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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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HOW MUCH DOES THE PUBLIC KNOW ABOUT THE ECB'S MONETARY POLICY?

EVIDENCE FROM A SURVEY OF DUTCH HOUSEHOLDS¹

Carin van der Cruijssen², David-Jan Jansen³ and Jakob de Haan⁴

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Abstract

Does the general public know what central banks do? Is this kind of knowledge relevant? Using a survey of Dutch households, we investigate these questions for the case of the European Central Bank (ECB). Our findings suggest that knowledge on the ECB's objectives is far from perfect. Both a weak desire to be informed and unawareness of insufficient knowledge are barriers for improving the public's understanding of monetary policy. However, our results also show that more intensive use of information improves understanding, suggesting that the media channel may play an important and constructive role in building knowledge. Finally, we find that knowledge on monetary policy objectives contributes to an individual's ability to form realistic inflation expectations.

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1. Introduction

During the last two decades, many central banks have become remarkably more transparent, placing greater weight on their communications (Blinder, Ehrmann, Fratzscher, De Haan and Jansen, 2008). Nowadays, it is widely held that independent central banks should be transparent and accountable, which means that they have a duty to publicly explain their actions and the reasoning that underlies those actions. In addition, transparency may enhance the effectiveness of monetary policy-making. According to the International Monetary Fund (2000), by *'making the objectives of monetary policy public, the central bank enhances the public's understanding of what it is seeking to achieve, and provides a context for articulating its own policy choices, thereby contributing to the effectiveness of monetary policy.'*⁵

Transparency requires that central banks communicate with the outside world. So far, the academic literature has mostly equated the outside world with financial market participants. This was already criticised by Blinder et al. (2008, p. 941), who pointed out that *'It may be time to pay some attention to communication with the general public.'*⁶ In fact, we know virtually nothing about the general public's knowledge about monetary policy, how information on central banks reaches the public, and how this information contributes to knowledge.⁷ More importantly, we have no clear understanding whether knowledge of monetary policy is relevant for the public's decision-making.

Our paper contributes to the literature by charting what the general public knows about the objectives of the monetary policy of the European Central Bank (ECB). The ECB has specified its objective as follows: *'The primary objective of the ECB's monetary policy is to maintain price stability.'*

⁵ Recent evidence suggests that central bank transparency enhances the effectiveness of monetary policy, although not all evidence points in the same direction (Van der Cruysen and Eijffinger, 2010b).

⁶ Similarly, Berger, Ehrmann and Fratzscher (2006, p. 29) point out that *'we have limited ourselves to an analysis of the transmission of communication, leaving open the question how communication is actually received by the final addressee, the general public. We leave this up to future research.'*

⁷ One related paper on these issues is Van der Cruysen and Eijffinger (2010a). However, they only measure knowledge about the European Central Bank's disclosure practices.

*The ECB aims at inflation rates of below, but close to, 2% over the medium term.*⁸ To study the general public's knowledge, we conducted a survey of Dutch households in April 2009. We presented participants with eleven statements about the ECB's objective. Four of these statements were based on the ECB's specification of its objective, while the remaining seven were false statements drafted by us. We asked respondents to answer whether they thought a particular statement was true or false.

Based on our survey, we address the following three questions. First, what does the general public know about the objectives of the ECB? Second, how does the general public obtain its information? Finally, to what extent is the public's knowledge on the objectives of monetary policy relevant? To answer this third question, we focus on the relationship between knowledge and the respondents' expectations for inflation. The ability to make a reasonable assessment of future price developments is important for adequate household financial decision-making. Therefore, we assess whether knowledge about ECB objectives affects the ability to formulate realistic inflation expectations.

To organise our analysis, we use the framework proposed by Blinder and Krueger (2004) in their study on the determinants of opinions on U.S. economic policy. They find that ideology is the most consistently important determinant of opinion, while measures of self-interest are least important. Knowledge about the economy is important to explain positions on some policy issues, but not all. In contrast to Blinder and Krueger, we focus on knowledge rather than opinions.⁹

Our main findings are as follows. First, we find that the respondents' knowledge about the ECB's policy objectives is far from perfect. The average number of correct answers to our eleven statements is less than five. There are interesting differences along demographic lines. We find that male respondents with strong self-interest, a clear ideology, and a high social status are more likely

⁸ Source: <http://www.ecb.int/mopo/html/index.en.html>. URL last accessed on 7 June 2010.

⁹ Our work differs from the standard Eurobarometer survey carried out by the European Commission which also focuses on opinions. However, since 2007 Eurobarometer has conducted special surveys regarding the level of knowledge of economic indicators. On average, Europeans are unaware of economic growth rates, inflation rates and unemployment rates, but do think these figures are important to political decision-making (European Commission, 2010).

to have correct knowledge, while elderly respondents and respondents who have a partner are more likely to have less knowledge about the ECB's monetary policy.

Second, we identify two barriers for improving the public's knowledge. Respondents with a strong desire to be informed acquire more information on the ECB's policies. As a result, their knowledge is better than the knowledge of respondents with a relatively weak desire to be informed. Also, we find that respondents generally claim to have much better knowledge than they actually have. However, turning to sources of information, our results also suggest that individuals who use the media more intensively to obtain information have better knowledge on monetary policy. This suggests that the media channel may be useful to improve the public's knowledge. It will be a challenge, however, to reach individuals who have no desire to be informed.

Finally, to what extent is knowledge about monetary policy relevant? We find strong evidence that better knowledge about the objectives of ECB monetary policy is related to an individual's ability to formulate realistic inflation expectations. Using probit regressions, we find that individuals who answer more questions on ECB objectives correctly have a higher probability of having realistic inflation expectations. This suggests there are important returns to this kind of knowledge, as the ability to make a reasonable assessment of future price developments is important for adequate household financial decision-making.¹⁰

The remainder of the paper is structured as follows. Section 2 describes the framework for our analysis, while section 3 describes the survey's setup. Section 4 gives an overview of the survey's main outcomes. The next three sections report our analytical results. Section 5 analyses the determinants of the respondents' desire to be informed about the ECB and the sources of information used. Section 6 investigates the determinants of the respondents' knowledge about the main objective of the ECB, while section 7 examines whether knowledge on monetary policy helps in formulating realistic inflation expectations. The final section offers concluding comments and

¹⁰ The positive effect of knowledge has also been established in related work on financial literacy. For instance, Lusardi and Mitchell (2007) and Van Rooij, Lusardi and Alessie (2009) find that more knowledgeable people are also more likely to plan for retirement.

discusses the policy implications of our findings.

2. A framework for the level of understanding

We relate the level of understanding of monetary policy to a number of factors. First, the expected benefits from obtaining information are important. If someone sees no benefits from being informed on monetary policy, she will have little incentive to obtain the relevant information, so that her level of understanding of central bank policies will be low. If someone does have an interest, the type of sources may become relevant. Most people do not receive their information on monetary policy directly from the central bank but via ‘intermediaries’, like television, radio, and newspapers. The role of these intermediaries in affecting the public’s understanding of central bank policies has been largely ignored in the literature. Our survey measures how and where respondents get their information on the ECB. Third, the quantity of information received through the various sources may play a role in someone’s understanding of monetary policy-making. Receiving more information may simply lead to a more thorough understanding of what central banks are doing. Finally, various other variables, such as the level of education, the type of job, or the level of income may also be relevant.

The various factors mentioned above are, in all likelihood, interrelated. To formalize the interdependencies between understanding (U), desire to be informed (D), sources of information (S), and quantity of information (Q), we use the framework as proposed by Blinder and Krueger (2004). We assume that the desire of person i to be informed is a function of self-interest (SI), ideology (ID), education (ED), and a vector X that contains control variables like sex and age.

$$(1) D_i = f_i(SI_i, ID_i, ED_i, X_i) + e_{1,i}$$

As mentioned, one of the crucial reasons that someone may want to be informed about monetary policy is self-interest. Self-interest may arise for several reasons. First, the real value of someone’s

income or financial assets may be affected by inflation. Alternatively, an individual may have an interest, because her line of work is closely influenced by monetary policy. In the empirical sections, we will use various proxies for self-interest, the most important of which will be income.

Following Blinder and Krueger (2004), we further posit that:

$$(2) S_i = f_2(D_i, SI_i, ID_i, ED_i, X_i) + e_{2,i}$$

and

$$(3) Q_i = f_3(D_i, SI_i, ID_i, ED_i, X_i) + e_{3,i}$$

The sources of information and the quantity of information depend on the desire to be informed, self-interest, ideology, education, and various control variables. The more someone wants to be informed about monetary policy and the stronger the self-interest, the more (different) sources of information she will use and the more information will be acquired. Also ideology may affect the sources of information used. People probably consult those sources of information that are closest to their own ideological position. Finally, the level of education is also likely to affect sources and quantity of information. First, highly educated persons will read different newspapers than people with low levels of education. Also, for these individuals newspapers may be more important than, for instance, television. Second, individuals with lower degrees of education may use fewer sources of information. Third, there is evidence that the level of education matters for the extent to which news is retrieved from various media sources. For instance, Grabe, Kamhawi and Yegiyan (2009) show that highly educated persons are relatively better in remembering items read in newspapers and on the internet. In contrast, the lower educated perform best in retrieving news presented on television.

Following Blinder and Krueger (2004), we assume that understanding of monetary policy-

making (U) is determined by ED , D , S , Q and X , so that we can write:

$$(4) U_i = f_4(ED_i, D_i, S_i, Q_i, X_i) + e_{4,i}$$

In sections 5 and 6, we present reduced-form regressions based on equation 1 to 4. In the end, we study determinants of understanding by estimating:

$$(5) U_i = \beta_0 + \beta_1 * D_i + \beta_2 * S_i + \beta_3 * Q_i + \beta_4 * X_i + \beta_5 * ED_i + \beta_6 * ED_i + \beta_7 * X_i + \varepsilon_i$$

where ε is white noise. Note that we include the variables that we assume to affect D , S , and Q as well these variables themselves. The reason for also including D , S , and Q is that the fit of our models explaining these variables is rather poor (see section 5). In our model, the coefficients of D , S , and Q reflect the impact of the unexplained variation of these variables on U . The next section describes our survey and explains how we use the respondents' replies to construct proxies for the variables used in the empirical analysis.

3. The survey

In April 2009 we sent a questionnaire to members of the DNB Household Survey (DHS). The DHS, formerly known as the CentER Savings Survey, is a panel study initiated in 1993 by CentERdata, a research institute affiliated to Tilburg University. Our questionnaire was sent out via the internet to 2,369 regular members of the DHS (16 years and older) from 17 until 21 April 2009. This panel forms a representative sample of the Dutch population. Compared to surveys conducted by telephone or mail, the response rate to this continuous internet-based survey is usually very high. In our case, the response rate is 70% which corresponds to 1,659 individuals.

