How Much Does the Public Know about the ECB's Monetary Policy? Evidence from a Survey of Dutch Households*

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Does the general public know what central banks do? Is this knowledge relevant? Based on a survey of Dutch households, we find that knowledge about the European Central Bank's objectives is far from perfect. A weak desire to be informed and unawareness among respondents about their limited knowledge are barriers for improving general understanding of monetary policy. However, our results also show that more intensive use of information improves respondents' understanding of the ECB, suggesting that communication may improve general knowledge. Finally, we find that knowledge about monetary policy objectives contributes to an individual's ability to form inflation expectations.

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1. Introduction

During the last few decades, many central banks have become increasingly more transparent, placing greater emphasis on external communications to financial markets and the general public (Dincer and Eichengreen 2007, 2009; Geraats 2009). Nowadays, the conventional wisdom is that independent central banks should be transparent and accountable, meaning that they have a responsibility to publicly explain their actions and the reasoning underlying those actions. In addition, transparency may enhance the effectiveness of monetary policymaking (Sibert 2009). 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."[1]

Transparency requires that central banks communicate with the outside world. So far, the literature has mostly equated the outside world with financial market participants.[2] Blinder et al. (2008, p. 941) point out that "it may be time to pay some attention to communication with the general public."[3] In fact, we know very little about the general public's knowledge of monetary policy, how information on central banks reaches the public, and how this information contributes to knowledge.[4] More importantly, we have no clear understanding of whether knowledge of monetary policy is relevant for the public's decision making.

[1]Research suggests that central bank transparency enhances the effectiveness of monetary policy, although not all evidence points in the same direction (van der Cruijsen and Eijffinger 2010b).

[2]There are many contributions to this literature, including Jansen and de Haan (2005), Ehrmann and Fratzscher (2007), Brand, Buncic, and Turunen (2010), Jansen (2011), Neuenkirch (2012), and Bulíř, Čihak, and Jansen (2013, 2014).

[3]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."

[4]It should be noted that interest in this topic is growing; see, e.g., Hayo and Neuenkirch (2014). Another related paper is van der Cruijsen and Eijffinger (2010a). However, they only measure knowledge about the European Central Bank's disclosure practices.

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. The ECB aims at inflation rates of below, but close to, 2 percent over the medium term."[5] To study the general public's knowledge, we conducted a survey of Dutch households. 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 this 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 about the objectives of monetary policy relevant? To answer the third question, we focus on the relationship between knowledge and the respondents' inflation expectations. The ability to make a reasonable assessment of future price developments is important for adequate household financial decision making (Katona 1975, Juster 1981, and Wärneryd and Wahlund 1985). Therefore, we assess whether knowledge about ECB objectives affects the ability to formulate realistic and accurate inflation expectations.

To organize 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 opinions, 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.[6]

[5]Source: http://www.ecb.int/mopo/html/index.en.html (URL last accessed on November 19, 2014).

[6]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 about economic indicators. On average, Europeans are unaware of economic growth rates, inflation rates, and unemployment rates, but do think that these figures are important for political decision making (European Commission 2010).

Our three 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 to have correct knowledge, while elderly respondents are more likely to have less knowledge about the ECB's monetary policy.

Second, the results indicate that 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. Turning to sources of information, our results also indicate that individuals who use the media more intensively to obtain information have better knowledge about monetary policy. This suggests that communication 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, we find strong evidence that better knowledge about the objectives of ECB monetary policy is related to an individual's ability to form inflation expectations. This part of the paper links to the literatures on knowledge heterogeneity (e.g., Orphanides and Williams 2004), financial literacy (e.g., Lusardi and Mitchell 2007a, Bruine de Bruin et al. 2010), and household surveys of expectations (e.g., Souleles 2004). Using probit regressions, we find that individuals who answer more questions about ECB objectives correctly have a higher probability of having realistic inflation expectations. In addition, our results suggest that respondents' knowledge about ECB monetary policy is negatively related to their absolute inflation forecast errors. These results suggest 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.

2. Framework

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 policymaking. Receiving more information may simply lead to a more thorough understanding of what central banks are doing. Finally, several other variables, such as the level of education, the type of job, or the level of income, may also be relevant.

The 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.

$$D_i = f_1(SI_i,\ ID_i,\ ED_i, X_i) + e_{1,i} \tag{1}$$

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, and choosing the best measure for self-interest is not obvious (Blinder and Krueger 2004). Our preferred measure in the empirical analysis is income. Income may be relevant, as the real value of someone's income will be affected by inflation. We consider two alternatives. First, an individual may have an interest because her line of work is closely influenced by monetary policy. Second, an individual may be interested in monetary policy because she has experienced negative consequences due to the financial and economic crisis.

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

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

and

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

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 she will acquire. 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 at remembering items read in newspapers and on the Internet. In contrast, the lower educated perform best at retrieving news presented on television.

Following Blinder and Krueger (2004), we assume that understanding of monetary policymaking (U) is determined by ED, D, S, Q, and X, so that we can write

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

Section 5 will discuss various empirical models for U_i. In the analysis, we include the variables that we assume to affect D, S, and Q as well as 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. 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 with Tilburg University. The survey comprises a representative sample of the Dutch population. Among other things, the panel provides data on income, housing, mortgages, loans, and personal characteristics.[7] Our questionnaire was sent out via the Internet to 2,369 regular members of the DHS (sixteen years and older) from April 17 until April 21, 2009. Compared with 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 percent, which corresponds to 1,659 individuals.

One potential concern regarding our data source is that participation in the DHS may have improved the knowledge of participants, as questions related to monetary policy have been submitted to panel participants before. For instance, van der Cruijsen and Eijffinger (2010a) used the DHS to study transparency of the ECB. If participation improves knowledge, our sample may no longer be representative of the Dutch population at large. Therefore, we examined whether length of participation in the panel was related to the level of knowledge about monetary policy. We found no evidence of a significant relationship between these variables. Another potential concern is that participants are aware that the survey is affiliated with De Nederlandsche Bank (DNB) and therefore feel more pressured to provide correct answers. However, in practice, all contacts

[7]Information on the DHS is available at http://www.centerdata.nl/en/projects-by-centerdata/dnb-household-survey-dhs (URL last accessed on March 21, 2012). See also Teppa and Vis (2012). Work using the DHS includes Hurd, van Rooij, and Winter (2011), van Rooij, Lusardi, and Alessie (2011, 2012), and Jansen, Mosch, and van der Cruijsen (2015).

with the survey participants are handled by CentERdata, and it is not mentioned in our questionnaire that DNB has commissioned it. So, it seems more likely that participants associate the survey with the University of Tilburg rather than DNB.

