# Inflation expectations, attitudes towards the ECB, and central bank announcements [*]

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## Abstract

A single supra-national organization, the European Central Bank, has a particularly challenging job as it must communicate policy information to over 300 million citizens living across 19 member states. It must also do so despite waning trust for the institution by the public. Embedding survey vignette experiments into three panel survey waves of German citizens, we examine whether individuals' support for the ECB affects their information uptake and inflation expectations. We use a novel approach to measure inflation expectations, leveraging the fact that it is difficult to translate price changes into annual inflation rates. Our experiments show that public approval of the ECB matters for receptivity to central bank communications. We also show that short and clear snippets of information are most effective in shaping respondents' inflation expectations. Our results provide some evidence that central banks can compensate for waning public trust by communicating more clearly and with greater brevity.

# 1 Introduction

Over the last 15 years, central banks increasingly target citizens with their policy communications. Whereas before, central bank communications focused primarily on investors and industry experts, central banks now direct a significant share of their policy communications towards the mass public. In the Eurozone, the European Central Bank (ECB), has an unique challenge as it must communicate complex policy information to over 300 million citizens living across 19 member states, with each member state experiencing different economic conditions.

Given the public's relatively new exposure to central bank communications, it remains unclear whether citizens actually benefit from an increase in central bank communications targeted towards them. The public shows very limited knowledge about the economy, and especially central banking, even though collectively, macroeconomic outcomes depend on citizens' beliefs, expectations, and behaviors (Bachmann, Berg, and Sims 2015; Bernanke 2007; Bodea and Hicks 2015). Further, despite increasing evidence that central bank communications can improve the effectiveness of monetary policy (Mokhtarzadeh and Petersen 2020), central banks, central bankers, and supra-national organizations such as the ECB, are increasingly unpopular with the public. So prevalent are these concerns that researchers now refer to these issues as the "twin deficit" in monetary policy, reflecting a combined lack of public understanding and a deficit in public trust in central banks (Haldane and McMahon 2018).

How do citizens form economic expectations given this "twin-deficit"? Much of the previous literature focuses on the role of demographics, socioeconomic, and historical characteristics in explaining the public's economic forecasts and mistakes therein. Recently, scholars have shown that an individual's inaccurate historical memory may pose strong effects on their inflation expectations (Haffert, Redeker, and Rommel 2019). Yet most of this literature ignores the influence of growing mistrust in central banks in general and the ECB in particular. Even Germany, one of the most powerful countries in the Eurozone, has recently become one of the strongest and most vocal critics of ECB policies (Bindseil, Domnick, and Zeuner 2015). This is puzzling as the country's hyperinflation history is thought to be so prominent in supporting central banks and anchoring citizens' expectations that it is sometimes referred to as "German stability culture" (Bulmer 2014; Howarth and Rommerskirchen 2013; Schmidt 2014)

In this paper, we argue that the effectiveness of central bank communication depends on the combination of message *clarity* and institutional *trust* and does so in an interactive way. To

develop this argument, we add to the central bank literature the notion that political predispositions act as a perceptual filter for citizens' information receptiveness. Indeed, the political science literature has long showed how political partisanship structures agents' economic outlook (Anderson, Mendes, and Tverdova 2004; Conover and Feldman 1986; Gerber and Huber 2010; Wlezien, Franklin, and Twiggs 1997). We extend this literature to the study of monetary policy and central banking.

For a supra-national organization like the ECB, we expect that euroskepticism rather than partisan affinity or political ideology most likely matters. Consequently, the political opinions that individuals have about the ECB as an institution is expected to play an important role in the transmission mechanism of information and by extension monetary policy. In this paper, we focus on inflation expectations as inflation expectations are at the core of monetary policy and central banking, however, we think that the theory is general enough to speak to other political economy issues as well. For example, one might think of the role that trust in the International Monetary Fund (IMF) plays in affecting the expected success of structural reforms. Similarly, one could think of the effect of regional currency cooperation and trust in exchange rates regimes on expectations of future exchange rates.

We collected original panel survey data in order to empirically test our argument. We implemented survey vignette experiments embedded in three waves of the German Internet Panel (GIP), a representative panel dataset of the German population, fielded between 2014 and 2016. Trust in the ECB amongst Germans was at its lowest in 20 years throughout this time period (Jonung and Roth 2020). Confirming previous research, we find evidence that the *clarity* of central bank communications matters: shorter and clearer central bank statements move panel respondents closer to the central bank's announced inflation target (Bholat et al. 2019). Second, we also find that panel respondents' *political predispositions towards the ECB* matters as well and as much as clarity. We show that a more positive attitude towards the ECB is associated with more information uptake of the ECB's message, which is important as it suggests that individuals' economic expectations of the future economy are entangled with political biases. As alternative mechanisms, we also test for the role of financial literacy, life-events, and policy preferences assessing their role in expectations formation. We find that more financially sophisticated members of the public are less sensitive to ECB communications, whereas those whose life-circumstances change, i.e., when their occupation status shifts, are more sensitive. We also find that having personal policy preferences closer to the ECB's inflation target

does not change respondents' receptivity to central bank communications. Importantly, this last finding suggests that it is attitudes towards the ECB rather than their policy preferences that matters for information uptake.

Our findings contribute a new understanding of the causal effects of central bank clarity as well as evidence on the role that political biases play in shaping everyday citizens' inflation expectations. They are particularly relevant because how citizens learn about monetary policy as well as how they perceive central banks and central banking has implications for the delivery of successful monetary policy. For example, if economic recovery from the global COVID-19 pandemic and future inflation rates depends on citizens making calculated market adjustments based on economic information and only those citizens supportive of the central bank uptake information, financial recovery may vary across countries, potentially leading to a viscous cycle of unequal recovery and loss of support for countries with low trust in central banks to start with. Our paper also contributes to the literature that examines the origins of households' inflation expectations using survey experiments (Armantier et al. 2016; Cavallo, Cruces, and Perez-Truglia 2017; Roos and Schmidt 2012); the literature on euroskepticism and European politics (De Vries 2018; Hobolt and Wratil 2015; Sorace and Hobolt 2021); and the literature that links political behavior and political economy (Tverdova 2012).

## 2 Literature Review and Hypotheses

### 2.1 Central Bank Communications and Inflation Expectations

Financial knowledge – or the ability to understand how money works – is important for undertaking many daily activities such as following news about the economy, managing debt, and buying a home. A basic understanding of financial concepts and the ability to apply numeracy skills can ensure that citizens manage their own financial affairs and react to news and events enfolding in the economy in ways that benefit them. Previous studies find that those with higher levels of financial knowledge make better investment and retirement decisions and are also less likely to accumulate debt (Clark, Lusardi, and Mitchell 2017; Hastings, Madrian, and Skimmyhorn 2013).

Central banks have recently tried to capitalize on links between central bank communications and financial literacy by paying closer attention to how they provide information to the general public. As demonstrated in Woodford (2005), the more the central bank is willing to share its

information, the more predictable policy. The management of expectations is crucial because uncertainty – about the state of the economy, the economy's structure, and the inferences that the public will draw from policy actions or economic developments – is a pervasive feature of monetary policy making. Informing the public about the central bank's future course of action has been shown to affect the public's behavior as well as macroeconomic outcomes (Bernanke 2004; Orphanides and Williams 2005). An increase in predictability, especially predictability about future monetary policy, is therefore associated with an increase in economic stability.[1] According to Cavallo, "All these efforts may help central banks increase the speed which which individuals react to monetary policy" (Cavallo, Cruces, and Perez-Truglia 2017, p.4). This is in direct opposition to older arguments of how monetary policy works (Blinder et al. 2008). Older theories by contrast suggest in order to be effective, monetary policy must be surprising; rather than be surprising, modern central banking aims to be predictable, informative, and clear.

The ECB itself also notes that "transparency means more than simply releasing information, as this does not by itself translate into a better understanding of monetary policy... [Clarity] becomes even more important when information is to be communicated to different audiences across different environments" (European Central Bank, 2002, p. 60).[2] Empirically, researchers have measured central bank clarity by examining the readability of central bank communications (Bulíř, Čihák, and Jansen 2013; Jansen 2011; Montes et al. 2016) or the expressed level of uncertainty in central bank statements (Baerg 2020). When there is a possibility of information overload or "cacophony," central banks also face a trade-off between providing more information meanwhile ensuring common understanding (Binder 2017; Chahrour 2014; Eppler and Mengis 2008).

While it is interesting that citizens' subjective expectations change when macro-economic information is communicated to them, there is also some evidence that changes in expectations affect citizens' economic behavior as well (Galashin, Kanz, and Perez-Truglia 2020). Importantly, previous research shows that people update their beliefs about the economy on the basis of new information despite any cognitive problems they may face in acquiring and processing the information (Armantier et al. 2016; Malmendier and Nagel 2016). In fact, experimentally induced information about inflation using survey experiments are shown to have even long-lasting

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[1]Economic theory predicts that inflation expectations influence both inflation dynamics and real activity. In particular, according to the New Keynesian Phillips curve, inflation $\pi_t$ depends on labor market slack $X_t$, expected inflation $E_t(\pi_{t+1})$, and a supply shock $\zeta_t$. For a given nominal interest rate, a rise in expected inflation implies a lower real interest rate, which should in turn imply higher consumption.

[2]European Central Bank (2002). The Accountability of the ECB. Monthly Bulletin, November, 45-57.

effects on research subjects' expectations (Bottan and Perez-Truglia 2017; Cavallo, Cruces, and Perez-Truglia 2017). While such studies are interesting, to our knowledge, previous studies on central bank clarity do not account for the role that political predispositions may play in the receptivity of subjects to information in the first place. Political biases may very well filter in or filter out information, which then affects the formation of inflation expectations. In the next section, we outline why political predispositions likely interact with information in influencing citizens' inflation expectations and why this is more likely for citizens with lower financial sophistication.

## 2.2 Political Predispositions and Public Support for the ECB

The economic voting literature has long argued that voters evaluate the economy and punish incumbents for bad economic outcomes (for an overview see Lewis-Beck and Stegmaier 2000). As far back as Campbell et al. (1960), party identification (ID), or which party a voter identifies with, is argued to affect individuals' political choice as well as their final vote. Partisan attachment also means that voters stay with the same party over time and resist contrary influence. Much of the literature argues that partisan attachment is formed early in life and is more or less stable over one's lifetime.

Just like party ID links voters to opinions about policies, it can also influence voters *evaluation* of economic circumstances as well as their *expectations* of the future economy. Voters' expectations not only matter for economic forecasts but also their consumption behavior and the macro-economy (Gerber and Huber 2009, 2010; Ladner and Wlezien 2007). When partisans anticipate their favored party will win the next election, they tend to form more optimistic perceptions of the future economy. Moreover, partisans also adjust their economic behaviors based on whether or not their preferred party holds power; this has a powerful effect showing how political variables can influence both perceptions and outcomes (Evans and Andersen 2006; Gillitzer, Prasad, and Robinson 2021). One example of the effects of political beliefs on economic expectations comes from researching individuals living in countries transitioning to democracy in Eastern Europe. Tverdova (2012) finds that citizens' political dispositions matter for their economic forecasts, with those favorable to democratic transition having more optimistic perceptions of the future economy. Furthermore, Tverdoa finds that this effect is particularly strong despite contemporaneous high inflation and unemployment levels (Tverdova 2012). In other words, despite living in unfavorable economic conditions, those individuals supportive of

democratic transition are also those individuals that think the economy will improve.