Appendix 1 lists our survey questions. The first three questions are general in nature. First, we asked respondents to indicate to what extent they were affected by the ongoing economic and

financial crisis. We use this information to construct a proxy for self-interest which ranges from 1 (not hit by the crisis) to 4 (very much hit by the crisis). Second, we asked whether respondents had occupations related to economic, monetary or financial issues. The responses to this question are used to construct another self-interest variable that ranges from 1 to 5. When the respondent's work is not related to economic, monetary or financial issues, this variable equals 1, while it is 5 when the respondent's job relates to these matters on a daily basis.

Third, we asked respondents to identify their political orientation. The answers to this question were used to construct a *no ideology (ID)* dummy, which is one for respondents indicating not to have thought much about politics. The motivation for this *ID*-variable is Blinder and Krueger's (2004) finding that people without a clear ideology have less knowledge about economic policy.

The survey continued with a short introduction of the ECB. As we are interested in knowledge on monetary policy, we only informed respondents that: '*The ECB is the central bank for Europe's single currency, the euro. Since 1999 the euro has been introduced in 16 European countries*'. Next, we asked respondents to rate their knowledge on the ECB and economic policy in general. We added this question to assess whether there is a mismatch between an individual's perceived knowledge about the ECB and her actual knowledge. Central bank communication policy will have greater difficulty in reaching those people who incorrectly believe to be well informed.

The subsequent question was aimed to measure explicitly the respondents' desire to be informed (*D*). We asked the following question: '*How important is it to you to keep well informed about the policies of the European Central Bank (ECB)?*'. There were five possible answers ranging from 'not important at all' to 'extremely important', which are ranked on a scale between 1 (low) and 5 (high). In question 6 we asked why respondents want to be informed about ECB policy. Respondents could indicate the importance they attach to a number of reasons.

Question 7 is arguably the most important in our survey as it measures the respondents' knowledge of monetary policy. It consists of a list of eleven statements on the main objective of the

ECB's monetary policy. Four of these statements were based on the ECB's specification of its objective, while the remaining seven were false statements drafted by us. For each statement, respondents were asked to answer whether the statement is true or false. As proxies for knowledge (U) we use the number of correct answers. We also analyse whether there are differences between the fraction of correct answers to true and false statements.

The remaining questions of our survey referred to the sources of information on the ECB. We first asked which sources of information respondents use to get information about the policies of the ECB. The respondents could indicate whether they used the various sources – such as television, radio or internet – regularly, occasionally or never. We use the answers to measure the use of information on a scale between 1 (never) and 3 (regularly). These measures are proxies for Q (quantity of information). Following Blinder and Krueger (2004), we also construct measures for the (lack of) *intensity* of information. Let s_1 , s_2 , and s_3 be the number of sources through which respondents 'never', 'occasionally' or 'regularly' obtain information on the ECB, respectively, and let s denote the total number of sources (s can be less than six because of non-response). Then QH ('quantity high') and QL ('quantity low') are defined as s_3/s and s_1/s , respectively. For example, if a respondent has a QH of 0.25 and a QL of 0.5, this respondent reads or hears regularly about the ECB via 25% of the sources, but via half of the sources she never gets information on the ECB.¹¹

The final question is: '*Which of the following is your most important source of information on the policy of the European Central Bank?*'. We use the response to this question to construct a dummy that measures whether or not a particular medium is the most important source of information. These dummies are proxies for the variable S in our model.

We have also have detailed background information on the DHS members, which we use to construct various control variables (X): a dummy that is one if the respondent is male (*male*), the

¹¹ Blinder and Krueger (2004, p. 341) argue: ' QH and QL thus measure *intensity* of information use and *lack of intensity*, respectively. Because not all sources of information convey equal information, our measures are undoubtedly crude proxies; but they are probably still correlated with the extent to which individuals access information about the economy.'

age of the respondent (*age*), and a dummy that is one if the survey participant is living together with a partner (*partner*). Furthermore, we control for the degree of urbanization by including a variable called *city*, which ranges from 1 (respondent lives in a rural area) to 5 (respondent lives in a very strongly urbanized area). We also have information on the size of households.¹² In addition, we control for the social status of the respondent (*status*). This variable ranges from 1 (low status) to 5 (high status). We also use DHS background information to create an education dummy *ED* that is one for respondents that successfully completed higher vocational education and/or university education, and zero otherwise. Finally, we use data on household income to construct our third self-interest variable, which ranges from 1 to 12, based on twelve monthly gross household income categories. This variable (labelled *SI1*) is our preferred proxy for self-interest. *SI1* is 1 for respondents reporting a household income of 500 euro or less, and 12 when monthly household income is 7,500 euro or more. Regression results using the other two proxies of self-interest ('affected by crisis' and 'work related to economic issues') are reported in Appendix 2.

4. An overview of the survey results

Table 1 provides information on our respondents' gender, age, size of their household, gross monthly income, education level, where they live, and whether they are living with a partner. The average respondent turns out to be male, in his early 50s, living with a partner, and earning a gross monthly income of around 3,800 euros. Table 1 also compares the survey means to the Dutch population based on data provided by Statistics Netherlands (CBS). On a number of dimensions, such as age, gender and education, the sample is not representative for the Dutch population. We checked, therefore, whether re-weighting observations would change our conclusions. This turned out not to be the case. Appendix 3 provides more details on the effect of weighting.

¹² We do not use household size in our regressions, as it did not turn out to be important. We do use the information on household size to study whether our sample is representative of the Dutch population.

[Insert Table 1 here]

Figures 1 to 3 give information about the extent to which respondents were hit by the financial crisis, their work environment, and their ideological position. Figure 1 shows that about 45 percent of the respondents answered that they were either very much or somewhat affected by the crisis. Figure 2 reveals that about 70 percent of the respondents are not professionally interested in monetary policy-making, thereby ensuring that the survey captures the understanding of the 'public at large'. Finally, Figure 3 presents information about the self-declared ideological position of the respondents. About 20% of the respondents indicate they have not thought much about their political position.

[Insert Figures 1-3 here]

Table 2 shows that over a quarter of the participants show little interest in being informed about monetary policy, as they indicate that being informed about ECB policies is either not very important, or even not important at all. It also appears that most respondents do not see a clear reason why ECB policy should matter to them personally. As follows from Table 3, 57% of the respondents consider the importance of the ECB for the economy as the crucial reason to be informed about the ECB. A majority of the respondents report that they 'just like to be informed'. Only few respondents judge the other, more personal, reasons on the list (ECB policy affects my purchasing power, my income, my stocks and other investments, and my job) as extremely important reasons to be informed about the ECB policies.

[Insert Tables 2 and 3 here]

Figure 4 shows the distribution of correct and incorrect answers to the eleven statements

about the ECB's objectives. 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. Importantly, few respondents are aware that the ECB does not define its objective in terms of inflation in each individual euro area country. The (false) statement that the ECB's objective applies to all euro area countries separately received the lowest score of correct answers (20%). This finding is potentially worrisome. It implies that even when the ECB meets its inflation goal, it can suffer a loss of credibility. As a result of insufficient knowledge, it is likely that an important share of the public at large interprets deviations of national inflation from 'close to but below two percent' as a shortcoming of ECB policy.¹³

[Insert Figure 4 here]

Finally, the difference between true and false statements turns out to be quite important. The true statements were items 1 (objective is price stability), 7 (inflation close to, but below 2%), 9 (objective applies to the euro area average) and 11 (objective applies to the medium term) of question 7 of our survey. Figure 5 shows the fraction of correctly answered true (left panel) and false (right panel) statements. Clearly, respondents did much better at answering true statements. This suggests that, when in doubt about the right answer, respondents chose 'true' as their default answer. As a consequence, we may be overestimating the level of knowledge on monetary policy. For instance, we were surprised by the number of people (50%) who answered statement 11 (the ECB's objective applies to the medium term) correctly as we considered this as one of the more difficult statements to answer. However, if respondents chose 'true' when in doubt, the estimate of 50% would be optimistic.

¹³ In contrast, Van der Crujssen and Demertzis (2009) show that professionals do realize that the ECB goal does not apply to national inflation rates. They find that while expectations of euro area inflation are well anchored at the ECB's goal, expectations of national inflation rates are not well anchored.

[Insert Figure 5 here]

Next, we relate respondents' self-declared knowledge to their actual knowledge. Figure 6 shows that there is a positive link between the two; on average individuals with higher self-declared ECB knowledge answer more questions correctly (correlation: 0.36). However, almost all survey participants that indicate to have good or very good knowledge (8.3% of the respondents) 'fail' the test, as they do not *fully* understand the ECB's main objective. The average number of correct answers is 6.5 for the 'good' category, and 7.8 for the 'very good' category. Especially in this last category, the dispersion is quite large. Although central bank communication can be used as a tool to improve knowledge, it will be difficult to reach those individuals who are not aware of these knowledge gaps.

[Insert Figure 6 here]

Finally, Table 4 shows the answers to the question concerning the most important source of information. It is clear that television is by far the most important source of ECB information. Almost 42% of the respondents put this intermediary on top, followed by newspapers (almost 33%). The other sources of information receive low scores. Around 8% of the respondents use no sources at all to acquire information about ECB policies.

[Insert Table 4 here]

5. The determinants of respondents' desire to be informed and use of media

The first step in our empirical analysis is to examine the determinants of the desire to be informed (D). Our proxy for D is the answer to question 5 of our survey: '*How important is it to you to be well informed on the policies of the European Central Bank (ECB)?*'. Table 5 shows the parameter

estimates for four ordered probit models where D is the dependent variable. In the first column, we only include a standard set of controls. In the subsequent three columns we include education (ED), self-interest proxied by income ($SI1$), and our 'no ideology' variable (ID).

[Insert Table 5 here]

Three control variables (age, male and status) are significant. Likewise, a person's education, self-interest and lack of ideology turn out to be important determinants of the desire to be informed.

We now turn to the determinants of media use (S and Q). To analyze the determinants of S , we use probit regressions, whereas we use ordered probit models to model Q . Recall that the variable S is a set of dummies reflecting whether or not respondents prefer to learn about the policies of the ECB via that particular source, while Q measures the extent to which a source of information is used on a scale between 1 (never) and 3 (regularly).

Table 6 shows results for the preferred media source. As there are few observations in most categories (see Table 4), we add some categories together. The results for this 'other' category are shown in column 3. Column 4 has results for those respondents who report using no media sources. Age turns out to affect preferences for all media sources, whereas gender, having a partner and status are not relevant. Desire to be informed, income, ideology and city are relevant in some cases. The directions of the effects are quite intuitive. Education and age positively affect the probability of preferring newspapers, and negatively affect preferences for television. Individuals who have not thought about ideology have a lower probability of preferring television and newspapers, and a higher likelihood of using no media sources. Income has a negative effect on the probability of preferring television.

Turning to the degree to which sources are used (Table 7), the coefficients for desire to be informed (D) are strongly significant in all cases, while the no ideology variable (ID) mostly has a significant negative coefficient. Our self-interest proxy ($SI1$) is generally insignificant, except for the

use of magazines. Age is a relevant factor in explaining the use of newspapers, magazines and the internet, while gender is relevant in all cases. Persons with a higher social status are also more likely to use newspapers and magazines than people with a low social-economic status.