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 1 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 about 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 about 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 they are well informed.

The subsequent question was designed 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 proxy for knowledge (U) we use the number of correct answers. We also analyze whether there are differences between the fraction of correct answers to true and false statements.

In the questionnaire, we included a portion of text stressing that there was no need to search for the correct anwers (see appendix 1). We even explicitly mentioned that participants need not worry about giving an incorrect answer. By including these comments, we wanted to minimize the likelihood that people used Internet sources (such as the ECB website) to search for information while completing the survey. Of course, we cannot exclude that people searched for correct answers. Still, searching for the answers to the eleven statements would have taken quite some time. Also, we did not offer participants any monetary incentives for answering more questions correctly and survey responses are anonymous, so that it is not possible to check which individual gave how many correct answers. Therefore, it seems unlikely that a significant portion of the respondents engaged in searching behavior. Moreover, if people did search for information, this would only strengthen our finding that knowledge on ECB monetary policy is far from complete.

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).

Along the lines of Blinder and Krueger (2004, p. 341), we construct two measures for the *intensity* and *lack of diversity* of

information. Let $s1, s2$, and $s3$ 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 $s3/s$ and $s1/s$, 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 percent of the sources, but via half of the sources she never gets information on the ECB.[8]

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 also have detailed background information on the DHS panel members, which we use to construct various control variables (X): a dummy that is 1 if the respondent is male (*male*), the age of the respondent (*age*), and a dummy that is 1 if the survey participant is living together with a partner (*partner*). As to the latter, it seems plausible that respondents with a partner are able to draw from a larger pool of information. 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.[9] In addition, we control for the social-economic status of the respondent (*status*). This variable ranges from 1 (weak status) to 5 (strong status). This variable—originally defined by Statistics Netherlands—takes a person's profession into account and whether she holds a managing position. If she holds such a position, the number of employees is also taken into account. We also use DHS background information to create an education dummy *ED* that

[8]There is a subtle difference regarding Blinder and Krueger's measure for QL and ours. In Blinder and Krueger (2004), QL is based on sources which are used "rarely or never," whereas in our questionnaire, QL is based on sources which are never used.

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

is 1 for respondents who successfully completed higher vocational education and/or university education, and 0 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. The income variable (labeled *SI1*) is our preferred proxy for self-interest.[10] The intuition is straightforward: high-income respondents would stand to lose more from high levels of inflation, so monetary policy would be highly relevant to them. *SI1* is 1 for respondents reporting a household income of €500 or less, and 12 when monthly household income is €7,500 or more.

4. Overview

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 fifties, living with a partner, and earning a gross monthly income of around €3,800. Table 1 also compares the survey means with 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 fully representative for the Dutch population. We checked, therefore, whether reweighting observations would change our conclusions. This turned out not to be the case. Appendix 2 provides more details on the effect of weighting.

Figures 1–3 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 policymaking, thereby ensuring that the survey captures the understanding of the "public at large." Finally, figure 3

[10]Regression results using the other two proxies of self-interest ("affected by crisis" and "work related to economic issues") to explain knowledge are available in appendix 2 of van der Cruijsen, Jansen, and de Haan (2010, p. 43). From that analysis, we concluded that income is more closely linked to knowledge than the alternative measures for self-interest.

Table 1. Summary Statistics

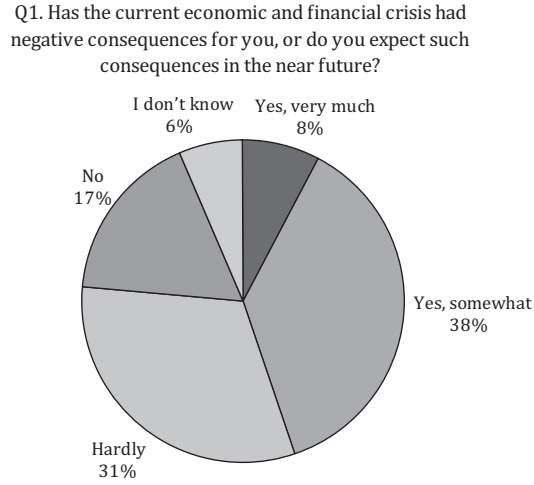
	Survey Mean	Population Mean
Sex (percent males)	55.1%***	49.0%
Age	52.6***	46.9
Household Size	2.5***	2.2
Partner (1 = living together with partner, 0 = otherwise)	0.78***	0.62
City Weighted Average (1 = rural, 5 = highly urbanized)	2.99	3.03
Monthly Gross Household Income (in €1,000)	3.77***	4.68
Education (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: For variables sex and age, we are able to use specific data on the population over age sixteen. For education, CBS data cover ages fifteen to sixty-five. For other variables, we use data on the total population. For income, data were only available yet for 2008. Education is coded as 1 if higher vocational education and/or university education was the highest degree, and 0 if otherwise. For region, we use the proportion of survey participants living in province x minus the actual proportion of people aged fifteen years or older in province x. *** denotes significant differences at the 1 percent level between survey and population means.

presents information about the self-declared ideological position of the respondents. About 20 percent of the respondents indicate that they have not thought much about their political position.

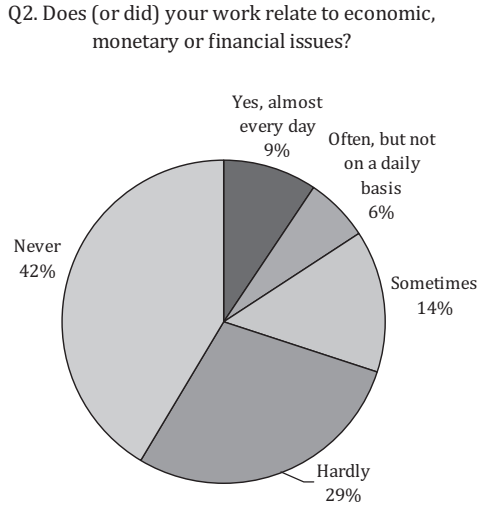
Table 2 shows that almost 63 percent of the respondents indicate that being informed about ECB policies is either somewhat important or very important. When asked for the reasons they want to be informed, 57 percent of the respondents consider the importance of the ECB for the economy as the crucial reason to be informed about the ECB (see table 3). A majority of the respondents report that they "just like to be informed." Table 3 also shows that (i) 52 percent and (ii) 66 percent of respondents consider it a somewhat/very/extremely important reason to be informed because of the effect of ECB policy on (i) "my personal or family income" and (ii) "how much my money can buy."