Political divisions based on other political beliefs or biases may be equally forceful in shaping individuals' economic expectations. Hobolt and Sorace (2020), for example, demonstrate differences in the economic perceptions of British citizens contingent on support for Brexit. Beyond the United Kingdom, support or opposition towards the European Union (EU) more generally, as well as opinions citizens may hold about the performance of EU institutions, may reflect political divides that can shape expectations. The ECB is a particularly important institution in EU economic governance and increasingly scholars have shown how the ECB operates in a highly politicized environment (Moschella, Pinto, and Martocchia Diodati 2020). The ECB was a key actor during the Euro crisis and its prominence in managing the Euro crisis resulted in controversies and heterogeneous support amongst member states. While the Eurozone stabilised without any member state defaulting or leaving the Eurozone, the adoption of so-called "unconventional" monetary policies increased opposition to the ECB's expanded powers, generating frustrations that were frequently criticized, especially in the German media and by German political and economic elites (Högenauer 2019). Also important for our research, this was associated with a gradual decline in support for the ECB among individuals living in Germany, which bottomed out in 2014, coinciding with the first wave of our survey (Jonung and Roth 2020).

For a supra-national organization like the ECB, with a mandate that encompasses 19 member states, euroskepticism rather than partisan attachment is therefore the most likely political cleavage to condition the transmission of central bank communications to everyday citizens. The term euroskepticism means criticism of the EU and the European integration project. De Vries (2018) argues that euroskepticism is fundamentally about attributing success and blame to different levels of government relative to one's own expectations: "When national conditions are good, in economic and political terms, or at least when people perceive them as such, euroskepticism is mostly likely to develop. When national conditions are bad, however, EU support is the most likely outcome with no viable alternative to membership is present" (De Vries 2018, p.6). As suggested above, the ECB, therefore, has a "twin-deficit" problem when it comes to policy communications: firstly, the ECB must communicate its policy decisions *clearly* to citizens who have limited interest and understanding of its policies. The severity of this knowledge gap about what the ECB does cannot be overstated. One recent study surveying Dutch households about their degree of knowledge about the ECB find that, on

average, respondents incorrectly guessed more than half of the eleven questions about what the ECB does (Cruijsen, Jansen, and De Haan 2015). Secondly, the ECB must also communicate in an increasingly hostile environment in terms of public support, though this hostility varies across countries and over time. Communications might be easily ignored by citizens that are euroskeptic. If individuals are not supportive of the ECB, even clear communications may have little sway on their expectations.

## 2.3 Hypotheses

Summarizing the review of related literature leads us to a number of testable hypotheses about the relationship between central bank clarity, euroskepticism, and inflation expectations. First, following from the previous literature, we test how ECB clarity affects respondents' inflation expectations. We propose two dimensions of clarity: more precise targets and message brevity. We test that:

H1 ECB statements that are clearer have a greater effect on individuals' inflation expectations compared to vaguer statements.

H2 ECB statements that are shorter have a greater influence on individuals' inflation expectations than longer statements.

Individuals must also be willing to incorporate central bank communications into their economic forecasts. That is, they must be receptive to the information in the first place. As outlined above, we expect that citizens incorporate economic information in ways that depend on their political predispositions towards the ECB. Rather than inflation expectations being based on computed inputs from economic data alone, inflation expectations may depend on to what extent respondents accept the ECB's information because it is consistent with their own views. Inflation expectations, therefore, likely reflect respondents' political opinions, making them similar to other kinds of public opinions. Inflation expectations may therefore depend on perceptions of how well the central bank is performing. Indeed, if the public believes that the central bank is doing a bad job, individuals may discount what the central bank says. Thus our third hypothesis is that:

H3 Central bank communications are more likely to affect expectations for those individuals who hold more favorable opinions of the central bank

To get at the causal effects of changes in central bank clarity and public support, we implemented three waves of survey experiments and directly manipulate the level of *clarity* by varying the use of clear language as well as the length of central bank messages. Importantly, our experimental manipulations allow us to make causal claims about between-group average treatment effects, while the panel set-up gives us a handle on controlling for individual-level determinants that may matter for political biases, such as changes to a respondent's economic situation or financial sophistication, which may make them particularly sensitive (or not) to economic information.

# 3 Research design

## 3.1 Case selection

In order to evaluate the effect of central bank statements on the formation of inflation expectations, we conducted 3-waves of survey experiments on a panel of respondents in Germany between 2014 and 2016. Germany offers an interesting study environment to examine inflation expectations for a number of reasons. First, inflation rates during the experimental period in Germany were very low – well below the ECB's target inflation rate of 2%. In low inflation environments, it may be rational that citizens pay little attention to the economy as inflation is less costly, which might make respondents' priors more diffuse and diffuse priors might mean that citizens make *larger* updates to their inflation expectations when presented with central bank communications. On the other hand, Germany's inflation is so low during the study period that the country is experiencing disinflation – or when inflation rates are slowing down, and even deflation – or where inflation rates are negative. Disinflation generates significant economic uncertainties, especially if people think that prices will be substantially lower in the future. Deflation and disinflation can cause individuals to postpone consumption decisions, for example deciding to buy big purchase items like cars and household appliances in the future because they expect that future prices will be even lower than they are today. Therefore, during this time period, it may also be costly for citizens to ignore important economic information from the central bank, and individuals may have incentives to search for information from public and private sources (Morris and Shin 1998). If individuals acquire information, this would make their priors harder to move and therefore we might expect *smaller* updates to their inflation expectations as a result of central bank messages. In summary, economic uncertainty about fu-

ture inflation make this time period especially interesting as the public's motivations for paying attention to inflation are conflicting.

Second, at first glace, Germany also represents an unlikely case for political opposition to the ECB. Germany was traditionally attached to creating a highly independent ECB modeled after its own central bank, the *Deutsche Bundesbank*. Germany also has no history of opposition to the national central bank and had, until the emergence of the Alternative für Deutschland, no major eurosceptic domestic right-wing party. However, the ECB's policies became politicized and a subject of scrutiny and dissatisfaction, especially from many of Germany's political and economic elites. A critical view of the ECB was taken publicly by the Bundesbank's President, Jens Weidman where he criticized ECB policies in a number of popular news outlets. Indeed, throughout our study period, the German and European news-media engaged in a lively and sometimes attacking debate about whether the ECB should engage in asset purchases of euro-area government bonds in order to help re-inflate struggling European economies. Opinions in Germany on euro-bond purchases varied enormously, with some pundits arguing that by purchasing assets, the ECB was over-extending its legal reach, yet others arguing in support of more activist policies aimed at re-inflating Europe. Important for us, ECB and inflation-related news was noteworthy, contentious, and talked about widely, making it a good opportunity to ask survey respondents about monetary policy. We especially exploit the timing of this political debate in wave 2 of our study where we encourage citizens to think about the asset purchase program directly and link the ECB's policy to the possibility of future changes in inflation.

## 3.2 Panel

In order to examine the effects of central bank communications on individuals' inflation expectations, we ran experimental vignettes on German households participating in three waves of an ongoing panel dataset called the German Internet Panel (GIP). GIP respondents are German residents in private households between 16 and 75 years-old. Sampling is based on multistage proportionate stratified random sampling, including equipping a number of previously offline individuals with computers and internet and making them online. Our survey experiments were fielded in November 2014 (Wave 14), November 2015 (Wave 20), and May 2016 (Wave 23). In this paper, we refer to these three surveys as wave 1, wave 2, and wave 3. The total number of respondents for wave 1 was 3,575; wave 2, 3,159; and wave 3, 2,941. In total, we have 2,457 respondents that are present across all three waves. Of the respondents in the sample, 97% were

given either of the two conditions of our information treatment in wave 1 and 97% either of the four conditions of our information treatment in wave 2. Non-response answers for our questions was very low, ranging from 2 to 70 respondents. The highest non-response rate in our set of questions appears on the question asking respondents to report their general news consumption levels (70 people or 2% of the survey).[3]

## 3.3 Experimental design

We incorporate two sets of information treatments, one in wave 1 and one in wave 2, and use comparisons between groups to identify the causal effects of inflation clarity in central bank information on respondents' inflation expectations.[4] In wave 3, we also ask respondents about their inflation beliefs, trust in inflation statistics, and level of uncertainty about their answer. In the first two waves, we implement *two information manipulations* that vary the level of inflation-target clarity (wave 1 and wave 2) by including (or not) vague or precise textual language as well as vary the length of the example policy statement given to respondents (wave 2). In this study, we do not compare our information treatments to a control group that receives no central bank message. This is because our research question asks whether respondents' expectations change given changes in the content of communications not whether communications affect respondents' expectations. There is a large and robust literature that shows elite cues matter for citizens' economic beliefs (Boydstun, Highton, and Linn 2018; Haller and Norpoth 1997; Shen, Ahern, and Baker 2014) and so in this experiment, we focus on manipulating the content of central bank messages rather than manipulating exposure to central bank messages.

**Wave 1, first information treatment:** In wave 1, we first elicit respondents' prior inflation expectations. We develop a novel way to ask respondents about their inflation expectations by leveraging the fact that it is difficult for individuals to translate annual changes in prices for a given basket of goods and services to changes in annual inflation rates. We do this to make sure that we measure the effect of our information treatment rather than just estimating who has good recall of inflation statistics, which might be due to other factors such as financial sophistication, news consumption, or an interest in economics or politics. In the first screen, respondents are asked to give an estimate of expected price changes for a particular basket of

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[3]More details on general panel attrition and non-response are given in Table A.1 in the the appendix.

[4]All survey questionnaire items introduced in this section are given verbatim (in German) in Section C.1 in the appendix.

goods and services over the next 12 months, which we denote as $\pi_{i,t}^0$. Respondents are given a hypothetical scenario in which a person is said to have spent 1500 Euros per month on typical purchases for food, goods, and services such as groceries, clothes and a hair-cut. Another benefit of asking the question this way is that we prompt respondents into thinking about a specific price basket therefore mitigating issue where respondents vary in terms of items they imagine in the basket. Respondents are then asked how much they think the same person would spend on the same items 12 months from now. As response options, individuals are given a list of different Euro amounts ranging from "less than 1500 Euros" to "1650 Euros or more." Each response option is measured in increments of 1 percent annual inflation, forcing respondents to consider the same scale, but respondents are not told the intervals in annual inflation rates at the time of answering the question about changes in the price basket.

On the next screen, respondents are then asked to consider inflation in Germany. Respondents are given a short explanation about inflation, including a definition of inflation and about the role of the ECB in managing inflation in the Eurozone. All respondents get this information. Then, respondents are randomized into two groups and receive either a vignette with a text snippet that gives information about inflation and also the ECB's policy goals (*Clear Information*) or a similar text that says the same thing but uses vaguer language (*Vague Information*).

The (English translation) of the vignettes read as follows:

*Clear Information*: The European Central Bank expects the important interest rates to remain at the current level or below for a longer period of time. This assessment rests on the general expectation of low inflation of 1 percent per year. The expected inflation for the Eurozone is in line with the objective of the Central Bank to keep inflation at 2 percent.

*Vague Information*: The European Central Bank expects the important interest rates to remain at the current level or below for a longer period of time. This assessment rests on the general expectation of low inflation. The expected inflation for the Eurozone is in line with the objective of the Central Bank to keep inflation at an appropriate level.

Respondents are then asked a number of questions, including a manipulation check, to make sure that they understood the question and were treated with the information. The manipulation treatment asked respondents how detailed the information they received was and a large number of people in the clear information treatment group said the information was detailed whereas

those in the vague group were more likely to say the information was less detailed.

