impacts the level of trust for some subset of the sample (respectively, individuals aged between 40 and 70, and individuals who report no preference for any political party). The general findings of both papers that providing information about ECB instruments and its inflation record, respectively, do not affect trust in the ECB might suggest that informing the public is not an effective strategy to increase public trust in central bank. However, providing information at one point in time – as is done in both papers – might be insufficient to change the level of trust in the ECB, but does not show that (repetitive) communication is an ineffective strategy. As Brouwer and de Haan (2021) argue: "the level of trust in the ECB may be relatively rigid: a text may not be sufficient to change people's feelings towards the ECB. For instance, studies in sociology stress the importance of "engagement" instead of merely providing information. Warren et al. (2014) for example, find that frequent engagement between the government and citizens via social media increases public trust." This suggestion is consistent with the view of Haldane (2017), who argues that "The public are anything but monolithic in their abilities and appetites. They are different folks. This suggests that, as a first step in any programme of improved central bank engagement, an improved understanding of these different folks is needed: their concerns, their constraints, their degrees of understanding and distrust, their appetite for information and their preferred means of receiving it...Having identified the different folks, it is then a question of applying different strokes to communicating and engaging with them. One size will not fit all. That probably means the need for engagement policies that are targeted and layered to meet the different needs of different cohorts. For instance, Haldane (2017) shows that publications of the Bank of England were accessible to less than 10% of the adult population due to the complexity of the language used in its publications. This led the BoE to publish a new, broader-interest version of its quarterly Inflation Report (IR), augmented with new layers of content aimed explicitly at speaking to a less-specialist audience. Haldane and McMahon (2018) find that the general public understand this new publication better. It is too early to tell whether this has had any effect on trust in the BoE."

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.ejpoleco.2022.102262.

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