[Insert Tables 6 and 7 here]

6. What determines knowledge about the ECB's objectives?

We now turn to explaining the respondents' knowledge about the ECB's monetary policy. As the dependent variable, we first use the number of correctly answered questions on monetary policy objectives. Following Blinder and Krueger (2004), zero scores were assigned in case respondents answered 'I don't know' to the knowledge questions. Figure 7 shows the distribution of the number of correct answers. Given the discrete and limited nature of this variable, we use models for analyzing count data.

[Insert Figure 7 here]

The workhorse model in this field is the Poisson regression.¹⁴ In our case, the standard Poisson assumption of equality between the conditional mean and the conditional variance is violated due to a clustering of the observations around zero. Of the 1659 observations, 16.3% has a value equal to zero. There are two explanations for this clustering at zero. First, the zero category includes those 0.8% of the respondents who have answered all knowledge questions incorrectly. One could call these observations the 'true zeros'. The second category of zeros is more prominent. It consists of those 15.6% of the respondents who answered 'I don't know' to all of the knowledge questions. Although these individuals may have had knowledge on monetary policy, they declined to answer any question. So, for each knowledge question, the respondent had to make two

¹⁴ The following discussion draws on Cameron and Trivedi (2007) and Winkelmann (2008).

decisions. First, the respondent had to decide whether she wanted to answer the question. Second, in case 'I don't know' was not selected, the respondent had to choose between 'true' and 'false'.

Therefore, it is important to model the decision to answer the knowledge questions in addition to analyzing the number of correctly answered questions. The literature on count data suggests two models: the hurdle model and the zero-inflated model. Winkelmann (2008, p. 189) recommends using a zero-inflated model once there is more than one reason for the occurrence of zeros. Therefore, our preferred model is a zero-inflated Poisson model (Lambert, 1992).¹⁵ This means that our results always come in two parts: a logit regression for the probability of a zero outcome, and a Poisson regression for the number of correct answers to question 7. The explanatory variables in the two parts of the model can be different. However, in practice, the independent variables used in the logit regression are often also used in the Poisson regression (Cameron and Trivedi, 2007, p. 127).

The estimation results for four zero-inflated Poisson models are presented in Table 8, whereas Table 9 shows marginal effects computed at sample means. Column (1) of Table 8 presents the results if the variables in the X vector are included, as well as the desire to be informed (D), self-interest ($SI1$), the no ideology variable (ID), and education (ED). Respondents with a strong desire to be informed, strong self-interest, a high social status, who live in urbanized areas, are less likely to have a zero score in the logit model, i.e., they are more inclined to answer the knowledge questions.¹⁶ In contrast, respondents without a clear ideology are less likely to receive a positive score. The results for the Poisson regression suggest that male respondents with strong self-interest, a clear ideology, higher education, and a high social status are more likely to answer the statements about the ECB's monetary policy correctly, while elderly respondents and respondents who have a partner are more likely to have less knowledge about the ECB's monetary policy. The marginal effects (Table 9) indicate that the included covariates have a significant impact on the

¹⁵ We compared the outcomes against a hurdle model (Mullahy, 1986). The parameter estimates for the two models were very similar. This is probably due to the small fraction (0.8%) of 'true' zeros.

¹⁶ Note that in columns (2) and (3) of Table 8 the coefficient of *city* is not significant in the logit model.

number of correct answers, except for education.¹⁷ Although the desire to be informed is not significant in the Poisson part of the model, the overall marginal effect is significant. The intuition is that the desire to be informed has a strong effect on the decision to answer the question, as shown in the logit regression.

In column (2) of Table 8 we add three variables reflecting the most important source of information on the ECB's monetary policy according to the respondents. The marginal effects in Table 9 are significant for all three media variables. This shows that respondents who use information have better knowledge than those 8% of the respondents who do not use any information at all. Next, we replace S by Q , our proxy for the quantity of information. As it turns out, this proxy is positive and significant for the case of television and newspapers (Table 9, column 3). This means that greater use of television and newspapers to learn about ECB policies has a positive relationship with actual knowledge about ECB objectives. Finally, we insert the intensity of information variables QH and QL (column 4 of Table 8). Respondents with relatively low information intensity – a relatively high share of sources through which they *never* obtain information on the ECB – are less inclined to answer the knowledge questions. Given that respondents answer the knowledge questions, those with high information intensity – a relatively high share of sources through which they *regularly* receive information on ECB's policy – have a better understanding of the ECB's goal. Overall, both QH and QL have a significant effect on the number of correct answers (Table 9, column 4). As expected, QH is positively and QL is negatively related to knowledge.

Overall, the results for the three sets of media variables suggest that obtaining more information leads to better knowledge on monetary policy. This implies that the media channel may be a useful channel for central banks to improve the public's knowledge.

¹⁷ Note that education may still play a significant role via the desire to be informed (see Table 5).

[Insert Tables 8 and 9 here]

To assess whether the difference between true and false statements is important, we repeated the analysis for determinants of knowledge. We now use OLS regressions where the dependent variables are the fraction of correctly answered true and false statements. Once again, we estimate three types of models, based on the type of media variables (*S*, *Q* or *QH* and *QL*) included. The results are shown in Table 10.

First, the result that obtaining information through the media improves knowledge continues to hold for true and false statements. There is even a clearer effect of *QL*, but only in case of the true statements. Still, some interesting differences compared to the results based on the total number of correct answers show up. First, the desire to be informed has a significant effect in all three models, but only for the true statements. Second, the demographic variables continue to be important, but often only in the case of the false statements.¹⁸

[Insert Table 10 here]

7. Is the level of knowledge related to inflation expectations?

We now turn to the final question: ‘To what extent are inflation expectations and knowledge on the ECB’s objective related?’. To address this issue, we use the following standard question from the DHS: ‘*What do you think is the most likely price increase (increase of consumer prices) over the next twelve months?*’. Figure 8 shows the distribution of the answers to this question.¹⁹ The expectations range between 1% and 10%, with the mode and median at 2%, while the mean is around 2.7%.

¹⁸ One concern regarding the knowledge regressions could be that participation in the DHS itself leads to better knowledge. We included length of participation in the panel as an additional regressor, but this variable had no significant effect.

¹⁹ Admittedly, our test is indirect, as these expectations pertain to Dutch consumer prices. Expectations for the euro area inflation are, however, not included in the DHS.

[Insert Figure 8 here]

There is a well-established literature regarding survey data on household expectations. A number of papers are closely related to our work in their use of micro-level data.²⁰ In an early contribution, Jonung (1981) shows how perceived and expected rates of inflation in a cross-section of Swedish households differ between various demographic groups. Differences between demographic groups are also found for the United States by Bryan and Venkatu (2001). Using the household data underlying the Michigan Index of Consumer Sentiment, Souleles (2004) finds evidence that household expectations are biased as well as inefficient. However, expectations are still economically meaningful, as they are useful in forecasting future consumption. Finally, Branch (2004, 2007) uses micro-data from the Michigan Survey of Consumers over the period 1977 to 1993 to study endogenous model uncertainty and models incorporating sticky-information as introduced by Mankiw and Reis (2002).

Table 11 gives a breakdown of inflation expectations reported by DHS members in April 2009 along various dimensions. In line with the literature, we find that inflation expectations vary across demographic groups. Men have lower inflation expectations than women, expectations decline with income and social-economic status, and individuals with high levels of education expect lower increases in consumer prices. Finally, expectations are relatively high for the young and old, and low for the middle-aged. We also find that the desire to be informed has a negative relationship with the level of expectations, and that people who have not thought about political ideologies expect higher levels of inflation.

[Insert Table 11 here]

²⁰ Most papers focus on the aggregate dynamics of household expectations. See Carroll (2003) for an important contribution. For expectations of experts, there is more research on individual forecasts. See, for instance, Doovern, Fritsche and Slačálek (2009) or Capistrán and Timmermann (2009).

Next, we turn to a more formal analysis of expectations. Our survey does not enable us to explore time-variation in inflation expectations.²¹ However, we have a very rich set of background variables, which we can use to explain the cross-sectional variation in expectations. We use this rich data-set to answer the question: ‘Does knowledge on monetary policy help in generating realistic inflation expectations?’. To do so, we first define ‘realistic’ expectations. Looking at Figure 8, a first point is that some respondents clearly expect a too high level of inflation. For instance, this would certainly apply to the nineteen individuals who expect a price increase of 10% over the next twelve months. It probably also applies to those respondents who expect inflation rates of 5% or higher. What about low levels of expected inflation? For instance, 2% may not seem unrealistic. On the other hand, at the time of our survey, professional forecasters were expecting Dutch inflation to be moderate, with the consensus lying around 1%.²² In the end, the actual rate of increase in Dutch consumer prices between April 2009 and April 2010 turned out to be 1.1%. From that perspective, an expected price increase of 2% may already be considered as too high. As the threshold between realistic and unrealistic expectations is not clear, we use two cut-off points: 1% and 2%, meaning that unrealistic expectations start at 2% and 3%, respectively.²³ Under these two definitions, the percentage of individuals with realistic expectations is, respectively, 17.8% and 55.9%.

To explain the variation in realism of inflation expectations, we use probit regressions where the dependent variable is a binary dummy. This dummy equals 1 in case the respondent has realistic expectations, and 0 otherwise. The key explanatory variable is the level of knowledge on ECB monetary policy. The first measure we use is the correct number of answers to statements about the ECB’s objective. The second measure is the fraction of correctly answered true and false statements. As control variables, we include all the variables that were used in Table 8 to explain

²¹ In any case, the DHS only includes the question on inflation expectations since the 2008 wave, so the sample would still have been limited.

²² In March 2009, the Netherlands Bureau of Economic Analysis was projecting an increase of consumer prices of 1% for 2009 and 2010. The April 2009 Consensus Forecasts for these two years were in the same range.

²³ We also investigated thresholds at 3% and 4%. These results were similar to those with the threshold at 2%.

knowledge. Finally, we include the degree to which respondents' work is related to economic, monetary or financial issues (*SI3*), as this variable may be relevant for the extent to which realistic expectations are formed. Table 12 shows marginal effects for four probit regressions. The first two columns use the threshold of 1%, while the latter two columns use the threshold of 2%. The included media variables are those that measure the most important source of information (*S*). Results using *Q*, or *QH* and *QL* were similar.