Figure 1. Impact of Financial Crisis on Respondents



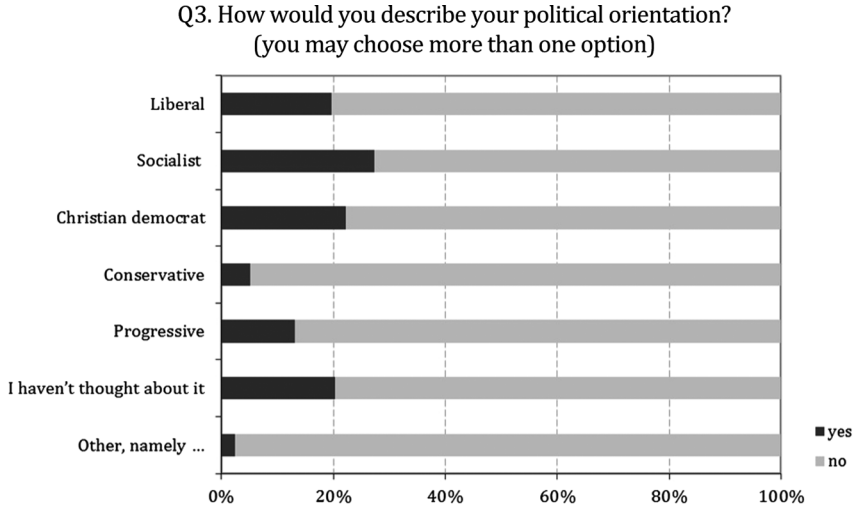
Notes: Based on replies by 1,659 respondents.

Figure 2. Working Environment of Respondents



Notes: Based on replies by 1,659 respondents.

Figure 3. Self-Declared Ideological Position



Notes: Based on replies by 1,659 respondents.

Table 2. Importance of Being Informed on 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

Notes: N = 1,659. 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)?"

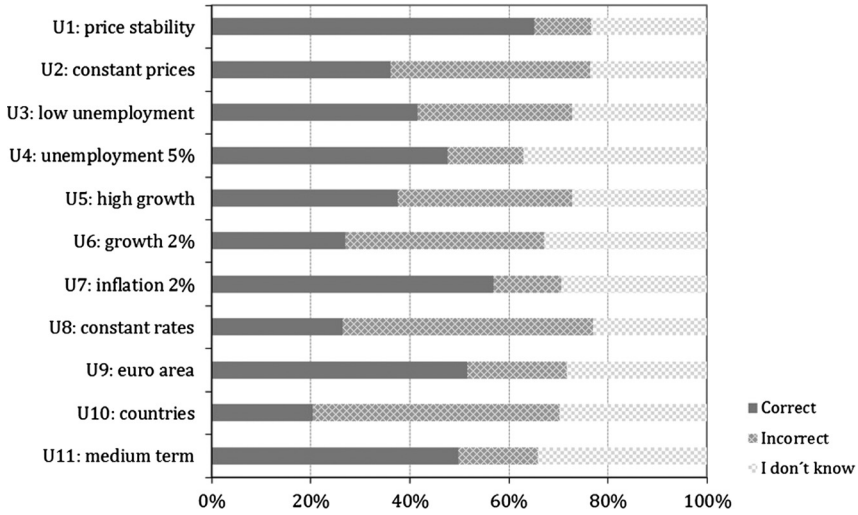
Figure 4 shows the distribution of correct and incorrect answers to the eleven statements about the ECB's objectives (question 7 in appendix 1). The statement that the main objective of the ECB is price stability received by far the highest percentage of correct

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

Notes: N = 1,468.

Figure 4. Understanding: Distribution of Answers Per Question



Notes: N = 1,659. The horizontal bars denote the percentage of correct (darkest gray) and incorrect (crossed dark gray) answers to the eleven statements on the ECB's main objective (see question 7 in appendix 1). The checkered light gray bars denote the percentage of respondents who answered "I don't know."

answers (65 percent). 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 (statement 10) received the lowest score of correct answers (20 percent).[11] In fact, of the 1,165 respondents who did not opt for "I don't know," only 29 percent gave the correct answer. One interpretation is that the public is actually misinformed rather than uninformed on this issue.[12] This

[11]In contrast, van der Cruijsen and Demertzis (2011) show that professionals do realize that the ECB goal does not apply to national inflation rates.

[12]We tested, per question, whether more than 50 percent of the respondents who do answer the true/false statements give the correct answer. If not, one could argue that the public at large is misinformed rather than uninformed. Our results (available on request) suggest that misinformation would apply to statements 6,

finding is potentially worrisome. It implies that even when the ECB meets its inflation goal, it can suffer a loss of credibility in countries in the euro area with an inflation rate above 2 percent. As a result of insufficient knowledge, it is likely that an important share of the public at large will interpret deviations of national inflation from "close to but below two percent" as a shortcoming of ECB policy. The statements on economic growth (statement 6) and constant rates (statement 8) also show a low number of correct answers. In these cases, only 40 percent (statement 6) and 34 percent (statement 8) of the respondents who believed to know the answer submitted correct answers.

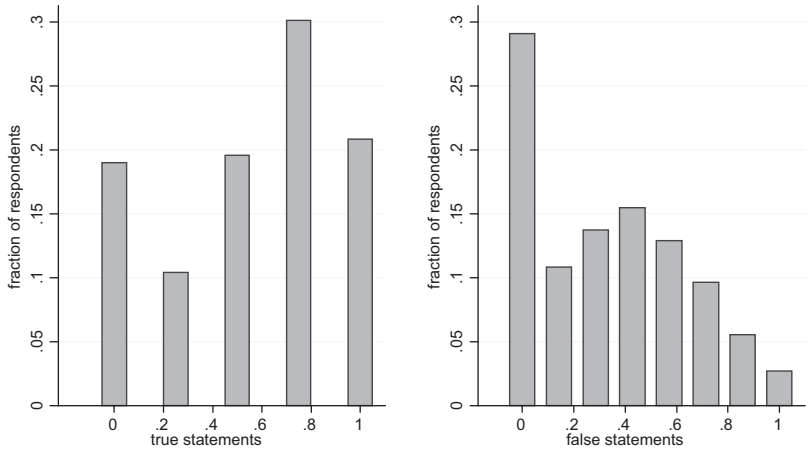
Finally, the difference between true and false statements turns out to be important. The true statements were statements 1 (objective is price stability), 7 (inflation close to but below 2 percent), 9 (objective applies to the euro-area average), and 11 (objective applies to the medium term) of question 7 of our survey. The horizontal axis of figure 5 shows the fraction of correctly answered true (left panel) and false (right panel) statements. The vertical axis shows the fraction of respondents per category.[13] Clearly, respondents did much better at answering true statements. This suggests that when in doubt about the correct answer, respondents chose "true" as their default answer. As a consequence, we may be over-estimating the level of knowledge about monetary policy. For instance, we were surprised by the number of people (50 percent) who answered statement 11 (the ECB's objective applies to the medium term) correctly, as we considered this to be one of the more difficult statements to answer. However, if respondents chose "true" when in doubt, the estimate of 50 percent would be optimistic.