Finally, before measuring our main outcome variable, respondents are shown their answer to the first question and are told how their initial response translates into an annual inflation rate. This translation makes their initial beliefs about inflation directly comparable to the inflation rate presented in the ECB texts. We then measure the main outcome variable, 12-month ahead inflation expectations, to assess the effect of the information treatment on respondents' expected annual inflation rate. In order to cue the respondents to think about the information treatments explicitly when answering this question, we add the text, "considering the expectations by the ECB [...]". We denote a respondent's answer to this question as, $\pi_{i,1}^1$, and we call this measure their posterior (posterior to information) inflation expectations.

**Wave 2, second information treatment:** Wave 2 occurs exactly one-year (12 months) later and, because the panel is a longitudinal survey, wave 2 has the same respondents, with the exception of a loss of some respondents discussed above and as shown in the appendix. We again use a similar treatment text only now we vary the information using a 2 by 2 experimental design: the use of a clear language or vague language and the length of the text, either short or long. As mentioned, we also tap into the ECB asset purchase program controversy, which was highly salient in the German media during this time period. German politicians and right-wing political elites legally challenged the ECB's emergency bond-buying scheme in a number of prominent court-cases. While Germany's constitutional court ruled that the bond-program was legal, Jens Weidmann as well as others frequently criticized the program publicly.[5]

The four (English translations) of the wave 2 treatment conditions read as follows:

*Clear information, long text*: The ECB extends its purchase of bonds to those issued by Eurozone governments, issuers with development objects, and issued by European institutions. Overall, monthly purchases of a total value of 60 million Euros are planned. These purchases will continue until September 2016 at a minimum. The program serves to fulfill the ECB mandate to ensure price stability and reach a medium-term inflation rate close to 2%.

*Vague information, long text*: The ECB extends its purchase of bonds to those issued by Eurozone governments, issuers with development objects, and issued by European

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institutions. Overall, monthly purchases of high total value are planned. These purchases will continue until the middle of next year at a minimum. The program serves to fulfill the ECB mandate to ensure price stability and reach a medium-term inflation rate close to an appropriate level.

*Clear information, short text*: The ECB extends its purchase of bonds. Purchases of a total value of 60 million Euros will continue until September 2016 and serve to fulfill the ECB mandate to ensure price stability and reach a medium-term inflation rate close to 2%.

*Vague information, short text*: The ECB extends its purchase of bonds. Purchases of high total value will continue until the middle of next year and serve to fulfill the ECB mandate to ensure price stability and reach a medium-term inflation rate close to an appropriate level.

As in wave 1, we again ask respondents for their posterior inflation expectations using the same question text, and we denote wave 2, one-year ahead inflation expectations as $\pi^1_{i,2}$.

**Wave 3, final inflation expectations:** Finally, wave 3 occurs 6 months later in May 2016 and is again fielded on the same panel of respondents. As before, we ask respondents for their inflation expectation, using the same text as in wave 1 and 2 and we denote wave 3, one-year ahead inflation expectations as $\pi_{i,3}$. We also ask respondents about how uncertain they are about their answer to their own inflation forecast and how much they trust inflation statistics.

## 3.4 Measures

The main variable that we are interested in predicting is the respondent's initial beliefs about price changes over the next 12 months, $\pi^0_{i,1}$, which we call their *prior (to treatment) inflation belief*. We are interested in how their *posterior (after treatment inflation expectations $\pi^1_{i,1}, \pi^1_{i,2}$)* relate to their prior estimates given our different information treatments. We use the term "posterior" as meaning "after receiving new information" and not necessarily that agents update their expectations using Bayes' rule. Additionally, we are also interested in respondents' attitudes towards the ECB, which we call *ECB performance*. More specifically, we record respondents' opinions on whether they approve of the ECB's performance with respect to the ECB achieving it's inflation mandate of 2%. We also ask respondents to self report how much

general news they consume (*News consumption*) as well as business/financial news (*Business news consumption*). This includes news that they watch, listen to, or read. Finally, we also elicit individuals' personal inflation preferences and then calculate the distance between their stated preferences and the ECB's 2% target rate (more on this below). Finally, we also ask respondents for their medium to long term 5-year and 10-year ahead inflation expectations, $\pi_{i,1}^5, \pi_{i,1}^{10}$. Further we examine respondents support for *EU integration* more broadly, their self-placement on the left-right scale(*ideology*), their trust in inflation statistics (*trust in statistics*) as provided by governmental institutions, and whether respondents report a change in their occupation status from wave to wave (e.g. from employed to unemployed or retired). *Changed occupation status* builds on self-reported occupation status elicited in each of the three waves before our experiment. *EU integration* and *ideology* are measured in other waves of the GIP in 2015.

Table 1 summarizes the time-line of our study across the three waves.

Table 1: Time-line of treatments and outcome measures within and across the three waves of the German Internet Panel (GIP)

|  |  |  |  |  | $\longrightarrow$ Time $\longrightarrow$ |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|
|  |  | **Wave 1, November 2014** |  |  |  | **Wave 2, November 2015** |  |  | **Wave 3, May 2016** |
| **Treatments** |  | ✓ |  |  |  | ✓ |  |  |  |
| **Outcome measures** | $\pi_{i,1}^0$ |  | $\pi_{i,1}^1$ |  |  |  | $\pi_{i,2}^1$ |  | $\pi_{i,3}^1$ |
| **Manipulation checks** |  |  |  | ✓ |  |  |  |  |  |
| **Additional measures** |  |  |  | $\pi_{i,1}^5, \pi_{i,1}^{10}$, ECB performance, News consumption, Business News consumption |  |  |  | Policy Congruence | Uncertainty Trust in statistics |

As shown in Table 1, ECB performance, news consumption, and business news consumption questions are asked after treatment but before the outcome measures. In wave 2, the policy congruence question is asked before the treatment and the outcome measure. In wave 3, questions about uncertainty in their inflation estimate and trust in inflation statistics are asked after the inflation expectations question.

While the survey experiment was not pre-registered, an earlier pre-test survey was fielded between July and August 2014, using a quota-sample of German households. All questions used in the analysis are also contained in the pre-test (Reference blinded for peer review).

# 4 Results

## 4.1 Clarity of information

Before we move on to discussing our main results, we first present descriptive information about the inflationary environment in Germany during our sample period. In the lead up to wave 1, inflation in Germany is going down and is below the ECB's 2% target rate. In November 2014, which is when our first wave is fielded, Germany starts to experience significant disinflation and even deflation (negative inflation rates) and this continues throughout the sample period. Consequently, changes in inflation are variable across the three waves of our experiments, moving between negative rates and one-percent inflation. Despite the decline, however, average prior inflation expectations in our sample (1-year ahead) is 3.30, with a standard deviation 2.72, which is well above actual inflation of 1%. This is not unusual as inflation expectations tend to be skewed, with respondents thinking that inflation is much higher then it actually is. After our information treatment, however, posterior inflation expectations are lower, averaging 2.61, with standard deviation 2.26. Additionally, as we have a longitudinal panel of respondents, we can also examine over-time changes in the panel's inflation expectations. Average inflation expectations across the sample period go down from 3.30% to 2.24% between 2014 and 2015, with a standard deviation of 1.82. They decline even further in 2016 from 2.24% to 2.07%, with a standard deviation of 1.72. Figure 1 shows that respondents are not only responding to our information treatments but also tracking real changes in inflation in the economy, though they do so with a significant time-lag and they stay well above the true inflation rate for the whole period.

Figure 2 shows that respondents allocated into the different treatment groups start off with similar prior expectations of future inflation. The mean of the prior is 3.35 in the *clear information* treatment and 3.26 in the *vague information* treatment. Difference-in-means and difference-in-distribution tests suggest that the differences are not statistically significant ($p = 0.36$ and $p = 0.45$).

Next we examine posterior inflation expectations across treatment groups in wave 1, which we measure after respondents receive the information manipulation. Recall the two different messages: half of our respondents receive clear information about the value of inflation and the ECB's target and the ECB's policy objective (*clear information*) whereas the other half of our respondents receive vaguer information about targets and the ECB's policy objective (*vague*
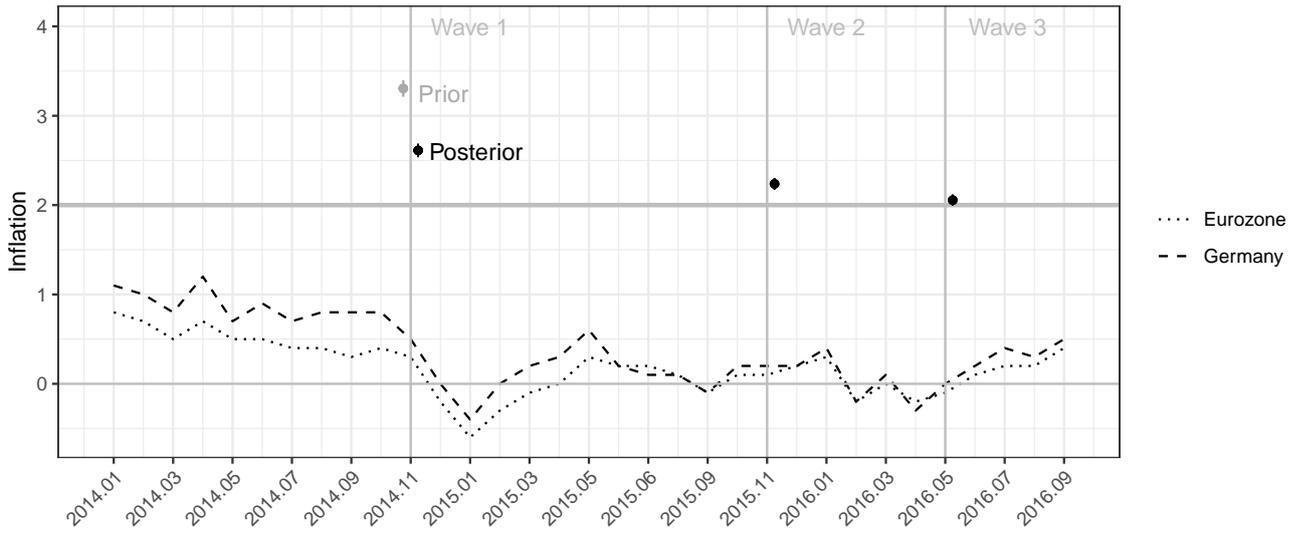
Figure 1: Prior and posterior expectation inflation in our sample (mean and standard error of the mean) and real inflation in Germany and the Eurozone.

*information*). Figure 3 illustrates the effect of the different information treatments on posterior expectations: clearer information significantly reduces respondents' average posterior inflation expectations, and it significantly lowers the variance amongst those in the *clear information* treatment group but not in the in the *vague information* treatment group. Remember that our respondents have to translate changes in prices of consumer goods and services into changes in inflation. Both groups, therefore, likely update as they correct mistaken calculations between price changes and annual inflation. Individuals in the *clear information* treatment group still update more, however, even when we take this into account. The posterior inflation expectation in the group that receives clear information is 2.58 while posterior inflation expectation in the group getting vaguer information is 2.65. The variance of the prior is 7.54 and 7.27 in the *clear information* and *vague information* treatments. After treatment, the variance of posterior expectations is 4.61 *clear information* and 5.60 *vague information*, which is a significant difference.