[Insert Table 12 here]

The regression results show that knowledge on monetary policy matters. The respondents' ability to formulate realistic inflation expectations is positively related to their level of knowledge on the ECB's objectives. Respondents who gave a higher number of correct answers also have a higher probability of giving realistic figures for inflation over the next twelve months (columns 1 and 3). Starting from the mean number of correct answers, an additional correct answer would increase the probability of realistic expectations with 1 to 2%. Again, the difference between true and false statements turns out to be important. As shown in the second and fourth columns of Table 12, it is mainly the individual's ability to answer false statements correctly that is positively related to the ability to formulate realistic expectations.²⁴

Turning to the other variables, the threshold for realistic expectations becomes relevant. If the threshold for realistic expectations is at 1%, the desire to be informed is significant, whereas for higher thresholds, ideology and age are significant. As 1% is the strictest criterion, it is perhaps not surprising that precisely those individuals, who have a strong motivation to obtain information, have a higher likelihood of formulating realistic expectations. For less strict definitions of realistic expectations, individuals who have not thought about ideology have about a 10% lower probability

²⁴ We also ran regressions without including the respondents who answered none of the knowledge questions. The results, which are available upon request, were similar.

of formulating realistic expectations than those who have thought about this subject. Also, the elderly have a somewhat lower probability of formulating realistic expectations. Finally, it is quite remarkable that *S13* is never significant. Intuitively, we would have expected that the extent to which people's jobs are related to economic issues would have been relevant for the quality of their expectations.

8. Conclusions and policy implications

Does the general public know what central banks do? Is this kind of knowledge relevant? Based on our analysis, we would answer these questions with: 'partially, at most' and 'yes, it is'. So far, research on central bank transparency and communication has focused on the impact of communication on financial markets. We report the outcomes of a survey that examines how well the general public understands the objectives of the ECB. We not only assess the respondents' understanding, but also examine whether the channels they use to obtain information about monetary policy affects their understanding. In general, more intensive use of information results in better knowledge, suggesting that the media channel may play an important and constructive role in building knowledge.

There is a lot of potential to build knowledge, as we find that understanding of monetary policy is far from perfect. The average number of correct answers to eleven statements about the ECB's objectives is less than five. One particular issue is that many respondents think that the ECB's inflation target applies to *individual* countries. This finding is potentially worrisome. Even at times when the ECB meets its inflation target, it may face criticism in countries where national inflation rates deviate from the 'close to but below two percent' target.

Our survey suggests two further reasons for concern. About a quarter of the respondents express little interest in being informed about monetary policy. Our survey also shows that few individuals see clear reasons why monetary policy would affect them personally. Rather, monetary policy is considered important for the economy as a whole. Second, we find that even survey

participants who believe they have adequate knowledge fail to fully understand the ECB's objectives. Both a weak desire to be informed and unawareness of insufficient knowledge constitute important barriers to improve the public's understanding. Although central bank communication can be used as a tool to improve knowledge, it will be difficult to reach those members of the public who see no clear reasons to listen. Therefore, to overcome the various barriers, central bank communication should not only focus on content in order to improve knowledge. Rather, it should also aim to convince people of the importance of monetary policy.

To what extent is knowledge about monetary policy relevant for the general public? First, as noted by Blinder et al. (2008), it is the public that gives central banks their democratic legitimacy, and hence their independence. To this end, it is crucial that the public understands what monetary authorities do. Our paper presents a second dimension to the case for adequate understanding, as we find that the level of knowledge on monetary policy has economic implications. Our results indicate that individuals with better knowledge about monetary policy objectives have a higher probability of formulating realistic inflation expectations. This suggests there are important returns to this kind of knowledge, as the ability to make a realistic assessment of future price developments is crucial for adequate household financial decision-making. It would be interesting to explore the effects of knowledge about monetary policy along other economic dimensions. We leave this for future research.

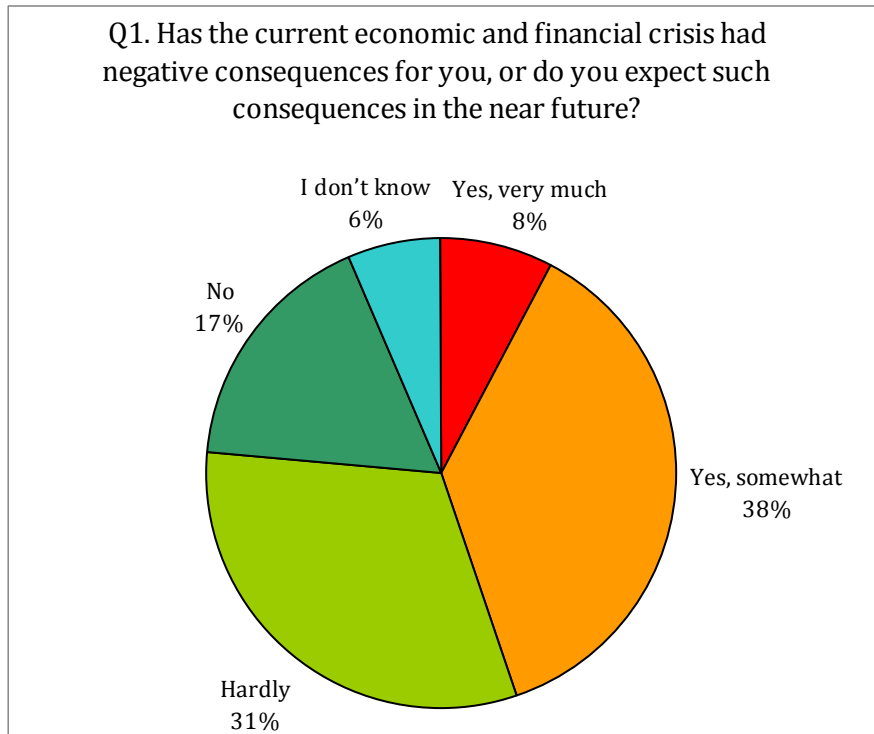
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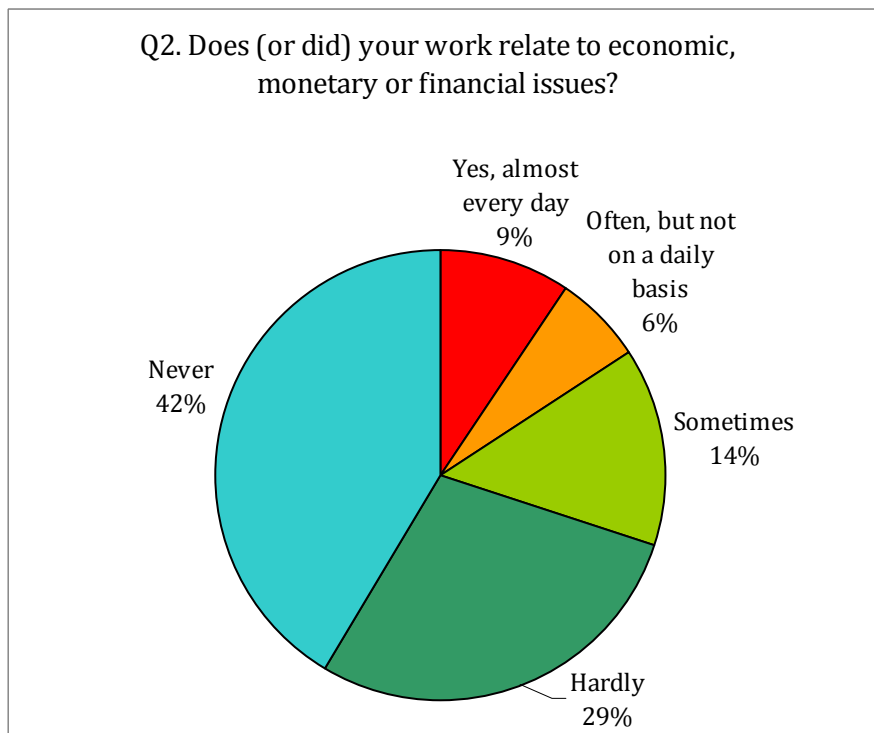
FIGURES AND TABLES

Figure 1. Impact of crisis on respondents



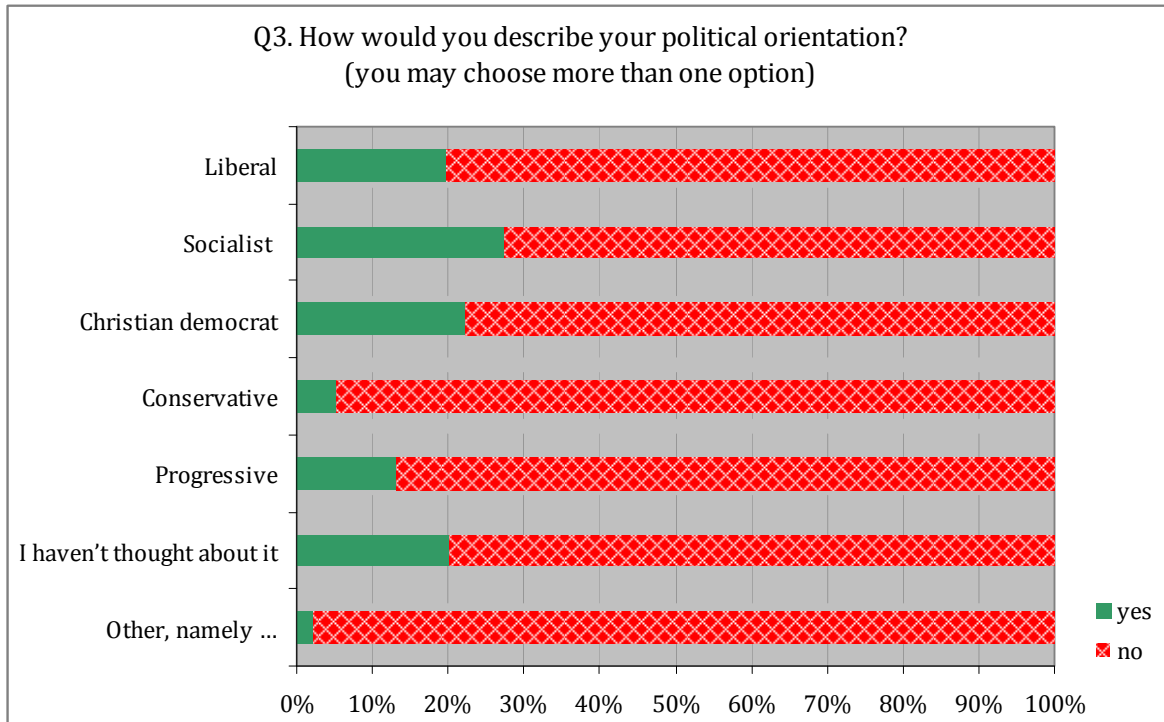
Note: N=1659.