Next, we relate respondents' self-declared knowledge to their actual knowledge. Figure 6 shows that there is a positive link

8, and 10, where the fraction of correct answers is well below 0.5. Note, however, that these questions were all false statements, which were harder for participants to answer in general.

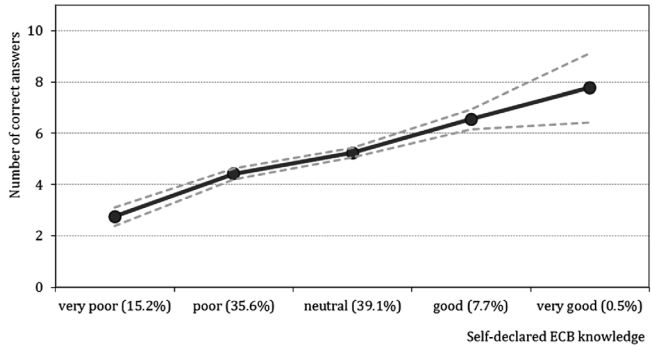
[13] As there were only four (seven) statements which were true (false), the distribution of the fractions of correct answers can only take a limited number of values.

Figure 5. Distribution of Correct Answers to True and False Statements



Notes: The histograms show on the horizontal axis the proportion of correct answers to true (left panel) and false (right panel) statements. The vertical axis measures the fraction of respondents per category. True statements were statements 1, 7, 9, and 11 of question 7 of our survey (see appendix 1). The remaining seven statements were false. Histogram is based on answers by 1,659 respondents.

Figure 6. Actual vs. Self-Declared Knowledge



Notes: N = 1,628. Response shares are shown in parentheses (1.9 percent of respondents did not report self-assessment). The circles denote the average number of correct questions; dotted lines denote the 95 percent confidence interval.

Table 4. Most Important Source of Information on the ECB

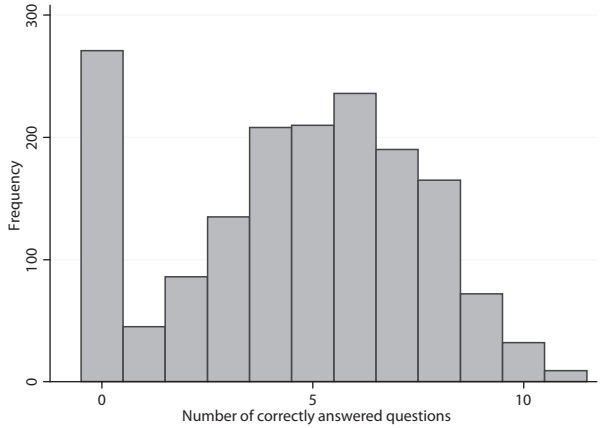
	Proportion	Std. Err.	95% Confidence Interval
Television	0.42	0.01	(0.39,0.44)
Radio	0.05	0.01	(0.04,0.06)
Newspapers	0.33	0.01	(0.30,0.35)
Magazines	0.02	0.00	(0.01,0.02)
Internet	0.05	0.01	(0.04,0.06)
Friends/Relatives/ Colleagues	0.01	0.00	(0.00,0.01)
I Don't Use Any Sources on ECB Policy	0.08	0.01	(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)

Notes: N = 1,400.

between the two; on average individuals with higher self-declared ECB knowledge answer more questions correctly (correlation: 0.36). However, almost all survey participants who indicate having good or very good knowledge (8.3 percent 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. Furthermore, overconfident individuals may fail to prepare optimally for the future (Marzilli Ericson 2011).

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 percent of the respondents put this intermediary on top, followed by newspapers (almost 33 percent). The other sources of information receive low scores.

Figure 7. Understanding: Distribution of Number of Correct Answers



Notes: N = 1,659. The histogram shows the number of correct answers to our eleven statements regarding the ECB's main objective of price stability.

5. Determinants of 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 if 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.

The workhorse model in this field is the Poisson regression.[14] This model assumes that the dependent variable y_i is independently Poisson distributed with density

$$f(y_i|x_i) = \frac{e^{-\mu_i}\mu_i^{y_i}}{y_i!} \tag{5}$$

[14]The following technical discussion draws on Greene (2003), Cameron and Trivedi (2005, 2007), and Winkelmann (2008).

and with mean parameter

$$E[y_i|x_i] = \mu_i = \exp(x_i'\beta), \tag{6}$$

where x_i is a vector of independent variables and β is a k x 1 parameter. The model is estimated by maximum likelihood. One crucial assumption of the Poisson model is that the conditional mean equals the conditional variance. This assumption of *equidispersion* is often violated, as the data are either over-dispersed (when the variance is larger than the mean) or under-dispersed (when the variance is smaller than the mean). A violation of the assumption of equidispersion will affect the estimated standard errors, in which case it is necessary to adjust the regression model accordingly. One straightforward way to check for equidispersion is to compare the sample mean and variance of the dependent variable.

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 1,659 observations, 16.3 percent has a value equal to zero. First, the zero category includes those 0.8 percent of the respondents who either answered all knowledge questions incorrectly or who answered some questions but did not provide correct answers. Second, the zero category consists of those 15.6 percent of the respondents who answered "I don't know" to all of the knowledge questions. Although these individuals may have had knowledge about monetary policy, they declined to answer any question. So, for each knowledge question, the respondent had to make two decisions. First, the respondent had to decide whether she wanted to answer the question. Second, if "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 (ZIP) model (Lambert 1992).[15] This means the combined estimation of a logit regression for the probability of a zero outcome and a Poisson regression for the number of correct answers to question 7. The density for the ZIP model is (Cameron and Trivedi 2005, p. 681):

$$\begin{aligned} g(y) &= h(0) + (1 - h(0)) * f(0) \quad \text{if } y = 0, \\ &(1 - h(0)) * f(y) \qquad\qquad\quad \text{if } y \geq 1, \end{aligned} \tag{7}$$

where $h(.)$ denotes the logit density, $f(.)$ is the Poisson density as described above in equation (5), and y is the number of correct answers to question 7 of the survey.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 part of the model (Cameron and Trivedi 2007, p. 127).