We do not find that the information treatment received in the first way continues to exert an effect on reported inflation expectations in wave 2 and 3. Any effect of the treatment therefore seems short-lived, not lasting into subsequent waves.[6]

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[6]Figure A.1 in the appendix illustrates that differences in the distribution of the posterior inflation expectation disappears across waves
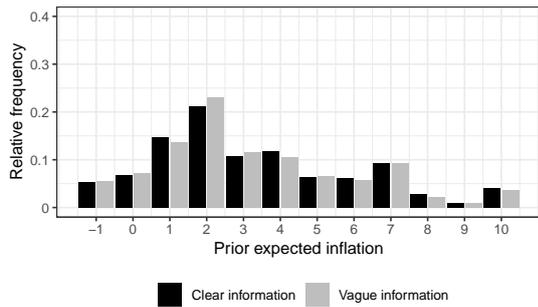
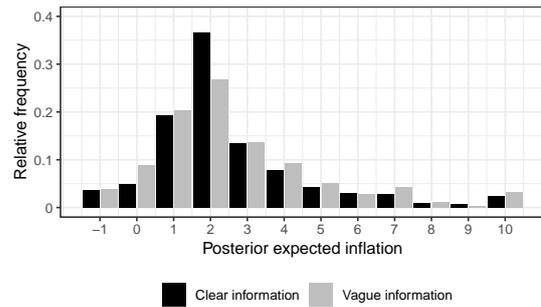Figure 2: Respondents' Reported Prior Inflation Expectations

Figure 3: Respondents' Reported Posterior Inflation Expectations

Another way to assess the information treatment effects, is to investigate respondent-level updating. Figure 4 illustrates the relationship between respondents' prior (to treatment in wave 1) and posterior (to treatment in wave 1) one-year ahead inflation expectations, grouped by the information treatment that they are allocated to. We find a clear distinction between those respondents who are given clear information compared to those who are given vague information. Those respondents in the clear treatment group are more likely to tighten around the ECB's numerical inflation target than those respondents given vaguer information and they are more likely to do so to a greater degree than those in the vague group and this difference is statistically significant.

While respondents move closer to the inflation target of 2% with their inflation expectation in both information treatment groups, respondents receiving the *clear information* reduce their difference to the target significantly more than those receiving *vague information*; more specifically, the reduction in deviation from the target is, on average, 0.22 in the *clear information* treatment. In the *vague information* treatment, the deviation from the target of 2% even increases by 0.09.

Difference-in-means and difference-in-distributions tests of the reductions between treatment groups both return $p < 0.01$. As before, it is important to point out that any treatment effect of the communicated text is short-lived. The treatment effect of the wave 1 information treatment disappears in waves 2 and 3.[7]

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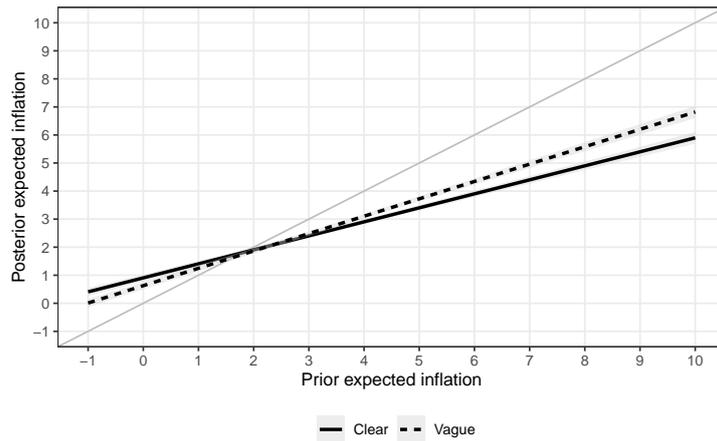[7]See Figure A.2 in the appendix.

Figure 4: Respondents' Prior vs Posterior Inflation Expectations (Wave 1)

To better understand aggregate differences across the groups, we also examine how much the marginal effect of prior inflation expectations (as elicited in wave 1) on posterior inflation expectation (as elicited in wave 1 and wave 2) differs by treatment condition. We estimate the marginal effect of prior inflation expectation on posterior inflation expectation speaking directly to our Hypotheses 1 and 2.[8] Figure 5 shows that, on average, those respondents that receive the clear information place significantly lower weight on their initial beliefs (and therefore a higher weight on ECB information) than those respondents that receive vague information. These results are consistent with evidence that finds that clearer central bank communications are more effective in shaping expectations than content that is more vague.

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[8]The marginal effects are estimated from a linear regression of posterior inflation expectation on prior inflation expectation, including a dummy variables for the different treatment condition (*vague information* or *clear information* in wave 1; *vague/short*, *vague/long*, *clear/short*, or *clear/long* information in wave 2), as well as individual-level controls (See Table 2 below).
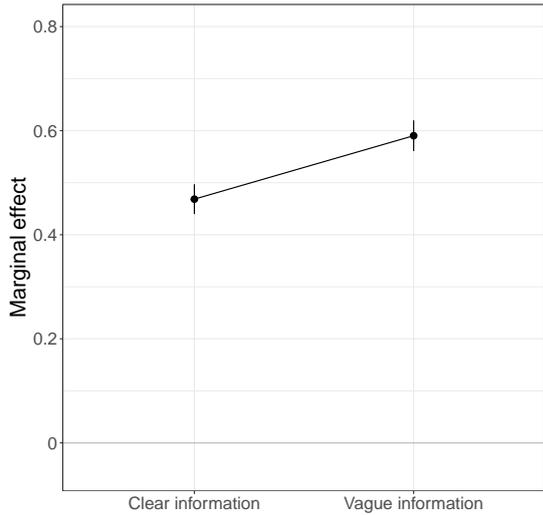
Figure 5: Marginal Effect of Respondents' Reported Prior Inflation Expectations (Wave 1) on Reported Posterior Inflation Expectations (Wave 1)
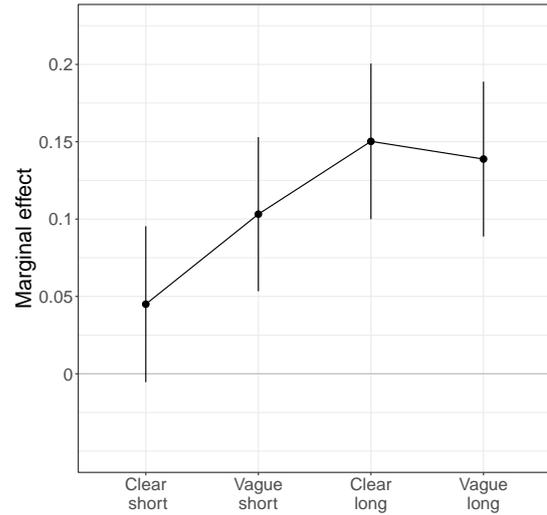
Figure 6: Marginal Effect of Respondents' Reported Prior Inflation Expectations (Wave 1) on Reported Posterior Inflation Expectations (Wave 2)

Because the data is a longitudinal panel, we can assume that respondents hold relatively sticky expectations of inflation. Assuming this, we can take the respondent's prior beliefs and examine how much clarity and brevity shift these expectations one-year later. The information treatment in wave 2 varies both the length of the statement given to respondents in addition to its level of clarity. Because we have already elicited prior expectations one-year earlier, we also include respondents' prior expectations directly into the analysis. As before, Figure 6 shows information that is both clear and short shows the weakest association between a respondent's prior and posterior inflation expectations when compared to either longer, clear information or vague information.

A range of important conclusions can be drawn from these first results:

**Result 1** *When the monetary authority communicates clearly, on average, respondents' inflation expectation will adjust more to the central bank's announcement than if the communications are vaguer.*

In summary, our experimental findings corroborate observational and laboratory studies that show that central banks can alter the public's expectations and in ways that they intend with their policy communications and that this works even for respondents that have relatively limited information about monetary policy (Ehrmann and Fratzscher 2009; Mokhtarzadeh and Petersen 2020). It is important to note, however, that the estimated substantive effect of the

Table 2: Linear Regression of Respondents' Reported Posterior Inflation Expectations in wave 1 and 2 on information treatment indicator, covariates, and their interactions.

| | Posterior wave 1 | Posterior wave 2 |
|---|---|---|
| *Prior* | 0.385 (0.090)*** | −0.091 (0.090) |
| *Information treatment* | | |
| *Clear* | 0.292 (0.084)*** | |
| *Vague, short* | | 0.119 (0.162) |
| *Clear, long* | | −0.029 (0.155) |
| *Clear, short* | | 0.282 (0.161)* |
| *Business news consumption* | −0.074 (0.032)** | −0.096 (0.040)** |
| *News Consumption* | 0.049 (0.047) | −0.169 (0.062)*** |
| *ECB performance* | 0.070 (0.055) | 0.201 (0.087)** |
| *Prior × Clear* | −0.122 (0.030)*** | |
| *Prior × Vague, short* | | −0.030 (0.041) |
| *Prior × Clear, long* | | −0.007 (0.043) |
| *Prior × Clear, short* | | −0.099 (0.040)** |
| *Prior × Business news consumption* | 0.019 (0.011)* | 0.003 (0.010) |
| *Prior × News Consumption* | −0.014 (0.014) | 0.030 (0.014)** |
| *Prior × ECB performance* | 0.068 (0.019)*** | 0.007 (0.020) |
| *Constant* | 0.544 (0.261)** | 2.725 (0.413)*** |
| $R^2$ | 0.472 | 0.059 |
| Adj. $R^2$ | 0.470 | 0.054 |
| Num. obs. | 3432 | 2645 |
| RMSE | 1.634 | 1.737 |

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

information on respondents' prior beliefs is relatively small. For example, going from a clear long piece of information to a clear short text lowers the estimated weight of the prior on posterior inflation expectation by $\approx 0.10\,(0.05, 0.15)$. Another contribution is the insight that brevity as well as clarity of targets also matters. Keeping monetary policy statements short delivers better gains for policy communication than lengthy but clear communications. Therefore, another implication of our results is that:

**Result 2** *Central bank communications that are short, even if they are vague, are more effective in shaping expectations than policy communications that are both clear and long.*

## 4.2 Political Predispositions

We next examine the influence of individuals' support for the ECB by treatment group, conditional on respondents' prior inflation expectations. The regression Table 2 shows our tests for a relationship between respondent's reported posterior inflation expectation and respondent's attitudes towards the ECB, speaking directly to our hypothesis 3. Recall that respondents' atti-

tudes towards the performance of the ECB are measured on a Likert-type scale, where (1) is very good and (5) very bad, and (3) the middle category is neither good nor bad. If attitudes towards the the ECB have an effect on the receptivity of central bank communications, then we should expect that respondents with more favorable opinions of the ECB (lower values) should also be more likely to up-weight information given by the ECB and down-weight their prior inflation expectations in forming posterior inflation expectations. Furthermore, as suggested, we expect that the information treatment works stronger for supporters the clearer the information. In order to test this, we first examine the marginal effect of prior expectations on posterior inflation expectation at each realization of the Likert-scale of attitudes towards the ECB by treatment condition. Figure 7 provides evidence that respondents who view the ECB favorably are also more likely to down-weight their priors and conversely, those less likely to view the ECB favorably are less affected. In terms of substantive effects, going from a rating of the ECB is doing a good job to the ECB is doing a bad (from interval 2 to 4 on the scale) reduces the weight of the prior around 0.15. Interestingly, this substantive effect is similar in size to effects observed for brevity. Secondly, we also see a level effect. Those in the clear information treatment group put lower weight on their priors compared to those in the vague treatment group, with statistically significantly differences for respondents that answered either 2, 3, or 4 on support for the ECB.
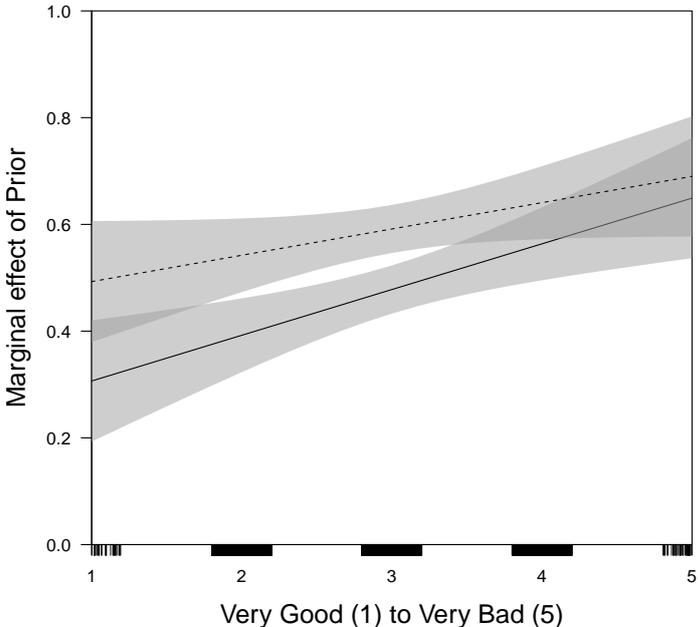