Figure 2. Working environment of respondents



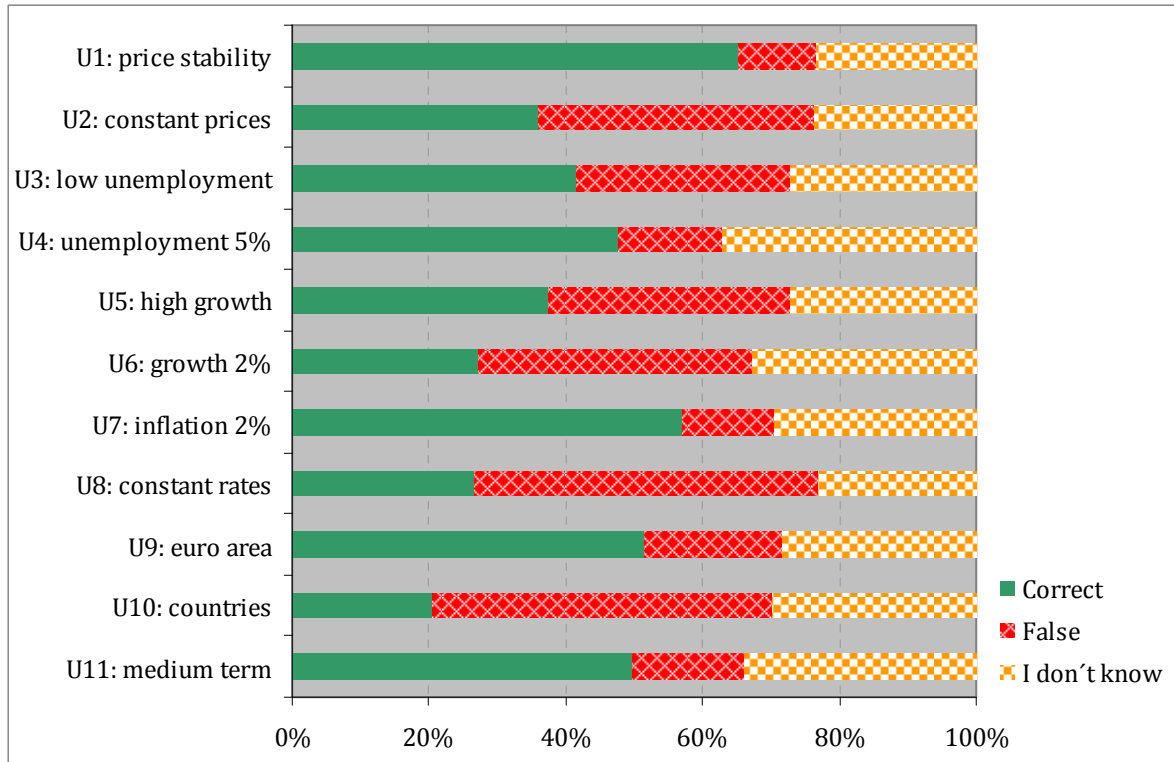
Note: N=1659.

Figure 3. Self-declared ideological position



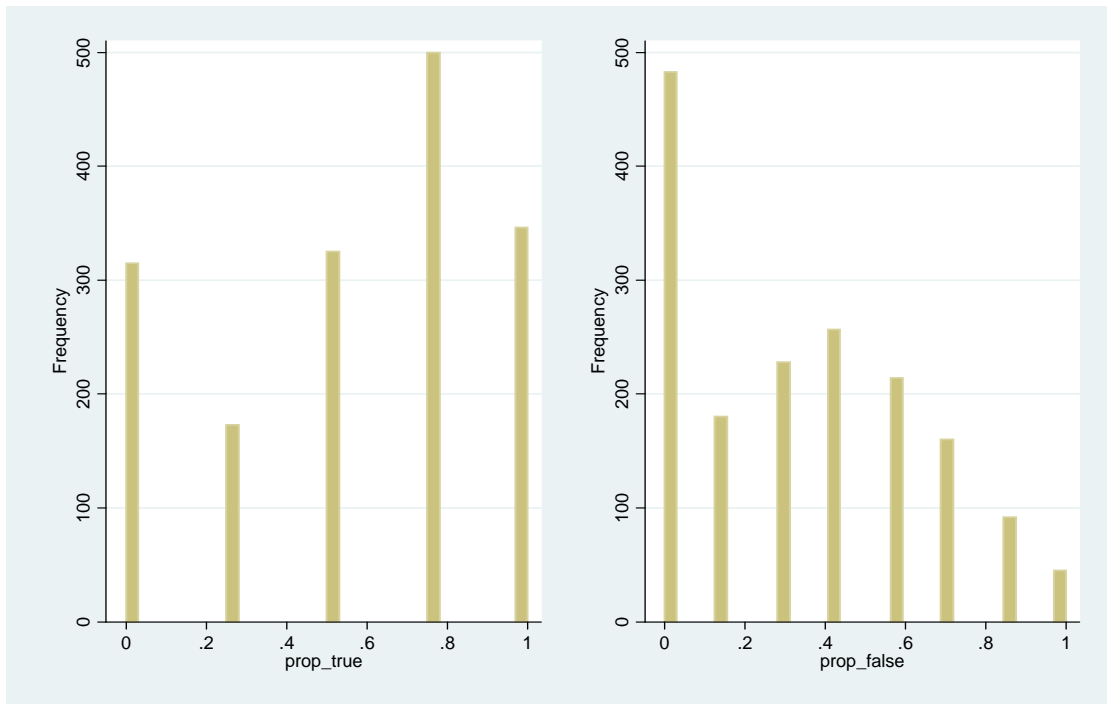
Note: N=1659.

Figure 4. Understanding: Distribution of answers per question



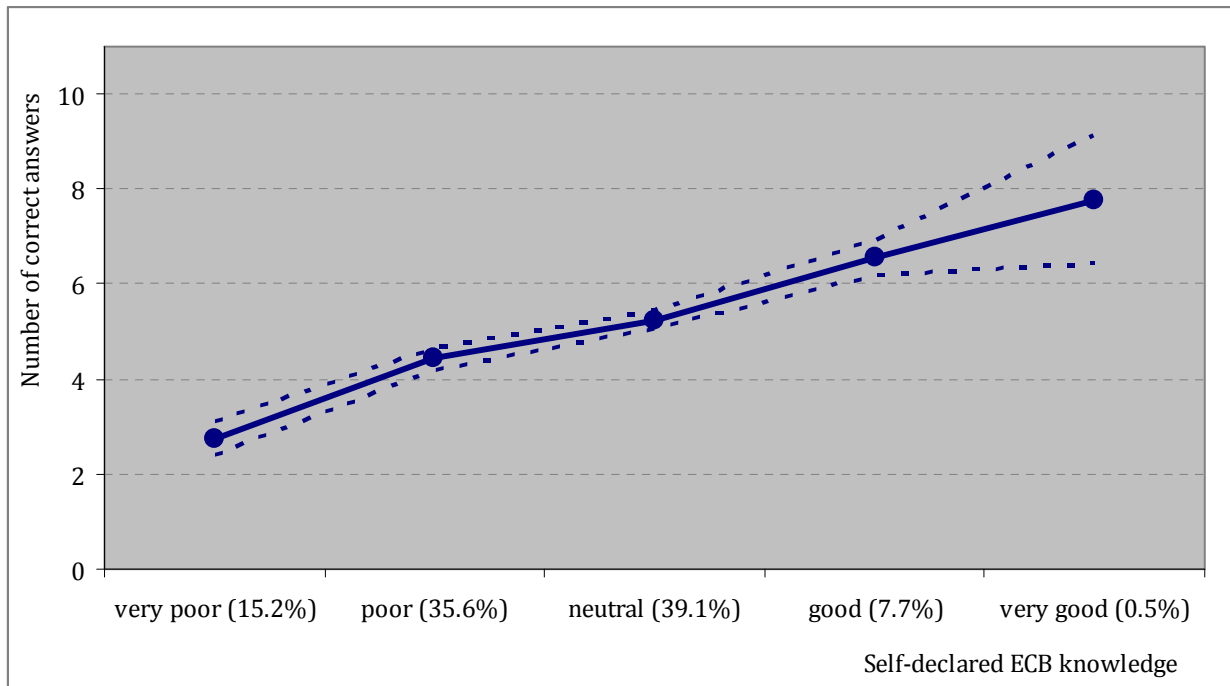
Note: N=1659. The horizontal bars denote the percentage of correct (solid) and incorrect (crossed) answers to the eleven statements on the ECB's main objective. The checkered bars denote the percentage of respondents who answered 'I don't know'.

Figure 5. Correct answers to true and false statements



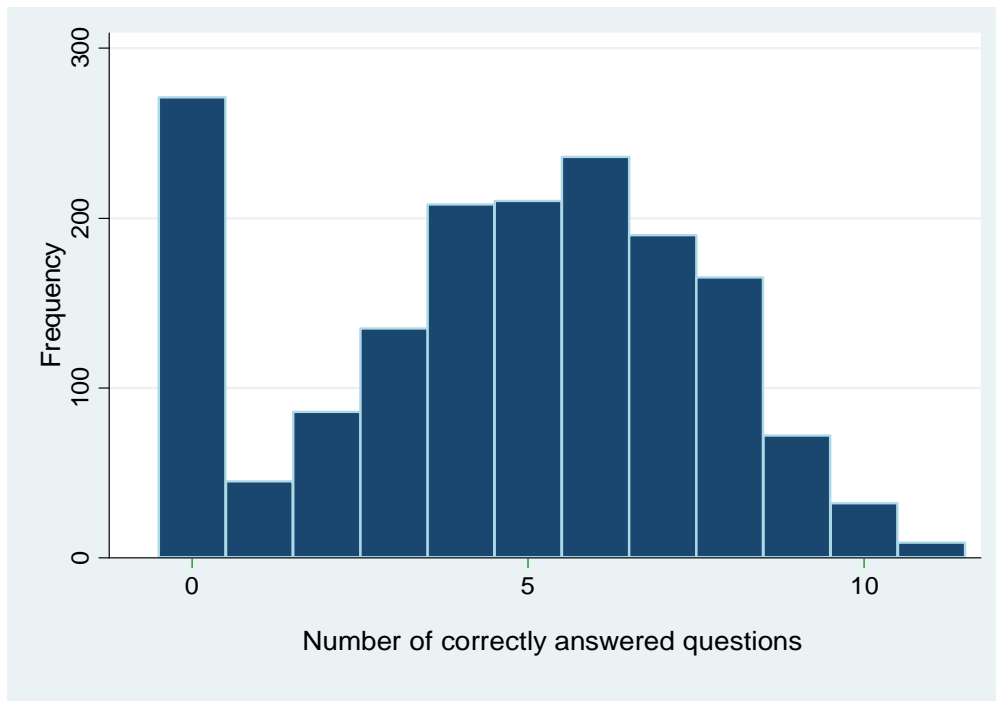
Note: The histograms show the proportion of correct answers to true (left panel) and false (right panel) statements. The vertical axis measures the number of respondents per category, the horizontal axis measures the fraction of correct answers. True statements were items 1, 7, 9 and 11 of question 7 of our survey. The remaining seven statements were false.