Table 5 presents the estimation results for four zero-inflated Poisson models, while table 6 shows marginal effects computed at sample means. Column 1 of table 5 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, and 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. 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. Elderly respondents are more likely to have less knowledge about the ECB's monetary policy. In contrast to our

[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 percent) of "true" zeros. As noted by a referee, it is also possible to distinguish between "true" and "excess" zeros, and estimate separately a Poisson model for the subsample of respondents who answer knowledge questions, and a logit regression explaining the decision to decline to answer any questions, while excluding the "true" zeros. This alternative estimation strategy also leaves the conclusions unchanged. Results for both exercises are available upon request.

Table 5. Determinants of Knowledge about ECB Monetary Policy

	(1)		(2) S		(3) Q		(4) QH and QL	
	Poisson	**Logit**	**Poisson**	**Logit**	**Poisson**	**Logit**	**Poisson**	**Logit**
Desire to be Informed (D)	0.01	-0.80^{***}	-0.01	-0.57^{***}	-0.01	-0.68^{***}	-0.01	-0.63^{***}
	(0.01)	(0.15)	(0.02)	(0.21)	(0.02)	(0.19)	(0.02)	(0.18)
Self-Interest (SI1)	0.02^{***}	-0.13^{***}	0.02^{***}	-0.19^{***}	0.02^{***}	-0.10^{*}	0.02^{***}	-0.12^{**}
	(0.00)	(0.05)	(0.00)	(0.06)	(0.00)	(0.05)	(0.00)	(0.05)
No Ideology (ID)	-0.12^{***}	0.86^{***}	-0.11^{***}	0.67^{**}	-0.10^{***}	0.52^{**}	-0.11^{***}	0.71^{***}
	(0.04)	(0.21)	(0.04)	(0.29)	(0.04)	(0.25)	(0.04)	(0.24)
Education (ED)	0.07^{***}	0.43^{*}	0.05^{**}	0.27	0.07^{***}	0.22	0.07^{**}	0.33
	(0.03)	(0.24)	(0.03)	(0.32)	(0.03)	(0.28)	(0.03)	(0.26)
Age	-0.00^{***}	-0.00	-0.00^{***}	0.00	-0.00^{***}	0.00	-0.00^{***}	0.00
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
Male	0.12^{***}	-0.15	0.11^{***}	0.20	0.10^{***}	0.04	0.11^{***}	-0.01
	(0.03)	(0.21)	(0.03)	(0.28)	(0.03)	(0.24)	(0.03)	(0.22)
Partner	-0.07^{***}	0.28	-0.08^{***}	0.29	-0.07^{***}	0.35	-0.08^{***}	0.28
	(0.03)	(0.26)	(0.03)	(0.35)	(0.03)	(0.30)	(0.02)	(0.26)
Status	0.02^{**}	-0.38^{***}	0.02^{**}	-0.26^{**}	0.02^{*}	-0.31^{***}	0.02^{*}	-0.32^{***}
	(0.01)	(0.10)	(0.01)	(0.13)	(0.01)	(0.12)	(0.01)	(0.10)
City	0.01	-0.18^{**}	0.01	-0.11	0.01	-0.12	0.01	-0.15^{*}
	(0.01)	(0.07)	(0.01)	(0.09)	(0.01)	(0.09)	(0.01)	(0.08)

(continued)

Table 5. (Continued)

	(1)		(2) S		(3) Q		(4) QH and QL	
	Poisson	**Logit**	**Poisson**	**Logit**	**Poisson**	**Logit**	**Poisson**	**Logit**
S or Q:								
TV			0.06	−0.74**	0.03	−0.34		
			(0.05)	(0.30)	(0.02)	(0.24)		
Radio					0.03	−0.06		
					(0.02)	(0.23)		
Newspapers			0.08*	−1.55***	0.03*	−0.77***		
			(0.05)	(0.39)	(0.02)	(0.20)		
Magazines					0.02	0.15		
					(0.02)	(0.34)		
Internet					−0.00	−0.05		
					(0.02)	(0.24)		
Friends and Relatives					−0.03	−0.17		
					(0.02)	(0.35)		
Other			0.13**	−1.58***				
			(0.05)	(0.52)				
QH							0.23***	−0.78
							(0.06)	(1.37)
QL							−0.00	1.60***
							(0.05)	(0.54)
Constant	1.62***	2.08***	1.62***	1.25	1.56***	2.95***	1.69***	0.04
	(0.07)	(0.59)	(0.08)	(0.79)	(0.08)	(0.82)	(0.08)	(0.80)
Observations	1,491	1,491	1,318	1,318	1,338	1,338	1,452	1,452
McKelvey and Zavoina's Pseudo R^2	0.18		0.17		0.20		0.19	

Notes: 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 6. Marginal Effects Based on Zero-Inflated Poisson Models

	(1)	(2) S	(3) Q	(4) QH and QL
Desire to be Informed (D)	0.36***	0.09	0.14	0.14
	(0.08)	(0.09)	(0.09)	(0.09)
Self-Interest (SI1)	0.14***	0.14***	0.12***	0.13***
	(0.03)	(0.03)	(0.03)	(0.03)
No Ideology (ID)	−0.93***	−0.75***	−0.67***	−0.79***
	(0.20)	(0.22)	(0.20)	(0.20)
Education (ED)	0.17	0.22	0.30*	0.23
	(0.15)	(0.15)	(0.15)	(0.15)
Age	−0.02***	−0.02***	−0.02***	−0.02***
	(0.00)	(0.01)	(0.00)	(0.00)
Male	0.65***	0.53***	0.53***	0.56***
	(0.15)	(0.15)	(0.15)	(0.15)
Partner	−0.45***	−0.52***	−0.44***	−0.48***
	(0.16)	(0.15)	(0.15)	(0.15)
Status	0.27***	0.18***	0.20***	0.21***
	(0.07)	(0.07)	(0.07)	(0.07)
City	0.12**	0.06	0.09*	0.09**
	(0.05)	(0.05)	(0.05)	(0.05)
S or Q:				
TV		0.52**	0.27**	
		(0.15)	(0.13)	
Radio			0.16	
			(0.11)	
Newspapers		0.80***	0.39***	
		(0.27)	(0.12)	
Magazines			0.05	
			(0.14)	
Internet			0.01	
			(0.12)	
Friends and Relatives			−0.09	
			(0.16)	
Other		1.08***		
		(0.30)		
QH				1.40***
				(0.49)
QL				−0.53*
				(0.30)

Notes: 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 5.

expectations, the same finding emerges for the partner variable. The marginal effects (shown in table 6) indicate that the included covariates have a significant impact on the number of correct answers, except for education.[16] 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 5, 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 6 are significant for all three media variables. This shows that respondents who use information have better knowledge than those 8 percent of the respondents who do not use any information at all. Next, we replace S with 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 6, 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 variable QH and lack of diversity variable QL (column 4 of table 5). Respondents with relatively low information diversity—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 the 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 6, 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 about monetary policy.[17] This implies that the media channel may be a useful channel for central banks to improve the public's knowledge.