Figure 7: Marginal Effect of Prior on Posterior Inflation Expectation by Attitudes towards the ECB (Vague – dashed line, Clear – solid line)

Our measure of ECB performance specifically targets respondents' attitudes towards the ECB with respect to the ECB's core mandate: controlling inflation. There are two possible concerns with this measure: First, we ask the ECB question right after respondents are treated. Respondents might therefore answer the question about the ECB in a way that is conditioned by either the treatment variable or the fact that they are getting information about the ECB from the survey. So as to account for this, we use an alternative measure proxying evaluation of ECB performance with support for EU integration. Attitudes towards EU integration are measured by asking respondents whether they believe there EU integration needs to continue further (0) or has already moved ahead too far (10). The correlation between ECB performance and attitudes towards EU integration is positive and statistically significant. When we replace our ECB support measure with the EU integration measure, we find similar results in the marginal effects. The more that a respondent wants EU integration to continue, the more open he/she is to ECB information and the less sticky their prior inflation beliefs. This is shown in Figure 8. Note that we see level effects in the treatment group for those respondents answering between 4 and 10 and not those below 4. This suggests again that the treatment condition is strongly related to euroskeptic opinions and less so with europhile opinions.

Figure 8: Marginal Effect of Prior on Posterior Inflation Expectation by Attitudes towards EU Integration (Vague – dashed line, Clear – solid line)
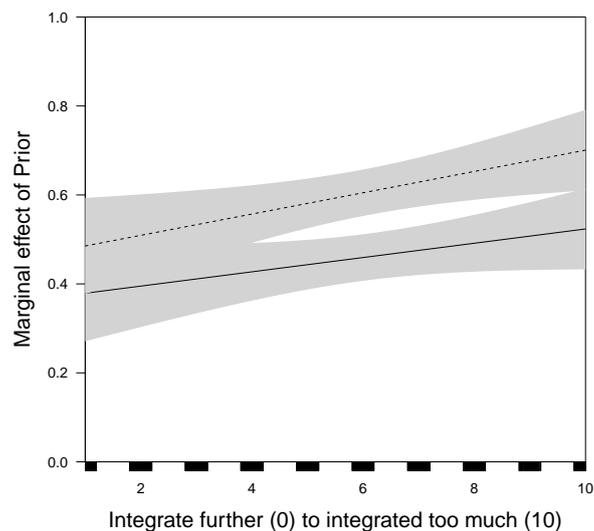


Second, ECB and EU support might be proxying other political biases, such as political ideology or partisanship, and not be reflective of euroskepticism at all. So as to check whether this is the case, we leverage the question on respondents let-right self-placement. Computing

marginal effects of respondents' prior on their posterior by self-placement on the political left-right scale does show any significant change in the marginal effects. As shown in Figure 9, the effect of ideological self placement on inflation expectations is not sloping upward as it is with measures of support for the ECB and EU integration. This finding leads us to conclude that it is indeed euroskepticism rather than other kinds of political biases that matter the most for inflation expectations in Germany.[9] This is particularly interesting as recent research shows that ideology matters for inflation expectations in the U.S. context (Gillitzer, Prasad, and Robinson 2021). German respondents accurately condition their inflation expectations on their public opinions about the ECB rather than ideology.

Figure 9: Marginal Effect of Priors on Posterior Inflation Expectation by Left-Right Self-Placement (Vague – dashed line, Clear – solid line)
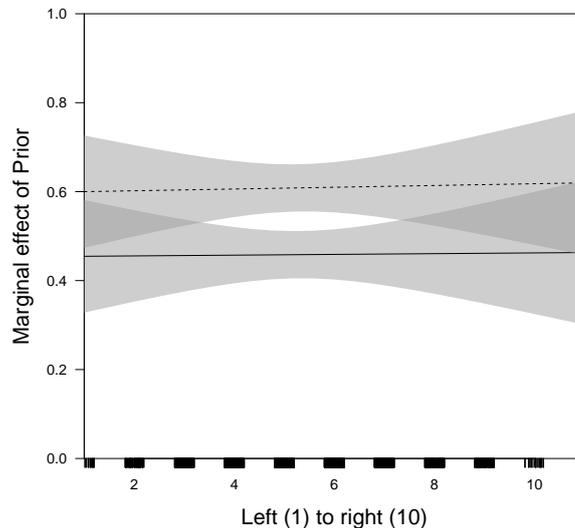


We summarize how the clarity in ECB communication interacts with political predisposition in our third result:

**Result 3** *Respondents more skeptical of the central bank are less likely to incorporate central bank announcements into their expectations whereas political ideology has little effect.*

### 4.3 Alternative Mechanisms

So far, we consider the effects of political biases, namely euroskepticism, and how political biases interact with information uptake from central bank communications. In this section, we

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[9]We find no correlation of attitudes towards the ECB and trust in inflation statistics provided by the ECB pointing towards euroskepticism as fueling ECB attitudes and not policy-specific animosities.

consider a number of possible alternative mechanisms to examine whether these explanations explain respondents' inflation expectations. We consider the role of (self-reported) financial sophistication, financial life-event changes, and personal inflation preferences as possible alternative mechanisms.

First, we are interested in whether a respondent's level of financial sophistication matters for their information uptake from public information. We proxy financial sophistication by asking respondents to self-report their media consumption, asking for declarations about general as well as business news consumption. As shown in Table 2, the general consumption of news media does not matter for respondents' posterior inflation expectations. General news media also does not interact with prior inflation expectation in determining the respondent's posterior beliefs in wave 1. On the other hand, respondents who self-report consuming more *business news* hold lower wave 1 - posterior inflation expectations than those who have less exposure to business news. Business news consumption also interacts significantly with a respondent's prior inflation expectation. In particular, as shown in Figure 10, the weight on prior inflation expectation increases as business news consumption increases. This suggests that that frequency or the intensity of private information clearly impacts expectations. Further, respondents who report to consume more business news are also more likely to have inflation priors closer to the ECB's 2% inflation target and are more certain in their expectation, which implies that they are likely learning about the economy from private sector sources and therefore either have a more sophisticated understanding of the economy or have stronger recall of inflation-related information. This finding is important as it is unlike findings in the literature on elite cues and political sophistication. In that literature, individuals with greater political sophistication are more rather than less likely to take up elite cues (Lodge and Taber 2013). In the case of central bank news, we see that people more exposed to business news have stickier and more correct priors than those with less exposure. In other words, people with more exposure to private information sources are less likely to be influenced by central bank communications but also have less room to move because they have more accurate beliefs in the first place.
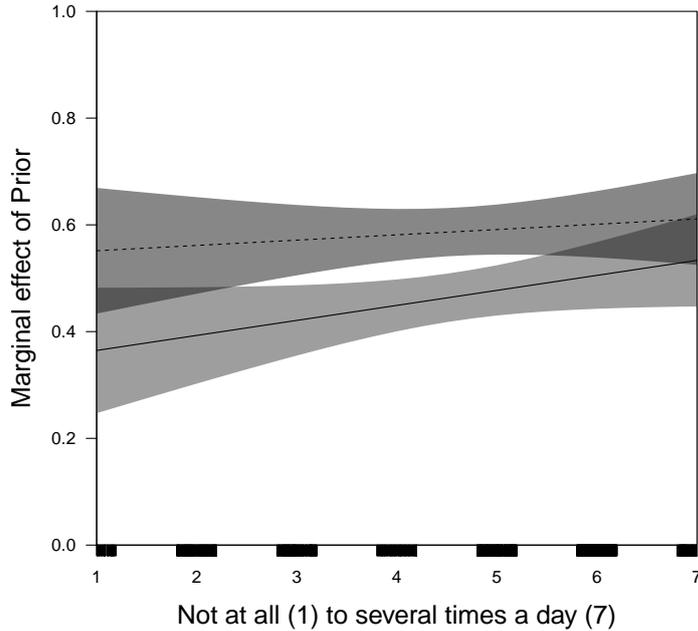
Figure 10: Marginal Effect of Priors on Posterior Inflation Expectation by Business News Consumption (Vague – dashed line, Clear – solid line)

Since we only depend on self-reported news and financial news consumption, one concern may be that respondents misreport their business savviness. To check for this, we provide another measure as proxy of financial knowledge, which we can exploit because of the panel structure of our dataset: whether a respondent reports a change in occupation status (e.g. from employed to retired or full time to part time) across the panel waves. Changes in one's financial situation are important life events which might correspond to a higher need for financial information or at least awareness in one's own financial situation. Indeed, we estimate that those who changed their occupation status also hold lower wave 1 - posterior inflation expectation, suggesting that they are more accurate than those not having important life events during the panel. When we put this behavioural measure in our model to proxy financial sophistication, as with business news consumption, we observe a higher marginal effect of the prior than those whose occupation status remained constant.[10]

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[10]We take the estimate of the effect of change in occupation status from the regression reported in Table 3.

Table 3: Linear Regression of reported posterior inflation expectation on indicator of first information treatment, whether respondents' occupation status change from Wave 1 to Wave 2, and the interaction of those two variables.

|  | Posterior wave 1 | Posterior wave 2 |
|---|---|---|
| *Prior* | 0.415 (0.089)*** | −0.072 (0.094) |
| *Information treatment* | | |
|     *Clear* | 0.270 (0.084)*** | |
|     *Vague, short* | | 0.119 (0.161) |
|     *Clear, long* | | −0.065 (0.157) |
|     *Clear, short* | | 0.288 (0.162)* |
| *Changed occupation status* | −0.092 (0.095) | −0.163 (0.150) |
| *News Consumption* | 0.012 (0.033) | −0.236 (0.049)*** |
| *ECB performance* | 0.064 (0.054) | 0.199 (0.088)** |
| *Prior × Clear* | −0.112 (0.030)*** | |
| *Prior × Vague, short* | | −0.033 (0.041) |
| *Prior × Clear, long* | | 0.004 (0.044) |
| *Prior × Clear, short* | | −0.101 (0.040)** |
| *Prior × Changed occupation status* | 0.012 (0.032) | 0.010 (0.037) |
| *Prior × News Consumption* | −0.008 (0.010) | 0.027 (0.012)** |
| *Prior × ECB performance* | 0.073 (0.019)*** | 0.010 (0.021) |
| *Constant* | 0.498 (0.258)* | 2.791 (0.420)*** |
| $R^2$ | 0.475 | 0.057 |
| Adj. $R^2$ | 0.474 | 0.052 |
| Num. obs. | 3451 | 2656 |
| RMSE | 1.639 | 1.744 |

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 4: Statistical models

Our final consideration is whether an individual's preferred policy matters for their expectations. To measure this, we examine deviations in individuals' personal policy preferences from the ECB's target rate of two-percent. In wave 2, we ask respondents about their own preferred inflation rate so as to measure policy congruence a number of ways. First, we ask them directly about their preferences. Second, respondents also indicate their inflation preferences by completing a number of small interactive tasks, which we list below. In all of these tasks, we include additional comprehension checks:

Task A: Respondents decide between either an economic scenario of high unemployment and low inflation in Germany and the Eurozone with an additional comprehension questions. A scenario where both indicators are stable is not given as an option.