Figure 6. Actual versus self-declared knowledge



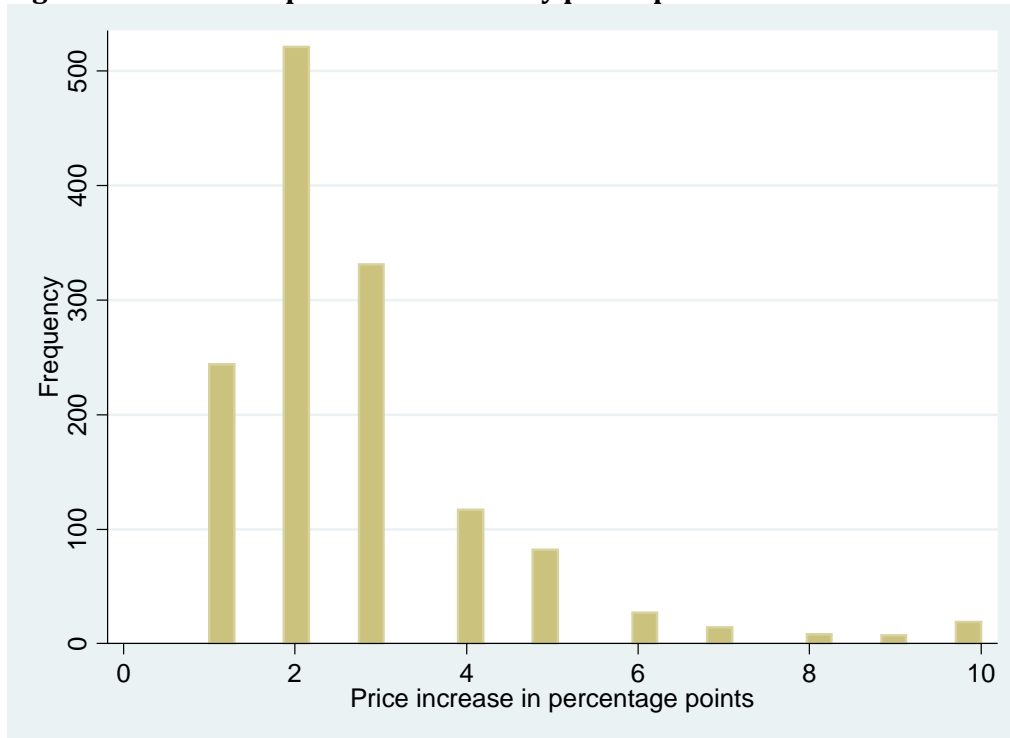
Note: N=1628. Response shares between parentheses (1.9% of respondents did not report self-assessment). The circles denote the average number of correct questions, the dotted lines the 95% confidence interval.

Figure 7. Understanding: Distribution of number of correctly answered questions



Note: N=1659. The histogram shows the number of correct answers to our eleven statements regarding the ECB's main objective of price stability.

Figure 8. Inflation expectations of survey participants



Note: This graph shows the distribution of inflation expectations for the participants in our survey. Of the 1659 respondents to our survey, 1370 answered the regular DHS question on inflation expectations. The precise wording of the question is: 'What do you think is the most likely price increase (increase of consumer prices) over the next twelve months?'. The responses were given in April 2009.

Table 1. Summary statistics

	Survey mean	Population mean
Sex (% males)	55.1%***	49.0%
Age	52.6***	46.9
Household size	2.5***	2.2
Partner (1=living together with partner, 0=otherwise)	0.78***	0.62
City weighted average (1=rural, 5 highly urbanized)	2.99	3.03
Monthly gross household income (*1000 euros)	3.77***	5.61
Education (0=low, 1=high)	0.36***	0.25
Region	proportion differences range from -0.03 to 0.01	

Source for population means: Statistics Netherlands (CBS) data for 2009.

Notes:

- 1) For variables sex and age, we are able to use specific data on the population over 16. For education, CBS-data cover 15-65 year old. For other variables, we use data on the total population. For income, data was only available yet for 2008.
- 2) Education is coded as 1 if higher vocational education and/or university education was highest degree, and 0 if otherwise.
- 3) For region, we use the proportion of survey participants living in province x minus the actual proportion of people aged 15 years or older in province x.
- 4) *** denotes significant differences at the 1% level between survey and population means.

Table 2. Importance of being informed on the policies of the European Central Bank

	Frequency	Percentage	Cumulative
Not important at all	71	4.3	4.3
Not very important	366	22.1	26.3
Somewhat important	797	48.0	74.4
Very important	247	14.9	89.3
Extremely important	58	3.5	92.8
I don't know	120	7.2	100.0

Note: N=1659. This table shows the distribution of answers to question 5 of our questionnaire: 'How important is it to you to be well informed on the policies of the European Central Bank (ECB)?'.

Table 3. Reasons why respondents want to be informed

	(a) Not important at all	(b) Not very important	(c) Somewhat important	(d) Very important	(e) Extremely important	(f) I don't know	Rank (based on c+d+e or d+e)
ECB policy affects my personal or family income	9.0%	18.9%	32.4%	16.0%	4.0%	19.8%	4
ECB policy influences how much my money can buy	4.8%	12.3%	34.3%	26.0%	5.5%	17.0%	3
ECB policy affects my business/job/profession	26.9%	19.1%	20.1%	10.0%	2.7%	21.2%	6
ECB policy affects the value of my stocks or other investments	26.4%	16.0%	20.5%	14.0%	4.1%	19.0%	5
ECB policy is important for the economy	1.8%	4.8%	21.9%	38.8%	18.1%	14.6%	1
I just like to keep informed well	5.7%	14.4%	32.4%	25.1%	11.0%	11.3%	2

Note: N=1468.

Table 4. Most important source of information on the ECB

	Proportion	Std. Err.	95% Confidence Interval
Television	0.42	0.01	(0.39,0.44)
Radio	0.05	0.01	(0.04,0.06)
Newspapers	0.33	0.01	(0.30,0.35)
Magazines	0.02	0.00	(0.01,0.02)
Internet	0.05	0.01	(0.04,0.06)
Friends/relatives/colleagues	0.01	0.00	(0.00,0.01)
I don't use any sources on ECB policy	0.08	0.01	(0.07,0.10)
I don't know	0.04	0.01	(0.03,0.05)
Other	0.01	0.00	(0.00,0.01)

Note: N=1400.

Table 5. The determinants of the respondents' desire to be informed (D)

VARIABLES	Dependent variable: desire to be informed (<i>D</i>)			
	(1)	(2)	(3)	(4)
<i>Self-interest (SI1)</i>			0.03** (0.01)	0.03** (0.01)
<i>No ideology (ID)</i>				-0.21*** (0.08)
<i>Education (ED)</i>		0.21*** (0.06)	0.16** (0.06)	0.13** (0.07)
<i>Age</i>	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)
<i>Male</i>	0.34*** (0.06)	0.34*** (0.06)	0.26*** (0.07)	0.26*** (0.07)
<i>Partner</i>	-0.07 (0.07)	-0.06 (0.07)	-0.05 (0.07)	-0.04 (0.07)
<i>Status</i>	0.07*** (0.03)	0.03 (0.03)	0.01 (0.03)	0.01 (0.03)
<i>City</i>	0.02 (0.02)	0.01 (0.02)	0.01 (0.02)	0.01 (0.02)
Observations	1530	1525	1491	1491
Pseudo R ²	0.06	0.06	0.06	0.06
McKelvey & Zavoina's Pseudo R ²	0.10	0.10	0.11	0.11

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table reports parameter estimates for ordered probit models. The dependent variable ranges between 1 (not important at all to be informed) and 5 (extremely important to be informed).

Table 6. The determinants of preferred media use (S)

VARIABLES	(1) TV	(2) Newspapers	(3) Other	(4) No sources
<i>Desire to be informed (D)</i>	0.03 (0.02)	0.02 (0.02)	0.04*** (0.01)	-0.01* (0.01)
<i>Self-interest (SI1)</i>	-0.01** (0.01)	0.01* (0.01)	0.01* (0.00)	-0.00 (0.00)
<i>No ideology (ID)</i>	-0.10** (0.04)	-0.09** (0.04)	0.04 (0.03)	0.05** (0.02)
<i>Education (ED)</i>	-0.08** (0.03)	0.09*** (0.03)	-0.01 (0.02)	0.00 (0.01)
<i>Age</i>	-0.00*** (0.00)	0.01*** (0.00)	-0.00*** (0.00)	0.00 (0.00)
<i>Male</i>	-0.06* (0.03)	0.04 (0.03)	0.03 (0.02)	-0.00 (0.01)
<i>Partner</i>	-0.01 (0.03)	-0.01 (0.03)	0.02 (0.02)	0.02** (0.01)
<i>Status</i>	-0.01 (0.02)	0.00 (0.01)	0.01 (0.01)	-0.01** (0.00)
<i>City</i>	-0.02 (0.01)	0.01 (0.01)	0.01** (0.01)	0.01* (0.00)
Probability (prefer = 1)	0.42	0.33	0.14	0.04
Pseudo R ²	0.03	0.07	0.03	0.09
McKelvey & Zavoina's Pseudo R ²	0.04	0.09	0.03	0.03

Note: Robust standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1. The table reports marginal effects for probit estimations. The dependent variables equal 1 if respondents prefer a particular source of information. The category 'other' contains respondents who prefer radio, magazines, internet, friends, family, colleagues or other sources. The last column shows results for respondents who use no media sources to obtain information about the ECB's policies. All regressions are based on 1318 observations. Marginal effects are computed at the sample means, except for binary dummies.

Table 7. Determinants of degree in which media is used (Q)

VARIABLES	(1) TV	(2) Radio	(3) Newspapers	(4) Magazines	(5) Internet
<i>Desire to be informed (D)</i>	0.49*** (0.05)	0.43*** (0.04)	0.49*** (0.04)	0.38*** (0.05)	0.49*** (0.05)
<i>Self-interest (SI1)</i>	-0.01 (0.01)	-0.00 (0.01)	0.03* (0.01)	0.04*** (0.02)	0.01 (0.02)
<i>No ideology (ID)</i>	-0.37*** (0.09)	-0.22** (0.10)	-0.29*** (0.09)	-0.17 (0.12)	-0.24** (0.11)
<i>Education (ED)</i>	-0.10 (0.08)	0.05 (0.08)	0.04 (0.08)	-0.07 (0.09)	-0.09 (0.09)
<i>Age</i>	0.00 (0.00)	0.00 (0.00)	0.01*** (0.00)	0.01*** (0.00)	-0.02*** (0.00)
<i>Male</i>	0.20*** (0.07)	0.29*** (0.07)	0.22*** (0.07)	0.20** (0.09)	0.33*** (0.08)
<i>Partner</i>	0.13 (0.08)	0.17** (0.08)	0.14* (0.08)	-0.02 (0.09)	0.04 (0.08)
<i>Status</i>	0.02 (0.03)	0.04 (0.03)	0.10*** (0.03)	0.09** (0.04)	0.05 (0.04)
<i>City</i>	-0.02 (0.02)	0.02 (0.02)	0.01 (0.02)	0.04 (0.03)	-0.02 (0.03)
Observations	1433	1415	1426	1386	1400
Pseudo R ²	0.09	0.08	0.13	0.10	0.08
McKelvey & Zavoina's Pseudo R ²	0.15	0.13	0.22	0.13	0.13

Note: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table reports parameter estimates for ordered probit models. The dependent variable measures the use of a particular type of media on a scale from 1 (never) to 3(regular).