[16]Note that education may still play a significant role via the desire to be informed (for further discussion, see van der Cruijsen, Jansen, and de Haan 2010).

To assess whether the difference between true and false statements is important, we repeated the analysis for determinants of knowledge. As we now use models where the dependent variables are the fraction of correctly answered true and false statements, we revert to the quasi-likelihood method proposed by Papke and Woolridge (1996). Once again, we estimate three types of models, based on the type of media variables (S, Q, or QH and QL) included. Table 7 shows the estimation results. The finding that obtaining information through the media improves knowledge continues to hold for true and false statements. There is even a clearer role for QL, but only in the case of the true statements. Still, some interesting differences compared with 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.

6. Relationship Between Knowledge and Inflation Expectations

We now turn to the final question: To what extent are inflation expectations and knowledge about 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. The expectations range between 1 and 10 percent, with the mode and median at 2 percent, while the mean is around 2.7 percent.[18]

Our analysis relates to three streams of research. First, several papers document that survey data on inflation expectations are inconsistent with the rational expectations hypothesis (Blanchflower

[17] As suggested by one of the referees, we have also estimated a Heckman selection model. The results (available on request) mirror the estimations in table 5.

[18] 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. It should also be noted that the participants were asked to submit their inflation expectations in a particular form: only natural numbers between 1 percent and 10 percent were possible.

Table 7. Determinants of Knowledge: Difference between True and False Statements

	S		Q		QH and QL	
	(1) True	(2) False	(3) True	(4) False	(5) True	(6) False
Desire to be Informed (D)	0.25***	−0.05	0.24***	0.00	0.26***	−0.00
	(0.05)	(0.04)	(0.06)	(0.05)	(0.05)	(0.05)
Self-Interest (SI1)	0.05***	0.06***	0.05***	0.05***	0.05***	0.06***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
No Ideology (ID)	−0.48***	−0.25**	−0.49***	−0.21*	−0.56***	−0.27***
	(0.12)	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)
Education (ED)	−0.02	0.13	−0.02	0.18**	−0.03	0.14*
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.08)
Age	−0.01*	−0.01***	−0.01***	−0.01***	−0.01***	−0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Male	0.05	0.26***	0.00	0.28***	0.04	0.29***
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.08)
Partner	−0.10	−0.29***	−0.06	−0.26***	−0.06	−0.28***
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.08)
Status	0.03	0.12***	0.05	0.12***	0.05	0.13***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
City	0.03	0.03	0.05*	0.05*	0.05*	0.05*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

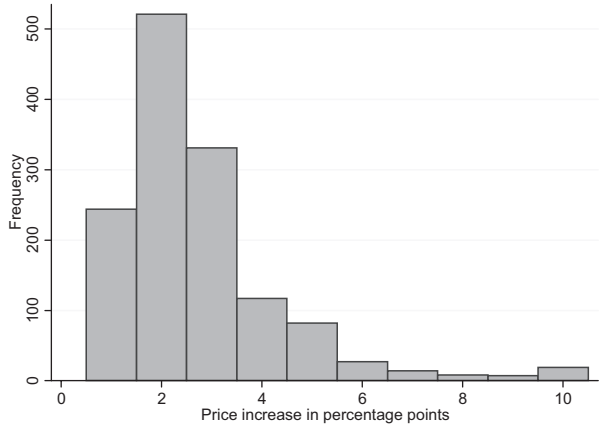
(continued)

Table 7. (Continued)

	S		Q		QH and QL	
	(1) True	(2) False	(3) True	(4) False	(5) True	(6) False
S or Q:						
TV	0.51***	0.20	0.26***	0.08		
	(0.14)	(0.13)	(0.08)	(0.07)		
Radio			0.09	0.04		
			(0.07)	(0.06)		
Newspapers	0.51***	0.37***	0.18**	0.21***		
	(0.14)	(0.13)	(0.07)	(0.06)		
Magazines			−0.04	0.01		
			(0.08)	(0.07)		
Internet			0.01	−0.00		
			(0.07)	(0.06)		
Friends and Relatives			−0.02	−0.08		
			(0.09)	(0.08)		
Other	0.61***	0.51***				
	(0.16)	(0.15)				
QH					0.52**	0.44**
					(0.25)	(0.19)
QL					−0.53***	−0.22
					(0.17)	(0.15)
Constant	−0.74***	−1.05***	−1.30***	−1.44***	−0.20	−0.94***
	(0.27)	(0.24)	(0.27)	(0.24)	(0.28)	(0.26)
Observations	1,318	1,318	1,338	1,338	1,452	1,452
McKelvey and Zavoina's Pseudo R^2	0.10	0.13	0.14	0.14	0.13	0.13

Notes: Robust standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The table reports parameter estimates for quasi-likelihood estimations according to Papke and Woolridge (1996), where the dependent variables are the fractions of correctly answered true and false statements about the ECB's monetary policy objectives.

Figure 8. Inflation Expectations of Survey Participants



Notes: This graph shows the distribution of inflation expectations for the participants in our survey who answered all knowledge questions. Of the 1,659 respondents to our survey, 1,370 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.

and Kelly 2008). Only a small portion of respondents form expectations consistent with rationality. Possible reasons for this heterogeneity include the use of different information sets by agents and different capacities of agents for processing information. In the framework of Carroll (2003), households obtain macroeconomic news using media sources. In each period, individuals absorb this news with a certain probability. Therefore, it may take time for news of changed macroeconomic circumstances to reach the entire population. Carroll finds that differences between household expectations and the views of professional forecasters narrow when inflation is more significant, probably because of increased media coverage and higher household interest. In learning models, individuals make statistical inferences about the unknown parameters governing the evolution of the economy. Orphanides and Williams (2005) find that the presence of learning increases the sensitivity of inflation expectations to shocks. From the perspective of the present paper, the result that inflation expectations under learning are much less sensitive to

inflation when the objectives of the central bank are known by the public is highly relevant. This finding suggests that better knowledge about the central bank may lead to more accurate expectations.