Task B: Respondents move interconnected sliders for interest rate, inflation, unemployment rate, and growth rate (order of sliders is randomized), for Germany, the Eurozone, or for their

individual situation. These sliders cue respondents that these indicators involve trade-offs. For example, when inflation rates increase, so do interest rates. Respondents are then asked to choose their preferred outcome.

Task C: Respondents report their preferred weighting that the ECB (or the German federal government) should apply to lowering inflation vs reducing unemployment on a scale of 0 to 10.

Using answers from these interactive tasks, we then measure *policy Congruence* as the (quadratic) distance between the respondent's preferred inflation rate and the ECB's 2% target rate.[11] Interestingly, we find little individual-level variation across the number of ways we try to get at preferred policy rates and find that an individual holds relatively consistent preferences over inflation across tasks. Furthermore, we also find that the preferred level of inflation is stable despite presenting different geographical regions with different conditions including: inflation in the Eurozone as a whole, Germany, and their own personally preferred situation, tailored to their own financial conditions. On average, respondents do not vary much in their answers despite these different hypothetical scenarios, with a median response that is very stable across the three types of questions (2.8, 2.8, 2.7). This implies that in the case of inflation preferences at least in this low inflation environment, respondents show little difference in "pocketbook" versus "socio-tropic" preferences. Despite this stability, however, when we move to examining between-respondent preferences, we observe significant variation. For example, while two-thirds of respondents prefer a world in which there is low inflation and high-unemployment, despite the fact that inflation is well below the ECB's target if made to choose, a remaining one-third of respondents prefer a world with higher inflation and higher unemployment.

We also probe respondents to consider monetary policy as if it involves trade-offs consistent with inflation "games" made available at most central bank museums or online.[12] In our games, we show respondents' randomized sliders and ask them to move the slider to their preferred inflation rate. When they move one indicator, such as inflation, they observe the effect of their preferred rate on other variables in the economy: interest rates, unemployment, and growth. The purpose of this task is to make respondents realize that different economic variables are inter-related. After interacting with our tasks, respondents' preferred inflation rate emerges at

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[11]In the main results, the policy rate we use comes from the task where respondents use sliders to specify their preferred inflation rate, however, we also run the results using the alternative measures and present them in Section C.1.2 in the appendix.

[12]For example, the ECB provides inflation education through the game Inflation Island. For an overview of the types of educational games see Inflation Island and Economia: Educational Games

a very similar rate of 2.5 percent. When we substitute respondent's preferences rather than respondent's opinions into the model, however, we get very different results. Unlike our key findings above, there is a little evidence for a relationship between policy distance from the ECB's inflation target and the marginal effect of the prior. The fact that preferences do not matter, either substantively or statistically, makes our findings that attitudes towards the ECB matter even more interesting. It seems that central bank communications is conditioned by whether or not someone positively (or negatively) evaluates the ECB (or the EU) and is independent from their own preferred level of inflation.
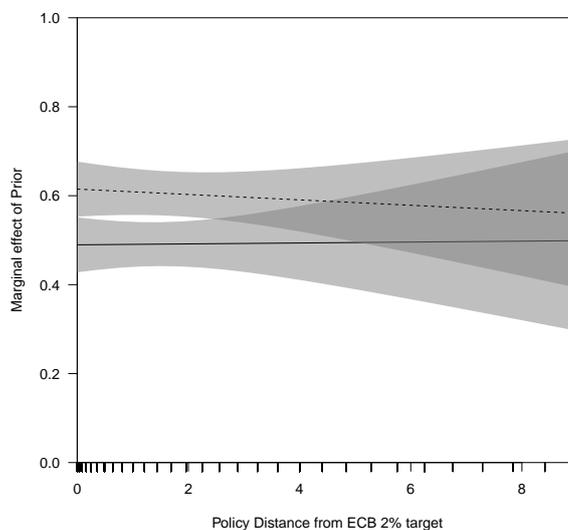


Figure 11: Marginal Effect of Priors on Posterior Inflation Expectation by Policy Congruence (Vague – dashed line, Clear – solid line)

## 5    Conclusion

In this paper, we provide evidence that citizens are sensitive to (short) textual information communicated by the European Central Bank (ECB). We find that this is true even during a time period where inflation is low, below the ECB's 2% target rate, and the ECB's monetary policy, especially the asset purchase program, is hotly contested and politicized in the German media and by German central bankers.

We motivated our experiments as a way to uncover how citizens update their beliefs given variations in information content. Our main finding is that citizens who hold more negative assessments of the ECB and those with greater exposure to financial news are also those less likely to uptake ECB communications. We also find that holding personal preferences close

to the ECB target rate is not associated with more uptake of the information. And we find that when interacting the message clarity and message length, texts that are both short and clear are most influencing. We think that these results are interesting especially because survey evidence suggests that respondents are uninterested and uninformed about monetary policy and yet factors such as public opinions matters for their economic beliefs.

Since our study was fielded, our insights only gained in relevance given that the German public have become even more critical of the ECB.[13] According to our results, elite signals in the German media toting the ineffectiveness of ECB policy may undermine the communication tools the ECB has in its arsenal for stabilizing inflation. Such a finding is therefore analogous to claims that increases in euroskepticism can reduce the legitimacy of European institutions and also their effectiveness (Baerg and Hallerberg 2016). Importantly our research also establishes that one way that the central bank can compensate for negative public approval is by increasing the clarity and reducing the length of policy communications.

In addition to these empirical insights, our study provide a number of new findings contributing to the public opinion literature. While previous studies suggest that political sophisticates may be more likely to adopt political information by their favored elites CITE, in our experiment, we find little evidence that public information crowds out private sector information for those consuming business news. In fact, information uptake, business news consumption is correlated with sophistication We also find surprising stability in respondents' personal preferences over inflation and we find that respondents are likely to report consistent preferences and make little distinction between personal inflation preferences, Eurozone inflation, and German inflation. Furthermore, while many studies have examined how non-elected political elites change citizens' opinion (Broockman and Butler 2017; Iyengar and Kinder 1987), new to this study is testing whether central banks can change citizens' understanding of the economy, and how, which also has important knock-on effects of models of politics, for example, models of economic voting.

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[13]For example, see the Financial times: German scepticism of the ECB reveals a eurozone paradox

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# Appendix

## A  Statistical appendix

### A.1  Attrition details

|  | 2012 sample | 2014 sample | Completion rate | Cumulative response |
|---|---|---|---|---|
| Wave 14 (November 2014) | 948 | 2627 | 72.4% | 14.8% |
| Wave 20 (November 2015) | 859 | 2300 | 63.8% | 13.0% |

Table A.1: Attrition statistics for the German Internet Panel

### A.2  Wave and treatment statistics

|  |  | Frequency | Proportion |
|---|---|---|---|
| **Wave 1** |  |  |  |
| Clear information |  | 1729 | .499 |
| Vague information |  | 1735 | .501 |
|  |  | 3464 |  |
|  |  |  |  |
| **Wave 2** |  |  |  |
| Clear information | short | 769 | .25 |
|  | long | 767 | .25 |
| Vague information | short | 768 | .25 |
|  | long | 768 | .25 |
|  |  | 3072 |  |

Table A.2: Wave and treatment statistics

## A.3 Additional analysis

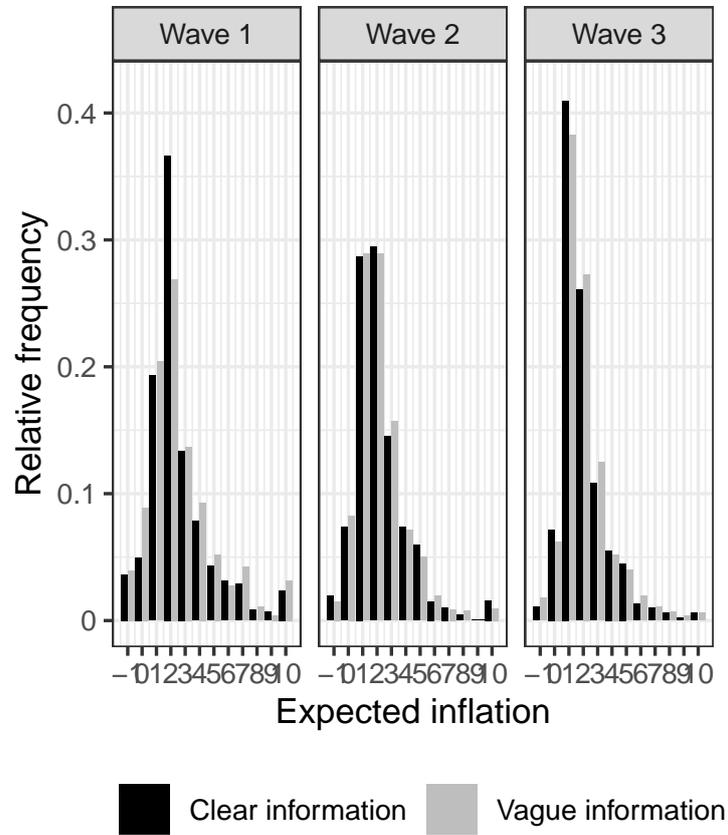Figure A.1: Respondents' Reported Posterior Inflation Expectations by Information Treatment in Wave 1



Figure A.2: Respondents Prior (Wave 1) vs Posterior Inflation Expectations
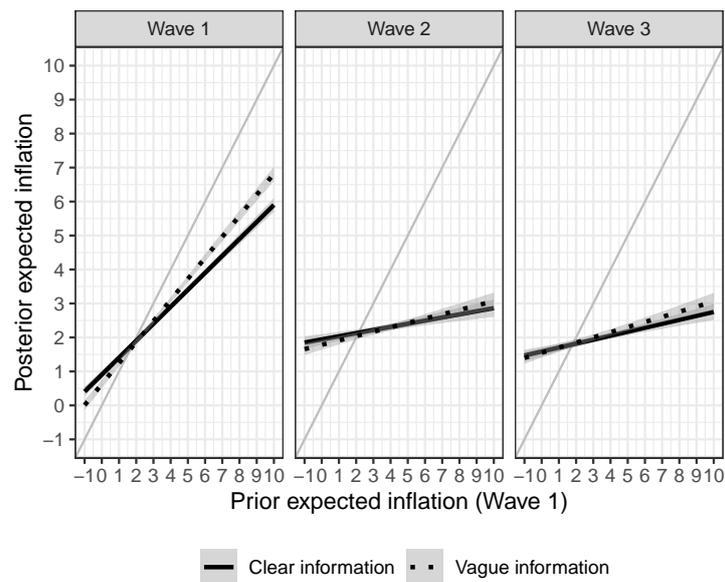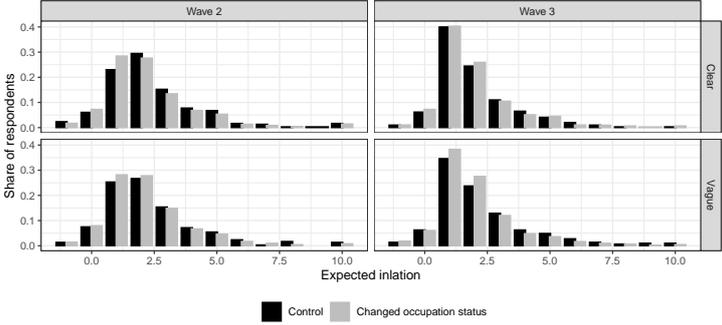
Figure A.3: Respondents' reported posterior inflation expectations by whether their occupations status changed from Wave 1 to Wave 2 and first information treatment (clear vs vague information in Wave 1) for Wave 2 and 3.