Table 8. Determinants of knowledge about ECB monetary policy

VARIABLES	(1)		(2) <i>S</i>		(3) <i>Q</i>		(4) <i>QH and QL</i>	
	Poisson	Logit	Poisson	Logit	Poisson	Logit	Poisson	Logit
<i>Desire to be informed (D)</i>	0.01 (0.01)	-0.80*** (0.15)	-0.01 (0.02)	-0.57*** (0.21)	-0.01 (0.02)	-0.68*** (0.19)	-0.01 (0.02)	-0.63*** (0.18)
<i>Self-interest (SI1)</i>	0.02*** (0.00)	-0.13*** (0.05)	0.02*** (0.00)	-0.19*** (0.06)	0.02*** (0.00)	-0.10* (0.05)	0.02*** (0.00)	-0.12** (0.05)
<i>No ideology (ID)</i>	-0.12*** (0.04)	0.86*** (0.21)	-0.11*** (0.04)	0.67** (0.29)	-0.10*** (0.04)	0.52** (0.25)	-0.11*** (0.04)	0.71*** (0.24)
<i>Education (ED)</i>	0.07*** (0.03)	0.43* (0.24)	0.05** (0.03)	0.27 (0.32)	0.07*** (0.03)	0.22 (0.28)	0.07** (0.03)	0.33 (0.26)
<i>Age</i>	-0.00*** (0.00)	-0.00 (0.01)	-0.00*** (0.00)	0.00 (0.01)	-0.00*** (0.00)	0.00 (0.01)	-0.00*** (0.00)	0.00 (0.01)
<i>Male</i>	0.12*** (0.03)	-0.15 (0.21)	0.11*** (0.03)	0.20 (0.28)	0.10*** (0.03)	0.04 (0.24)	0.11*** (0.03)	-0.01 (0.22)
<i>Partner</i>	-0.07*** (0.03)	0.28 (0.26)	-0.08*** (0.03)	0.29 (0.35)	-0.07*** (0.03)	0.35 (0.30)	-0.08*** (0.02)	0.28 (0.26)
<i>Status</i>	0.02** (0.01)	-0.38*** (0.10)	0.02** (0.01)	-0.26** (0.13)	0.02* (0.01)	-0.31*** (0.12)	0.02* (0.01)	-0.32*** (0.10)
<i>City</i>	0.01 (0.01)	-0.18** (0.07)	0.01 (0.01)	-0.11 (0.09)	0.01 (0.01)	-0.12 (0.09)	0.01 (0.01)	-0.15* (0.08)
<i>S or Q:</i>								
<i>TV</i>			0.06 (0.05)	-0.74** (0.30)	0.03 (0.02)	-0.34 (0.24)		
<i>Radio</i>					0.03 (0.02)	-0.06 (0.23)		
<i>Newspapers</i>			0.08* (0.05)	-1.55*** (0.39)	0.03* (0.02)	-0.77*** (0.20)		
<i>Internet</i>					0.02 (0.02)	0.15 (0.34)		
<i>Friends and relatives</i>					-0.00 (0.02)	-0.05 (0.24)		
<i>Magazines</i>					-0.03 (0.02)	-0.17 (0.35)		
<i>Other</i>			0.13** (0.05)	-1.58*** (0.52)				
<i>QH</i>							0.23*** (0.06)	-0.78 (1.37)
<i>QL</i>							-0.00 (0.05)	1.60*** (0.54)
<i>Constant</i>	1.62*** (0.07)	2.08*** (0.59)	1.62*** (0.08)	1.25 (0.79)	1.56*** (0.08)	2.95*** (0.82)	1.69*** (0.08)	0.04 (0.80)
Observations	1491	1491	1318	1318	1338	1338	1452	1452
McKelvey & Zavoina's Pseudo R ²		0.18		0.17		0.20		0.19

Note: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table reports parameter estimates for four zero-inflated Poisson models. For each model, there is a separate column with the results for the Poisson regression and the logit regression. For the S-variables in column 2, we have collected various sources into the category 'other', because of the low number of observations for individual categories.

Table 9. Marginal effects based on zero-inflated Poisson models

VARIABLES	(1)	(2)	(3)	(4)
		<i>S</i>	<i>Q</i>	<i>QH and QL</i>
<i>Desire to be informed (D)</i>	0.36*** (0.08)	0.09 (0.09)	0.14 (0.09)	0.14 (0.09)
<i>Self-interest (SI1)</i>	0.14*** (0.03)	0.14*** (0.03)	0.12*** (0.03)	0.13*** (0.03)
<i>No ideology (ID)</i>	-0.93*** (0.20)	-0.75*** (0.22)	-0.67*** (0.20)	-0.79*** (0.20)
<i>Education (ED)</i>	0.17 (0.15)	0.22 (0.15)	0.30* (0.15)	0.23 (0.15)
<i>Age</i>	-0.02*** (0.00)	-0.02*** (0.01)	-0.02*** (0.00)	-0.02*** (0.00)
<i>Male</i>	0.65*** (0.15)	0.53*** (0.15)	0.53*** (0.15)	0.56*** (0.15)
<i>Partner</i>	-0.45*** (0.16)	-0.52*** (0.15)	-0.44*** (0.15)	-0.48*** (0.15)
<i>Status</i>	0.27*** (0.07)	0.18*** (0.07)	0.20*** (0.07)	0.21*** (0.07)
<i>City</i>	0.12** (0.05)	0.06 (0.05)	0.09* (0.05)	0.09** (0.05)
<i>S or Q:</i>				
<i>TV</i>		0.52** (0.15)	0.27** (0.13)	
<i>Radio</i>			0.16 (0.11)	
<i>Newspapers</i>		0.80*** (0.27)	0.39*** (0.12)	
<i>Internet</i>			0.01 (0.12)	
<i>Friends and relatives</i>			-0.09 (0.16)	
<i>Magazines</i>			0.05 (0.14)	
<i>Other</i>		1.07*** (0.30)		
<i>QH</i>				1.40*** (0.49)
<i>QL</i>				-0.53* (0.30)

Note: Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table reports marginal effects evaluated at sample means for the four zero-inflated Poisson models shown in Table 8.

Table 10. Determinants of knowledge: the difference between true and false statements

VARIABLES	S		Q		QH and QL	
	(1) True	(2) False	(3) True	(4) False	(5) True	(6) False
<i>Desire to be informed (D)</i>	0.06*** (0.01)	-0.01 (0.01)	0.06*** (0.01)	0.00 (0.01)	0.06*** (0.01)	-0.00 (0.01)
<i>Self-interest (SI1)</i>	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01*** (0.00)
<i>No ideology (ID)</i>	-0.11*** (0.03)	-0.05** (0.02)	-0.12*** (0.03)	-0.04* (0.02)	-0.13*** (0.03)	-0.06*** (0.02)
<i>Education (ED)</i>	-0.00 (0.02)	0.03 (0.02)	-0.01 (0.02)	0.04** (0.02)	-0.01 (0.02)	0.03* (0.02)
<i>Age</i>	-0.00* (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)	-0.00*** (0.00)
<i>Male</i>	0.01 (0.02)	0.06*** (0.02)	0.00 (0.02)	0.06*** (0.02)	0.01 (0.02)	0.06*** (0.02)
<i>Partner</i>	-0.02 (0.02)	-0.07*** (0.02)	-0.02 (0.02)	-0.06*** (0.02)	-0.01 (0.02)	-0.06*** (0.02)
<i>Status</i>	0.01 (0.01)	0.03*** (0.01)	0.01 (0.01)	0.03*** (0.01)	0.01 (0.01)	0.03*** (0.01)
<i>City</i>	0.01 (0.01)	0.01 (0.01)	0.01* (0.01)	0.01* (0.01)	0.01* (0.01)	0.01* (0.01)
<i>S or Q:</i>						
<i>Tv</i>	0.13*** (0.03)	0.04 (0.03)	0.06*** (0.02)	0.02 (0.02)		
<i>Radio</i>			0.02 (0.01)	0.01 (0.01)		
<i>Newspapers</i>	0.13*** (0.03)	0.08*** (0.03)	0.04** (0.02)	0.05*** (0.01)		
<i>Internet</i>			0.00 (0.02)	0.00 (0.01)		
<i>Friends and relatives</i>			-0.00 (0.02)	-0.02 (0.02)		
<i>Magazines</i>			-0.01 (0.02)	0.00 (0.02)		
<i>Other</i>	0.15*** (0.04)	0.11*** (0.03)				
<i>QH</i>					0.10* (0.05)	0.10** (0.04)
<i>QL</i>					-0.12*** (0.04)	-0.05 (0.03)
<i>Constant</i>	0.33*** (0.06)	0.26*** (0.05)	0.21*** (0.06)	0.17*** (0.05)	0.46*** (0.06)	0.28*** (0.06)
Observations	1318	1318	1338	1338	1452	1452
Adjusted R ²	0.09	0.12	0.13	0.12	0.12	0.12

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 The table reports results for OLS regressions, where the fractions of correctly answered true and false statements about the ECB's objectives are the dependent variables.

Table 11. Summary statistics for the level of inflation expectations

	Mean	Standard deviation	Number of observations
Full sample	2.73	1.64	1370
<i>Breakdown by:</i>			
<i>Age</i>			
Younger than 20	3.12	1.78	33
Between 20 and 39	2.61	1.56	274
Between 40 and 64	2.69	1.60	719
Between 65 and 79	2.83	1.75	316
80 or older	3.04	2.00	28
<i>Gender **</i>			
Male	2.64	1.53	771
Female	2.83	1.77	599
<i>Partner</i>			
Living with a partner	2.74	1.66	1061
Not living with a partner	2.68	1.59	309
<i>Income</i>			
Low income	2.89	1.81	605
Medium income	2.63	1.46	601
High income	2.48	1.55	164
<i>Education **</i>			
No higher vocational education or university	2.81	1.72	874
Higher vocational education or university	2.58	1.48	491
<i>Social-economic status</i>			
1 (= lowest)	4.32	2.58	19
2	2.91	1.76	297
3	2.77	1.70	333
4	2.59	1.40	441
5 (=highest)	2.57	1.64	276
<i>City</i>			
1 (= least urbanised)	2.83	1.87	224
2	2.56	1.38	311
3	2.67	1.52	289
4	2.94	1.92	324
5 (=most urbanised)	2.60	1.43	215
<i>Desire to be informed</i>			
1 (= lowest)	3.20	2.01	59
2	2.86	1.74	289
3	2.63	1.54	677
4	2.63	1.56	202
5 (=highest)	2.39	1.53	46
<i>Ideology ***</i>			
No ideology	3.26	2.11	276
Ideology	2.59	1.47	1094

Note: This table provides summary statistics for inflation expectations along various dimensions. The inflation expectations were surveyed in April 2009, and pertain to the expected change in Dutch consumer prices for the next 12 months. For the income variable, the total scale (which ranges between 1 and 12) was mapped into three groups: low (values 1 to 4), medium (values 5 to 8) and high (values 9 to 12). The summary statistics may differ between this table and Table 1, as not every participant in our survey returned inflation expectations. For binary dummies, */**/** denotes significant differences at the 10/5/1 % level.