Second, also in the financial literacy literature the role of knowledge is crucial. For instance, lack of knowledge causes households not to plan for retirement (Lusardi and Mitchell 2007b) and to borrow at higher interest rates (Lusardi and Tufano 2009). Using RAND's American Life Panel, whose members were recruited from respondents participating in the Michigan Survey of Consumers in 2007, Bruine de Bruin et al. (2010) report that individuals with lower financial literacy have higher inflation expectations. Van Rooij, Lusardi, and Alessie (2011) report that Dutch households also exhibit fairly low levels of financial knowledge. Financial illiteracy is not only widespread, but is particularly severe in certain demographic groups. Especially the elderly and women display very low levels of economic knowledge.

Third, there is a well-established literature regarding survey data on household expectations.[19] In an early contribution, Jonung (1981) shows how perceived and expected rates of inflation in a cross-section of Swedish households differ between several 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).

We now turn to the findings. Table 8 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. In particular, men have lower inflation expectations than women ($p < 0.05$) and

[19] Most papers focus on aggregate household expectations. For expectations of experts, there is more research on individual forecasts. See, for instance, Capistrán and Timmermann (2009) or Dovern, Fritsche, and Slaálek (2012).

Table 8. Summary Statistics for Inflation Expectations

	Mean	Standard Deviation	Number of Observations
Full Sample	2.73	1.64	1,370
Breakdown By:			
Age			
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
Gender**			
Male	2.64	1.53	771
Female	2.83	1.77	599
Partner			
Living with a Partner	2.74	1.66	1,061
Not Living with a Partner	2.68	1.59	309
Income			
Low Income	2.89	1.81	605
Medium Income	2.63	1.46	601
High Income	2.48	1.55	164
Education**			
No Higher Vocational Education or University	2.81	1.72	874
Higher Vocational Education or University	2.58	1.48	491
Social-Economic Status			
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
City			
1 (= Least Urbanized)	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 Urbanized)	2.60	1.43	215

(continued)

Table 8. (Continued)

	Mean	Standard Deviation	Number of Observations
Desire to be Informed			
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
Ideology***			
No Ideology	3.26	2.11	276
Ideology	2.59	1.47	1,094

Notes: This tables 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 twelve 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, *, **, and *** denote significant differences at the 10, 5, and 1 percent level.

individuals with high levels of education expect lower increases in consumer prices ($p < 0.05$). We also find that people who have not thought about political ideologies expect higher levels of inflation ($p < 0.01$). There are also indications that expectations decline with income and social status, but these coefficients are not significant.

Next, we turn to a more formal analysis of expectations. Our survey does not enable us to explore time variation in inflation expectations. However, we have a very rich set of background variables, which we can use to explain the cross-sectional variation in expectations. We address two questions. First, does knowledge about monetary policy help in generating realistic inflation expectations? Second, does knowledge help in reducing absolute forecast errors? These two questions are related, but using the absolute errors is a stricter evaluation of the numbers submitted by the participants. At the same time, using absolute forecast errors enables us to use the variation in the data more extensively. It also enables us to assess the magnitude of the economic effect of knowledge more directly.

To define "realistic" expectations, we use several cut-off points. Looking at figure 8, 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 percent over the next twelve months. What about low levels of expected inflation? For instance, 2 percent 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 percent.[20] In the end, the actual rate of increase in Dutch consumer prices between April 2009 and April 2010 turned out to be 1.1 percent. From that perspective, an expected price increase of 2 percent may already be considered too high. As the threshold between realistic and unrealistic expectations is not clear, we use two cut-off points: 1 percent and 2 percent, meaning that unrealistic expectations start at 2 and 3 percent, respectively.[21] Under these two definitions, the percentage of individuals with realistic expectations is 17.8 percent and 55.9 percent, respectively. Using the absolute forecast error is more straightforward. We use the actual rate of increase in Dutch consumer prices as the realized measure of inflation, so that the absolute forecast error equals $|\pi^e - 1.1|$, where π^e denotes the submitted inflation expectation.

Table 9 shows the results for these two exercises. Columns 1–4 show marginal effects for probit regressions, where the dependent variable equals 1 if the respondent has realistic expectations, and 0 otherwise. The first two columns use the threshold of 1 percent, while columns 3 and 4 use the threshold of 2 percent. Columns 5 and 6 use the absolute forecast error as the dependent variable; the results are coefficients from OLS regressions. The key explanatory variable is the level of knowledge about ECB monetary policy. The first measure we use is the correct number of answers to statements about the ECB's objective (columns 1, 3, and 5). The second measure is the fraction of correctly answered true and false statements (columns 2, 4, and 6). As control variables, we include all the

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

[21] We also investigated thresholds at 3 and 4 percent. These results (available on request) were similar to those with the threshold at 2 percent.

Table 9. Knowledge and Inflation Expectations

	Realistic Expectations				Absolute Forecast Error	
	Ending at 1%		Ending at 2%			
	(1)	(2)	(3)	(4)	(5)	(6)
Knowledge:						
Number of Correctly	0.01**		0.02***		−0.07***	
Answered Questions	(0.01)		(0.01)		(0.02)	
Fraction of Correctly		−0.01		0.02		−0.14
Answered True Statements		(0.04)		(0.05)		(0.16)
Fraction of Correctly		0.13***		0.18***		−0.58***
Answered False Statements		(0.04)		(0.06)		(0.16)
Other Variables:						
Desire to be Informed (D)	0.04***	0.05***	0.02	0.03	−0.13**	−0.14**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.07)	(0.07)
SI1: Income	−0.00	−0.00	0.01	0.01	−0.03	−0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
No Ideology (ID)	0.00	−0.00	−0.09**	−0.10**	0.69***	0.70***
	(0.04)	(0.04)	(0.05)	(0.05)	(0.18)	(0.18)
Work Related to	−0.00	−0.00	−0.01	−0.01	0.03	0.03
Monetary Issues	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)
Age	−0.00	−0.00	−0.00**	−0.00**	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

(continued)

Table 9. (Continued)

	Realistic Expectations				Absolute Forecast Error	
	Ending at 1%		Ending at 2%			
	(1)	(2)	(3)	(4)	(5)	(6)
Status	0.02	0.02	0.03*	0.03*	−0.10**	−0.10**
	(0.01)	(0.01)	(0.02)	(0.02)	(0.05)	(0.05)
City	−0.01	−0.01	−0.01	−0.01	0.07*	0.07*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)
TV	0.02	0.03	0.06	0.07	0.04	0.02
	(0.04)	(0.04)	(0.05)	(0.05)	(0.17)	(0.17)
Newspapers	0.03	0.03	0.08	0.08	−0.15	−0.16
	(0.05)	(0.05)	(0.05)	(0.05)	(0.16)	(0.16)
Other	0.03	0.04	0.04	0.04	−0.13	−0.14
	(0.05)	(0.06)	(0.06)	(0.06)	(0.19)	(0.19)
Constant					1.74***	1.73***
					(0.33)	(0.33)
Probability [realistic = 1]	0.18	0.18	0.58	0.58		
McKelvey and Zavoina's Pseudo R^2	0.02	0.03	0.01	0.01		
Adjusted R^2					0.06	0.06