# B    Panel Information and Ethics

The German Internet Panel is based on a random probability sample of the general population in Germany aged 16 to 75. The study started in 2012, and was supplemented with additional participants in 2014. The panel participants were recruited offline using strict statistical procedures. Every other month, panel participants are invited to take part in a voluntary online survey.

The online panel methodology in combination with the random probability sample of the general population enables the GIP to conduct research on both cross-sectional and longitudinal issues, to run randomized experiments, and to react quickly to current events in politics, the economy, and society.

In 2012 and 2014, the GIP sampled with a so-called ADM design. In a first stage, 250 and 299 regions were randomly selected from a database of 52,947 regions, with approximately the same number of households. The regions were stratified in advance according to federal state and urbanity to ensure a proportionate distribution across the whole of Germany. A random starting address was then drawn in each region. Following a strict random route procedure, the first 200 households (identified via names on mailboxes or doorbells) along the pre-defined random route were listed in a database. At the head office, this household list was cleaned for non-existent households. Subsequently, we randomly drew households with a fixed spatial distance of exactly 5 households. Finally, selected households received an advance letter announcing the visit of an interviewer. The final gross sample consisted of 4,878 households in 2012 and 9,316 in 2014.

Interviewers conducted 15-minute face-to-face interviews in the households to establish contact, to introduce the study, to determine which household members were part of the eligible sample (target population: persons aged 16-75), and to identify households in need for computer and internet equipment to enable their participation in the study.

Eligible household members who agreed to be contacted were subsequently invited by postal mail to participate in the online study. Households that did not have the necessary computer and internet equipment were provided with user-friendly devices, internet and the appropriate technical support.

In 2012, the recruitment process yielded 1,603 registered online panelists with a cumulative AAPOR response rate of 18.5%; in 2014, this were 3,401 registered online panelists with a cumulative response rate of 21.0%. All samples are regularly surveyed to collect individual data on socio-economic characteristics, behaviors, and attitudes with bi-monthly 20–25 minutes questionnaires. For each survey, an email-invitation is sent out to all panelists on the 1st day of the odd months. The survey remains open for one month. At the beginning of each questionnaire, the identity of the respondents is verified through self-assessment. The participants receive a conditional incentive of 4 Euros and plus a yearly bonus: 10 Euros for all who took part in all surveys of year, or 5 Euros for all who took part in all but one surveys of year. Study participants may choose whether the incentive is transferred into their bank account, paid out as an Amazon voucher, or donated to charity.

The GIP survey data are made available to researchers as Scientific Use Files in the GIP data archive at the GESIS-Leibniz Institute for the Social Sciences six months after the completion of fieldwork and after data preparation and pseudonymization. As part of the Open Science movement, the GIP makes all survey data available to the scientific community. Researchers worldwide can apply for data access free of charge (except for a processing fee).

The GIP collects a wealth of detailed information as well as paradata that cannot be provided in Scientific Use Files for reasons of data protection. In order to enable scientists to work on these data, the GIP offers On-Site Data Access (ODA) in our Data Center in Mannheim. On request, we can provide sensitive data such as small-area information, the year of birth, verbatim data, ECSP collected paradata, as well as detailed response categories that were aggregated in the Scientific Use Files. This sensitive information may be used in the controlled environment of the ODA.

# C Experimental design appendix

## C.1 Questionnaire items

### C.1.1 Wave 1 (November 2014)

1. Assessing inflation

   German original:
   *Bei den folgenden Fragen besteht Ihre Aufgabe darin, Preisentwicklungen einzuschätzen. Eine Person gibt aktuell 1500 Euro für Lebensmittel und Kleidung sowie für Friseurbesuche pro Monat aus. Wie werden sich diese Ausgaben in 12 Monaten verändern? Geben Sie bitte an, wie viel diese Person für Lebensmittel und Kleidung sowie für Friseurbesuche in 12 Monaten ausgeben wird. Gehen Sie bitte davon aus, dass sich weder die Lebensumstände noch das Konsumverhalten der Person verändern wird, d.h. sie wird in 12 Monaten ähnliche Produkte und Dienstleistungen im gleichen Umfang wie derzeit nutzen. Bei dieser Frage können Sie nur eine Antwort geben.*

   *Ausgaben in 12 Monaten* [Answer key:] *weniger als 1500 EUR, 1500 EUR, 1515 EUR, 1530 EUR, 1545 EUR, 1560 EUR, 1575 EUR, 1590 EUR, 1605 EUR, 1620 EUR, 1635 EUR, 1650 EUR oder mehr.*

2. Inflation expectation, vague/ clear treatment condition

   German original:
   *Bei den folgenden Fragen besteht Ihre Aufgabe darin, Preisentwicklungen einzuschätzen. Eine Person gibt aktuell 1500 Euro für Lebensmittel und Kleidung sowie für Friseurbesuche pro Monat aus. Wie werden sich diese Ausgaben in 12 Monaten verändern? Geben Sie bitte an, wie viel diese Person für Lebensmittel und Kleidung sowie für Friseurbesuche in 12 Monaten ausgeben wird.* [Anchoring treatment 1 (AT1):]

   AT1.1 Vague information:
   *Die europäische Zentralbank erwartet, dass die wichtigen Zinssätze für eine längere Zeit auf dem gegenwärtigen Level oder darunter liegen werden. Diese Einschätzung beruht auf den insgesamt gedämpften Inflationsaussichten. Die Inflationserwartung für die Eurozone deckt sich mit dem Ziel der Zentralbank die Preissteigerung auf angemessenem Niveau zu halten.*

   AT1.2 Clear information:
   *Die europäische Zentralbank erwartet, dass die wichtigen Zinsssätze in den nächsten 6 bis 12 Monaten auf dem gegenwärtigen Level oder darunter liegen werden. Diese Einschätzung beruht auf den insgesamt gedämpften Inflationsaussichten von derzeit 1 Prozent pro Jahr. Die Inflationserwartung für die Eurozone deckt sich mit dem Ziel der Zentralbank die Preissteigerung nahe 2 Prozent zu halten.*

   *Bei der vorherigen Frage haben Sie angegeben, dass eine Person im* [Date, year from now][Answer from question 1] *für Lebensmittel und Kleidung ausgeben wird. Dieser Betrag entspricht einer jährlichen Inflationsrate von* [Answer from question 1 expressed as inflation rate]. *Wenn Sie nun die Erwartungen der EZB berücksichtigen, was schätzen Sie: Wie viel Euro wird diese Person für die gleichen Lebensmittel und die gleiche Kleidung im* [Date, year from now] *bezahlen? Gehen Sie bitte davon aus, dass sich weder die Lebensumstände noch das Konsumverhalten der Person verändern wird, d.h. sie wird in 12 Monaten ähnliche Produkte und Dienstleistungen im gleichen Umfang wie derzeit nutzen. Bei dieser Frage können Sie nur eine Antwort geben.*

*Ausgaben in 12 Monaten* [Answer key:] *weniger als 1500 EUR, 1500 EUR, 1515 EUR, 1530 EUR, 1545 EUR, 1560 EUR, 1575 EUR, 1590 EUR, 1605 EUR, 1620 EUR, 1635 EUR, 1650 EUR oder mehr.*

3. Medium-term inflation expectation

   German original:
   *Mit welcher jährlichen Inflationsrate rechnen Sie in 5 Jahren? Bei dieser Frage können Sie nur eine Antwort geben.* [Answer key:] *-1,0,1,2,3,4,5,6,7,8,9,10 %*

4. Long-term inflation expectation

   German original:
   *Mit welcher jährlichen Inflationsrate rechnen Sie in 10 Jahren? Bei dieser Frage können Sie nur eine Antwort geben.* [Answer key:] *-1,0,1,2,3,4,5,6,7,8,9,10 %*

5. Manipulation check

   German original:

   Vague information treatment condition:
   *In einer der vorherigen Fragen haben Sie folgende Informationen gelesen: Die Inflationserwartung für die Eurozone deckt sich mit dem Ziel der Europmäischen Zentralbank, die Preissteigerung auf angemessenem Niveau zu halten.*

   Clear information treatment:
   *In einer der vorherigen Fragen haben Sie folgende Informationen gelesen: Die Inflationserwartung für die Eurozone deckt sich mit dem Ziel der Europäischen Zentralbank, die Preissteigerung nahe 2% zu halten.*

   *Für wie detailliert halten Sie diese Information?*
   Answer key: *überhaupt nicht detailliert, wenig detailliert, mäßig detaillier, ziemlich detaillier, sehr detailliert*

6. Approval of ECB

   German original:
   *Die Hauptaufgabe der Europäischen Zentralbank (EZB) ist es, dafür zu sorgen, dass die Preise in der gesamten Eurozone stabil bleiben. Das bedeutet, dass die EZB dafür verantwortlich ist, dass sich die Preise über die Zeit nur wenig verändern. Wie erfüllt die EZB Ihrer Meinung nach die Aufgabe, die Preise stabil zu halten?*
   Answer key: *sehr gut, gut, weder gut noch schlecht, schlecht, sehr schlecht*

7. News consumption

   German original:
   *Wie oft schauen oder lesen Sie Nachrichten?*
   Answer key: *gar nicht, seltener als einmal pro Woche, einmal pro Woche, alle 4-6 Tage, alle 2-3 Tage, einmal am Tag, mehrmals am Tag*

8. Business news consumption

   German original:
   *Wie oft schauen oder lesen Sie Nachrichten zu wirtschaftlichen Themen?*
   Answer key: *gar nicht, seltener als einmal pro Woche, einmal pro Woche, alle 4-6 Tage, alle 2-3 Tage, einmal am Tag, mehrmals am Tag*

### C.1.2 Wave 2 (November 2015)

1. Preference inflation vs unemployment Germany (*CD20100 pref_inflation_unemployment_de*)

    German original:
    *Bei den folgenden Fragen geht es um Inflation. Wenn alles teurer wird spricht man von Inflation und meint damit, dass Sie sich für denselben Geldbetrag weniger kaufen können. Die Stärke der Inflation wird als Inflationsrate bezeichnet. Die Inflation wirkt sich auf die Arbeitslosenrate aus. Üblicherweise sind entweder die Inflationsrate oder die Arbeitslosenrate niedrig, nicht aber beide zum selben Zeitpunkt. Stellen Sie sich vor, dass Sie für Deutschland zwischen zwei extremen Szenarien wählen müssten. Für welches dieser beiden Szenarien würden Sie sich entscheiden?* [Answer key:] *Deutschland hätte in den nächsten 2 Jahren eine Inflationsrate von nur 2% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von 15%. Deutschland hätte in den nächsten 2 Jahren eine Inflationsrate von 15% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von nur 2%.*