Table 12. Knowledge and realistic inflation expectations

	<i>Realistic expectations end at 1%</i>		<i>Realistic expectations end at 2%</i>	
	(1)	(2)	(3)	(4)
<i>Knowledge:</i>				
<i>Number of correctly answered questions</i>	0.01** (0.01)		0.02*** (0.01)	
<i>Fraction of correctly answered true statements</i>		-0.01 (0.04)		0.02 (0.05)
<i>Fraction of correctly answered false statements</i>		0.13*** (0.04)		0.18*** (0.06)
<i>Other variables:</i>				
<i>Desire to be informed (D)</i>	0.04*** (0.02)	0.05*** (0.02)	0.02 (0.02)	0.03 (0.02)
<i>SI1: income</i>	-0.00 (0.01)	-0.00 (0.01)	0.01 (0.01)	0.01 (0.01)
<i>No ideology (ID)</i>	0.00 (0.04)	-0.00 (0.04)	-0.09** (0.05)	-0.10** (0.05)
<i>SI3: work related to monetary issues</i>	-0.00 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.01)
<i>Age</i>	-0.00 (0.00)	-0.00 (0.00)	-0.00** (0.00)	-0.00** (0.00)
<i>TV</i>	0.02 (0.04)	0.03 (0.04)	0.06 (0.05)	0.07 (0.05)
<i>Newspapers</i>	0.03 (0.05)	0.03 (0.05)	0.08 (0.05)	0.08 (0.05)
<i>Other</i>	0.03 (0.05)	0.04 (0.06)	0.04 (0.06)	0.04 (0.06)
Observations	1104	1104	1104	1104
Probability[realistic = 1]	0.18	0.18	0.58	0.58
McKelvey & Zavoina's Pseudo R ²	0.02	0.03	0.01	0.01

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1 The figures represent marginal effects for probit regressions. The dependent variables are binary dummies that indicate whether or not an individual's inflation expectations were realistic. Expectations are defined as unrealistic if they are above 1 and 2%, respectively. Marginal effects are computed at sample means, except for (0,1) dummies. The measure of media use included is the most important source of information (S). Results for Q, QH and QL were similar. Marginal effects for education, sex, partner, status and city are not significant and are not shown in this table.

Appendix 1: The questionnaire

Intro 1: This questionnaire concerns the European Central Bank, but we will first ask you three general questions.

Q1. Has the current economic and financial crisis had negative consequences for you, or do you expect such consequences in the near future?

- Yes, very much
- Yes, somewhat
- Hardly
- No
- I don't know

Q2. Does (or did) your work relate to economic, monetary or financial issues?

- Yes, almost every day
- Often, but not on a daily basis
- Sometimes
- Hardly
- Never

Q3. How would you describe your political orientation? (you may choose more than one option)

- Liberal
- Socialist
- Christian democrat
- Conservative
- Progressive
- I haven't thought about it
- Other, namely ...

Intro 2: The remainder of this questionnaire is on the European Central Bank (ECB). The ECB is the central bank for Europe's single currency, the euro. Since 1999 the euro has been introduced in 16 European countries.

Q4. How do you judge your own knowledge about...

	Very poor	Poor	Neutral	Good	Very good	I don't know
...the European Central Bank						
...economic developments (like price changes, economic growth and unemployment)						

Q5. How important is it to you to be well informed on the policies of the European Central Bank (ECB)?

- Not important at all
- Not very important
- Somewhat important
- Very important
- Extremely important
- I don't know

[Note: respondents that answered “not important at all” continued with Q7.]

Q6. Could you please tell us more about your reasons to be informed about the policy of the European Central Bank (ECB)?

	Not important at all	Not very important	Somewhat important	Very important	Extremely important	I don't know
ECB policy affects my personal or family income						
ECB policy influences how much my money can buy						
ECB policy affects my business/job/profession						
ECB policy affects the value of my stocks or other investments						
ECB policy is important for the economy						
I just like to keep informed well						
Other, namely:						

Intro 3: We would like to gain insight into people’s understanding of the most important goal of the European Central Bank. There is no need to search for the correct answers, and you should not worry about giving an incorrect answer.

Q7. Can you please indicate whether the following statements that refer to the main objective of the European Central Bank (ECB) are true or false?

	true	false	I don’t know
The main objective of the ECB...			
...is price stability			
...is to keep prices constant			
...is low unemployment			
...is an unemployment rate of at most 5%			
...is high economic growth			
...is an economic growth rate of at least 2%			
...is an inflation rate that is close to but below 2%			
...is to keep interest rates constant			
...applies to the euro area average			
...applies to all euro area countries separately			
...applies to the medium-term			

Intro 4: We would like to ask you a number of questions concerning the manner in which you receive information about the policy of the European Central Bank (ECB).

Q8. Through which sources of information do you hear or read about the policies of the European Central Bank (ECB)?

	Regularly	Occasionally	Never	I don't know
Television				
Radio				
Newspapers				
Magazines				
Internet				
Friends, family, colleagues				
Other, namely:				

Intro 5: Finally, we would like to ask you a number of questions on the sources of information on the policy of the European Central Bank (ECB).

Q9. Which of the following is your most important source of information on the policy of the European Central Bank? (please select only one)?

- Television
- Radio
- Newspapers
- Magazines
- Internet
- Friends/relatives/colleagues
- I don't use any sources on ECB policy
- I don't know
- Other, namely:

Appendix 2: Results for other measures of self-interest

Table A2.1 shows results when using the alternative measures of self-interest. The model shown corresponds to column (1) of Table 8, but uses a slightly different sample, as we only use those observations for which all three self-interest variables are available. The self-interest variable *SI2* – the extent to which respondents are hit by the crisis – is not a good alternative for *SI1*. In contrast, self-interest based on the importance of ECB knowledge for work (*SI3*) seems a reasonable alternative. Given that respondents answer the knowledge questions, *SI3* is significantly related to the degree of ECB knowledge. Note also that *SI1* is not only significantly related to the degree of understanding but also to the decision to answer the questions, which is not the case for *SI3*.

Table A2.1 Determinants of knowledge using different indicators of self-interest

VARIABLES	(1)		(2)		(3)		(4)	
	Poisson	Logit	Poisson	Logit	Poisson	Logit	Poisson	Logit
<i>Desire to be informed (D)</i>	0.01 (0.01)	-0.76*** (0.16)	0.02 (0.01)	-0.77*** (0.17)	0.01 (0.01)	-0.81*** (0.18)	0.01 (0.01)	-0.79*** (0.17)
<i>Self-interest (SI1)</i>	0.02*** (0.00)	-0.11** (0.05)					0.01*** (0.00)	-0.13*** (0.05)
<i>No ideology (ID)</i>	-0.10*** (0.04)	0.88*** (0.23)	-0.11*** (0.04)	0.90*** (0.23)	-0.11*** (0.04)	0.93*** (0.23)	-0.10*** (0.04)	0.87*** (0.23)
<i>Education (ED)</i>	0.08*** (0.03)	0.35 (0.25)	0.11*** (0.02)	0.15 (0.25)	0.11*** (0.02)	0.15 (0.25)	0.09*** (0.03)	0.39 (0.25)
<i>Age</i>	-0.00*** (0.00)	-0.00 (0.01)	-0.00*** (0.00)	-0.00 (0.01)	-0.00*** (0.00)	-0.00 (0.01)	-0.00*** (0.00)	0.00 (0.01)
<i>Male</i>	0.12*** (0.03)	-0.17 (0.22)	0.16*** (0.02)	-0.41** (0.20)	0.15*** (0.02)	-0.42** (0.20)	0.12*** (0.03)	-0.16 (0.22)
<i>Partner</i>	-0.07*** (0.03)	0.33 (0.27)	-0.08*** (0.03)	0.44 (0.27)	-0.08*** (0.03)	0.44 (0.27)	-0.07*** (0.03)	0.35 (0.28)
<i>Status</i>	0.02* (0.01)	-0.32*** (0.10)	0.03** (0.01)	-0.35*** (0.10)	0.02** (0.01)	-0.35*** (0.10)	0.02 (0.01)	-0.33*** (0.10)
<i>City</i>	0.01 (0.01)	-0.19** (0.08)	0.01 (0.01)	-0.19** (0.08)	0.01 (0.01)	-0.20** (0.08)	0.01 (0.01)	-0.19** (0.08)
<i>Self-interest (SI2)</i>			-0.00 (0.01)	-0.12 (0.11)			-0.01 (0.01)	-0.14 (0.11)
<i>Self-interest (SI3)</i>					0.03*** (0.01)	0.05 (0.08)	0.02*** (0.01)	0.13 (0.08)
<i>Constant</i>	1.65*** (0.07)	1.62*** (0.62)	1.69*** (0.07)	1.65** (0.66)	1.63*** (0.07)	1.39** (0.65)	1.63*** (0.08)	1.65** (0.65)
Observations	1423		1423		1423		1423	
McKelvey & Zavoina's Pseudo R ²	0.18		0.16		0.18		0.17	

Note: Column (1) is based on the same regression model as column (1) of Table 8. The outcomes differ slightly because we only include respondents for which information on all three SI-variables is available. Robust standard errors are shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table reports parameter estimates for zero-inflated Poisson models. *SI1* is income, *SI2* measures the extent to which respondents are hit by the crisis, and *SI3* measures whether ECB knowledge is relevant for respondents' work.

Appendix 3: Weighting

Table 1 indicates issues regarding representativeness. We have used information from Statistics Netherlands on gender, age, household size, partner and education to compute sampling weights. The differences between the weighted and unweighted levels of knowledge are small. To be precise, when we weight observations, we find that the estimated level of knowledge is slightly lower. For instance, the average number of correct answers to question 7 of our survey declines from 4.60 to 4.45. The overall impression that the public's knowledge on monetary policy is far from perfect, is left undisturbed by weighting. Unfortunately, we are unable to weight according to income. As income turns out to have a positive relationship with knowledge, we would rate the conclusions regarding the level of knowledge as being rather too optimistic than pessimistic.

There has been an extended discussion on weighting in regression analysis. For various positions in this debate, see: Angrist and Pischke, 2009 (p. 91-94); DuMouchel and Duncan, 1983; Korn and Graubard, 1994; Magee, Robb and Burbidge, 1998; Pfeffermann, 1993; or Winship and Radbill, 1994. The consensus seems that weighting is more relevant for estimating population parameters than for establishing measures of association between variables. Also, weighting may have the drawback of increasing the standard errors of the estimates.

For a number of reasons, we base our regressions on unweighted data. First, we note that the descriptive results are already not very sensitive to weighting. Second, our sampling weights are solely based on independent variables already included in the regressions. In this case, unweighted and weighted regressions will yield consistent estimates, but the former will be, as noted, more efficient (Winship and Radbill, 1994). Third, we followed DuMouchel and Duncan's (1983) suggestion to include sampling weights and interaction terms between weights and independent variables in the regressions to detect possible misspecification. In almost all cases, we were not able to reject the hypothesis that the coefficients for the sampling weights and the interactions terms equal zero, which indicates using unweighted data is appropriate. Further details regarding weighting are available from the corresponding author.

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