Notes: Robust standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Columns 1–4 present 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 percent, 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). Columns 5 and 6 present coefficients from OLS regressions, where the absolute forecast error is the dependent variable. Parameters for education, sex, and partner are not significant and are not shown in this table. Results are based on 1,104 observations.

variables that were used in table 5 to explain knowledge. Finally, we include the degree to which respondents' work is related to economic, monetary, or financial issues, as this variable may be relevant for the extent to which realistic expectations are formed. The included media variables are those that measure the most important source of information (S). Results using Q, or QH and QL, were similar (available on request).

The regression results suggest that knowledge about monetary policy matters. Columns 1–4 indicate that the respondents' ability to formulate realistic inflation expectations is positively related to their level of knowledge about 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 percent. Again, the difference between true and false statements turns out to be important. As shown in the second and fourth columns of table 9, it is mainly the individual's ability to answer false statements correctly that is positively related to the ability to formulate realistic expectations. A similar picture emerges for the absolute forecast error (columns 5 and 6). Answering an additional question correctly is associated with a decrease of the forecast error by 0.07 percentage points. Again, the correlation between knowledge and expectations is the strongest for respondents who correctly answer the false statements.

Turning to the other variables, we find significant results for the desire to be informed, having no ideology, and age. The threshold for realistic inflation expectations is relevant. If the threshold for realistic expectations is set at 1 percent, the desire to be informed is significant, whereas for higher thresholds, ideology and age are significant. As 1 percent 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 percent lower probability of formulating realistic expectations than those who have thought about this subject. Also, the elderly have a somewhat lower probability of formulating realistic expectations. We also find that age is positively correlated to the absolute forecast

error. Finally, it is remarkable that the degree to which respondents' work is related to economic, monetary, or financial issues is neither related to the realism of inflation expectations nor to the absolute forecast error. 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 inflation expectations.[22]

Finally, we investigate whether particular pieces of information are particularly useful for the general public. To this end, we aggregated the number of correct answers to questions for five categories: price stability (statements 1, 2, and 7), economic growth (statements 3 and 4), unemployment (statements 5 and 6), countries or euro area (statements 9 and 10), and other issues (statements 8 and 11). Using these variables, we again test what determines realistic inflation expectations and absolute forecast errors. Table 10 shows the results. The useful elements of knowledge are related to economic growth and price stability. When using realistic inflation expectations (using 1 percent or 2 percent as a cut-off point) as dependent variables, the number of correct answers to questions on economic growth has a strong connection to the quality of expectations (columns 1 and 2). Moreover, correctly answering questions on economic growth and price stability is negatively related to the absolute forecast error. From the perspective of central bank communication, the issues of economic growth and price stability (and the possible trade-offs between them) would therefore be good candidates for providing greater clarity to the general public.

7. 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 as follows: "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

[22] As a robustness check, we reran the regressions in table 9 without the desire to be informed, as this variable may be strongly correlated to having a job in economics. However, the coefficient for a job related to monetary issues remained insignificant (results available on request).

Table 10. Which Types of Knowledge Are Most Relevant for Inflation Expectations?

	Realistic Expectations		Absolute Forecast Error
	Ending at 1%	Ending at 2%	
	(1)	(2)	(3)
Knowledge About:			
Price Stability	0.01	0.02	−0.14**
	(0.02)	(0.02)	(0.06)
Unemployment	−0.01	−0.00	0.00
	(0.01)	(0.02)	(0.06)
Economic Growth	0.04***	0.07***	−0.22***
	(0.02)	(0.02)	(0.06)
Countries or Euro Area	0.00	−0.00	0.02
	(0.02)	(0.02)	(0.07)
Other Issues	0.01	0.01	0.03
	(0.02)	(0.03)	(0.07)
Other Variables:			
Desire to be Informed (D)	0.04***	0.03	−0.14**
	(0.02)	(0.02)	(0.06)
SI1: Income	−0.00	0.01	−0.03
	(0.01)	(0.01)	(0.02)
No Ideology (ID)	0.01	−0.09*	0.67***
	(0.04)	(0.05)	(0.18)
Work Related to Monetary Issues	−0.01	−0.02	0.04
	(0.01)	(0.01)	(0.03)
Age	−0.00	−0.00**	0.01***
	(0.00)	(0.00)	(0.00)
Status	0.02	0.03*	−0.09*
	(0.01)	(0.02)	(0.05)
City	−0.01	−0.01	0.06*
	(0.01)	(0.01)	(0.04)
TV	0.03	0.07	0.00
	(0.04)	(0.05)	(0.17)
Newspapers	0.03	0.09*	−0.18
	(0.05)	(0.05)	(0.16)
Other	0.04	0.05	−0.17
	(0.06)	(0.06)	(0.19)
Constant			1.75***
			(0.34)
Probability [realistic = 1]	0.18	0.58	
McKelvey and Zavoina's Pseudo R^2	0.03	0.04	
Adjusted R^2			0.07

Notes: Robust standard errors are shown in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The knowledge variables are measured as the number of correct answers per category. For the other variables, see the notes to table 9.

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 affect 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 enhancing the public's 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 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 research also suggests that several survey participants have only a weak desire to be informed. Furthermore, those respondents 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 (see also Ehrmann and Tzamourani 2012).

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 evidence 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. Also, we document a negative relationship between monetary policy knowledge and inflation forecast errors. Knowledge on price stability and economic growth is particularly strongly related to the quality of inflation expectations. These findings suggest there are important returns to knowledge on monetary policy, 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.

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 who 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?

The **main** objective of the ECB...	True	False	I don't know
1... is price stability			
2... is to keep prices constant			
3... is low unemployment			
4... is an unemployment rate of at most 5%			
5... is high economic growth			
6... is an economic growth rate of at least 2%			

7. . . is an inflation rate that is close to but below 2%
8. . . is to keep interest rates constant
9. . . applies to the euro area average
10. . . applies to all euro area countries separately
11. . . 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. 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 we refer to DuMouchel and Duncan (1983), Pfeffermann (1993), Winship and Radbill (1994), Korn and Graubard (1995), Magee, Robb, and Burbidge (1998), and Angrist and Pischke (2009). 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 on request.

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