2. Comprehension inflation vs unemployment trade-off Germany
(*CD20101 pref_inflation_unemployment_de_s2* or *CD20102 pref_inflation_unemployment_de_s3*

    German original:
    *Sie haben sich bei der vorherigen Frage für das [erste/zweite] Szenario entschieden: Deutschland hätte in den nächsten 2 Jahren eine Inflationsrate von nur [2/15]% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von [15/2]%. Das [zweite/erste] Szenario lautete: Deutschland hätte in den nächsten 2 Jahren eine Inflationsrate von [15/2]% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von nur [2/15]%. Wie hoch müsste die prozentuale Arbeitslosenrate im ersten Szenario mindestens sein, damit Sie sich für das zweite Szenario entscheiden würden? Bitte tragen Sie eine Zahl [zwischen 16 und 100/größer als 15] ein.* [Answer key:] Integer [16-100/>15]

3. Preference inflation vs unemployment Eurozone (*CD20103 pref_inflation_unemployment_eu*)

    German original:
    *Stellen Sie sich vor, dass Sie für den Euroraum zwischen zwei extremen Szenarien wählen mässten. Für welches dieser beiden Szenarien würden Sie sich entscheiden?* [Answer key:] *Der Euroraum hätte in den nächsten 2 Jahren eine Inflationsrate von nur 2% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von 15%. Der Euroraum hätte in den nächsten 2 Jahren eine Inflationsrate von 15% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von nur 2%.*

4. Comprehension inflation vs unemployment trade-off Eurozone
(*CD20104 pref_inflation_unemployment_de_s2* or
*CD20105 pref_inflation_unemployment_de_s1*

    German original:
    *Sie haben sich bei der vorherigen Frage für das [erste/zweite] Szenario entschieden: Der Euroraum hätte in den nächsten 2 Jahren eine Inflationsrate von nur [2/15]% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von [15/2]%. Das [zweite/erste] Szenario lautete: Der Euroraum hätte in den nächsten 2 Jahren eine Inflationsrate von [15/2]% pro Jahr, bei einer gleichzeitigen Arbeitslosenrate von nur [2/15]%. Wie hoch müsste die prozentuale Arbeitslosenrate im ersten Szenario mindestens sein, damit Sie sich für das zweite Szenario entscheiden würden? Bitte tragen Sie eine Zahl [zwischen 16 und 100/größer als 15] ein.* [Answer key:] Integer [16-100/>15]

5. Inflation/interest rate/unemployement rate/growth rate preference Eurozone/Germany (*CD20106 pref_inflation_eu* or *CD20107 pref_inflation_de*)

German original:

*Die Europäische Zentralbank (EZB) und die Euroländer, wie beispielsweise die Deutsche Bundesbank, legen die wichtigsten Zinssätze für den Euroraum fest. Dieser Zins wird als Leitzins bezeichnet, da er die gesamte Volkswirtschaft beeinflusst. Durch die Erhöhung des Leitzinses macht die Zentralbank das Geld "teurer," das heißt Bürger und Unternehmen nehmen weniger Kredite auf. Damit ist das Geld der Banken weniger gefragt und die Inflation sinkt. In den folgenden zwei Fragen werden Sie gebeten, einmal die Rolle der EZB einzunehmen und den Leitzins für den Euroraum festzulegen und einmal die Rolle der deutschen Bundesbank einzunehmen und entsprechend den Leitzins für Deutschland festzulegen. In der dritten Frage bittet man Sie, einen Leitzins festzulegen, der für Ihre eigene finanzielle Situation am besten ist. Der Leitzins hat einen Einfluss auf die Höhe der Inflation, der Arbeitslosigkeit und des Wirtschaftswachstums im Euroraum und auch in Deutschland.*

*Stellen Sie sich vor, dass Sie die Rolle der [EZB/Bundesbank] übernehmen und den Leitzins für [den Euroraum/Deutschland] festlegen. Der Leitzins hat einen Einfluss auf die Höhe der Inflation, der Arbeitslosigkeit und des Wirtschaftswachstums im Euroraum.*

*Die vier unten stehenden Linien sind so miteinander verbunden, dass ein höherer Zinssatz zu einer niedrigeren Inflation, einer höheren Arbeitslosenrate und einem niedrigeren Wirtschaftswachstum führt. Ein niedrigerer Zinssatz hat die gegenteiligen Auswirkungen. Bitte klicken Sie auf die [erste/zweite/dritte/vierte] Linie, um Ihren bevorzugten Zinssatz auszuwählen. Anschließend können Sie die Werte verändern, indem Sie eines der Vierecke verschieben [order of sliders is randomized]. [Answer key:]*
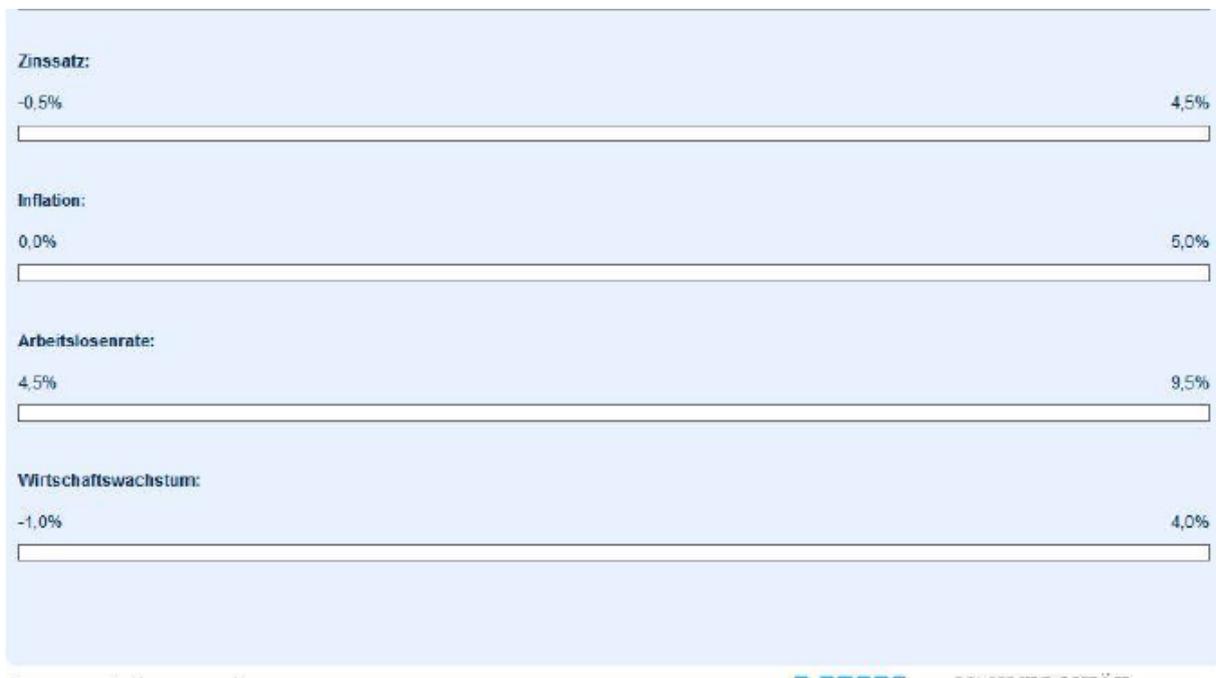


Figure C.1: Example of screen as displayed to respondents to answer question item *CD20106* and *CD20107*

6. Preferences personal inflation (*CD20108 pref_inflation_personal*)

German original:

*Stellen Sie sich vor, dass man Sie persönlich beauftragt hat, einen Leitzins festzulegen, der für ihre eigene finanzielle Situation am besten ist. Der Leitzins hat einen Einfluss auf die Höhe der Inflation, der Arbeitslosigkeit und des Wirtschaftswachstums in Deutschland. Die vier unten stehenden Linien sind so miteinander verbunden, dass ein höherer Zinssatz zu einer niedrigeren Inflation, einer höheren Arbeitslosenrate und einem niedrigeren Wirtschaftswachstum führt. Ein niedrigerer Zinssatz hat die gegenteiligen Auswirkungen. Bitte klicken Sie auf die [erste/zweite/dritte/vierte] Linie, um Ihren bevorzugten Zinssatz auszuwählen. Anschließend können Sie die Werte verändern, indem Sie eines der Vierecke verschieben [order of sliders is randomized].* [Answer key:] See previous question item.

7. Weighting inflation/unemployment rate (*CD20109 weight_unemployment_EZB, CD20110 weight_inflation_EZB, CD201011 weight_unemployment_EZB*, and *CD201102 weight_inflation_EZB*)

   German original:

   *Die Politik der [EZB/deutschen Bundesregierung] beeinflusst die Inflation und die Arbeitslosenrate. Auf einer Skala von 0 bis 10: Wie stark sollte Ihrer Meinung nach die Verringerung der Inflation und wie stark die Reduzierung der Arbeitslosenrate gewichtet werden?*
   *Die Summe der Antworten muss 10 ergeben.* [Answer key:]



Figure C.2: Example of screen as displayed to respondents to answer question item *CD20106* and *CD20107*

8. Inflation expectation (next 12 month, (*CD20113 change_inflation_ecb*)

   German original:
   *Der folgende Bericht beschreibt und erklärt die Handlungen der EZB für die Öffentlichkeit. Bitte beachten Sie diese Informationen bei der Beantwortung der anschließenden Frage.* [Anchoring treatment 2 (AT2):]

   AT2.1 Clear information, long:
   *Die EZB dehnt ihre Ankäufe auf Anleihen aus, die von im Euroraum ansässigen Zentralstaaten, Emittenten mit Förderauftrag und europäischen Institutionen begeben werden. Insgesamt sind monatliche Ankäufe von Vermögenswerten in Höhe von 60 Milliarden Euro geplant. Die Ankäufe sollen mindestens bis September 2016 erfolgen. Das Programm dient der Erfüllung des Mandats der EZB, die Preisstabilität zu gewährleisten und mittelfristige Inflationsraten nahe 2% zu erreichen.*

   AT2.2 Vague information, long:
   *Die EZB dehnt ihre Ankäufe auf Anleihen aus, die von im Euroraum ansässigen Zentralstaaten und anderen Emittenten und Institutionen begeben werden. Insgesamt sind monatliche Ankäufe von Vermögenswerten in großer Höhe geplant. Die Ankäufe sollen mindestens bis Mitte nächsten Jahres erfolgen. Das Programm dient der Erfüllung des Mandats der EZB, die Preisstabiliät zu geährleisten und mittelfristige Inflationsraten nahe einem angemessenen Level zu erreichen.*

   AT2.3 Clear information, short:
   *Die EZB dehnt ihre Ankäufe auf Anleihen aus. Die Ankäufe in Höhe von 60*

*Milliarden Euro sollen bis September 2016 erfolgen und dienen der Erfüllung des Mandats der EZB zur Gewährleistung von Preisstabilität und einer Inflationsrate nahe 2%.*

AT2.4  Vague information, short:

*Die EZB dehnt ihre Ankäufe auf Anleihen aus. Die Ankäufe in großer Höhe sollen bis Mitte nächsten Jahres erfolgen und dienen der Erfüllung des Mandats der EZB zur Gewährleistung von Preisstabilität und einer angemessenen Inflationsrate.*

*Wie sehr wird Ihrer Meinung nach die Inflationsrate in den nächsten 12 Monaten steigen oder sinken (in Prozent)?* [Answer key]: *-1 oder mehr sinken, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10% oder mehr steigen.*